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Proceedings of the Central and Arctic Regional Science Advisory Process on the Recovery Potential Assessment of Lake Sturgeon for Designatable Units 1-5

Compte rendu du processus de consultation scientifique régionale du Centre et de l'Arctique sur l'évaluation du potentiel de rétablissement de l'esturgeon jaune des unités désignables 1-5

October 20-22, December 3 and 17, 2009

Winnipeg, MB R3T 2N6

Du 20 au 22 octobre, les 3 et 17 décembre 2009

Winnipeg MB R3T 2N6

Thomas C. Pratt
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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting participants. Proceedings 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.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d’analyses ou d’interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenus dans le présent rapport puissent être inexacts ou propres à induire en erreur, ils sont quand même reproduits aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considéré en tant que reflet des conclusions de la réunion, à moins d’indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l’information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

In November 2006, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed the status of Lake Sturgeon (*Acipenser fulvescens*). The populations in western Canada, Western Hudson Bay (Designated Unit (DU) 1), Saskatchewan River (DU2), Nelson River (DU3), Red-Assiniboine rivers – Lake Winnipeg (DU4) and Winnipeg River - English River (DU5), were designated as Endangered. These Lake Sturgeon DUs are now being considered for legal listing under the *Species at Risk Act* (SARA). In advance of making listing decisions, Fisheries and Oceans Canada (DFO) Science has been asked to undertake Recovery Potential Assessments (RPAs) for DUs 1-5. Science advisory meetings were held on 20-22 October 2009 and 3 and 17 December 2009 to conduct these RPAs. Meeting participants were from DFO Science and the Species at Risk program, the provinces of Alberta, Saskatchewan, Manitoba and Ontario, aboriginal communities and organizations, SaskPower, Manitoba Hydro, an environmental consulting company, the University of Manitoba and State University of New York-Oswego. A draft Research Document and Science Advisory Report for each DU was distributed prior to the meetings. During the meetings, the participants discussed the best available information and knowledge gaps for Lake Sturgeon in DUs 1-5 on a range of topics related to species biology, population and distribution objectives, habitat requirements, threats to survival or recovery, potential mitigation measures and allowable harm. Participants also identified Management Units within each DU. The meeting documents were revised to reflect the discussions and conclusions reached.

This Proceedings report summarizes the relevant discussions and presents the key conclusions reached at the meetings. The five Science Advisory Reports and their supporting Research Documents, resulting from these advisory meetings, are published on the DFO Canadian Science Advisory Secretariat Website at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

SOMMAIRE

En novembre 2006, le Comité sur la situation des espèces en péril au Canada (COSEPAC) a évalué la situation de l'esturgeon jaune (*Acipenser fulvescens*). Les populations de l'ouest du Canada, de l'ouest de la baie d'Hudson (unité désignable [UD] 1), de la rivière Saskatchewan (UD 2), du fleuve Nelson (UD 3), des rivières Rouge-Assiniboine et du lac Winnipeg (UD 4) ainsi que des rivières Winnipeg et English (UD 5) ont été désignées comme étant « en voie de disparition ». On examine présentement la possibilité d'inscrire ces UD d'esturgeon jaune à la liste de la *Loi sur les espèces en péril* (LEP). Avant que l'on prenne une décision quant à l'inscription des populations, on a demandé aux Sciences de Pêches et Océans Canada (MPO) d'effectuer des évaluations du potentiel de rétablissement (EPR) des UD 1 à 5. On a tenu des réunions de consultation scientifique du 20 au 22 octobre 2009 ainsi que les 3 et 17 décembre 2009 pour réaliser ces EPR. Parmi les participants aux réunions, mentionnons des représentants des Sciences du MPO et du programme sur les espèces en péril, des gouvernements de l'Alberta, de la Saskatchewan, du Manitoba et de l'Ontario, d'organismes et de communautés autochtones, de SaskPower, de Manitoba Hydro, d'une entreprise d'experts-conseils en environnement, de l'Université du Manitoba et de l'Université d'État de New York-Oswego. Les ébauches d'un document de recherche et d'un avis scientifique pour chaque UD ont été remises aux participants avant les réunions. Au cours des réunions, les participants ont discuté de la meilleure information disponible et des lacunes dans les connaissances concernant l'esturgeon jaune des UD 1-5 en examinant un éventail de sujets liés à la biologie de l'espèce, aux objectifs en matière de répartition et de population, aux besoins en matière d'habitat, aux menaces pesant sur la survie ou le rétablissement, aux mesures d'atténuation potentielles et aux dommages admissibles. Les participants ont également défini des unités de gestion au sein de chaque UD. Les documents découlant des réunions ont été révisés en fonction des discussions tenues et des conclusions formulées.

Le présent compte rendu résume les discussions pertinentes et présente les principales conclusions découlant de ces réunions. Les cinq avis scientifiques et les documents de recherche à l'appui qui découlent de ces réunions de consultation scientifique sont publiés sur le site Web du Secrétariat canadien de consultation scientifique du MPO, à l'adresse : http://www.dfo-mpo.gc.ca/csas-sccs/index-fra.htm.

INTRODUCTION

In November 2006, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed Lake Sturgeon (*Acipenser fulvescens*). Eight designatable units (DUs) of Lake Sturgeon were recognized in Canada by COSEWIC. Five of the DUs include Lake Sturgeon populations that occur in Alberta, Saskatchewan, Manitoba and the English and Wabigoon rivers in northwestern Ontario. Lake Sturgeon populations in these DUs have been reduced by 50% or more as a result of overexploitation and habitat degradation or loss. They are now being considered for legal listing under the *Species at Risk Act* (SARA). To inform these listing decisions and to provide the basis for other SARA-related activities (e.g., recovery planning and SARA permitting), Recovery Potential Assessments (RPAs) were conducted on October 20-22 and December 3 and 17. All meetings were held in Winnipeg, though a few participants joined the December meetings via teleconference.

The purpose of the meetings, as described in the Terms of Reference (Appendix 1), was to assess and provide advice on the recovery potential of Lake Sturgeon in the five DUs. The RPA is a science-based peer review that assesses the current status of Lake Sturgeon and possible recovery targets, what is known about its biology, habitat and threats, the scope for human-induced mortality and potential mitigation measures, alternatives and enhancements. (Full details about the RPA process are available on the Canadian Science Advisory Secretariat (CSAS) website at http://www.dfo-mpo.gc.ca/csas/Csas/status/2007/SAR-AS2007_039_e.pdf.)

Meeting participants (Appendix 2) included DFO Science sector and Species at Risk program, the provinces of Alberta, Saskatchewan, Manitoba and Ontario, aboriginal communities and organizations, SaskPower, Manitoba Hydro, an environmental consulting company, the University of Manitoba and State University of New York-Oswego. DFO drafted working papers, that later became Research Documents, for each of the five DUs to serve as the basis for the RPA. Science Advisory Reports (SARs) were also drafted. They were distributed to participants in advance of the first meeting. Two Lake Sturgeon modelling papers were also distributed.

The meeting generally followed the agenda outlined in Appendix 3, except that the timeline extended over an additional two days in December. Discussions among participants were also conducted by e-mail between and following the meeting dates during which further revisions were made to the RPA documents, especially for DUs 2, 4 and 5.

This Proceedings report summarizes the relevant meeting discussions and presents the key conclusions reached for DUs 1-5. The information in the Discussion section is presented by topic, rather than chronologically. It begins with a brief description of the start of the meeting. The remainder of the Discussion section summarizes the meeting discussions, beginning with those common to all five DU working papers followed by those specific to each DU.

Science advice resulting from these meetings is published in the CSAS Science Advisory Report series and the supporting data analyses are published in the Research Document series. In a few instances, information resulting from a discussion documented in the Proceedings was inadvertently left out of a Research Document. In those cases, the missing information was included in the appropriate Science Advisory Report and the Proceedings document was cited as the source.

DISCUSSION

The Chair provided an overview of the RPA process and the meeting Terms of Reference. He explained that the documents resulting from the RPA process are intended to provide the best available scientific information about Lake Sturgeon in DUs 1-5 for various elements of the SARA process. Final versions of the RPA documents will be posted on the CSAS website, which is available to the public. Participants agreed to review and revise the working papers during the meeting to ensure the best and most up-to-date information was included. These documents were later finalized and published as Research Documents. The draft SARs were revised following the meetings based on revisions made to the working papers.

DUs 1-5

Authorship

According to CSAS standards, DFO is the sole author of SARs and Proceedings reports resulting from CSAS meetings while specific authors are identified for the Research Documents. During the Lake Sturgeon RPA meetings, participants agreed that those who contributed significantly to development of a working paper should be identified as an author, if they agreed. Authors' names would be shown in alphabetical order following the original three DFO authors of the working paper.

Abstract

Participants agreed that some information in the abstract taken from the COSEWIC status report (COSEWIC 2006) was not entirely accurate for all DUs. Abstracts were later revised to reflect the best available information.

Introduction

The value of Lake Sturgeon to the tourist industry was noted by participants and added to this section.

Species biology and ecology

Some terms and/or their descriptions used in this section (e.g., sexual maturity) were revised to improve accuracy and clarity.

Participants noted that much of the information presented in the working papers is based on research conducted on Lake Sturgeon in rivers rather than lakes. Behaviour observed in one system (e.g., avoidance of/preference for higher-velocity water) may reflect differences in life history between riverine and lacustrine fish.

Lake Sturgeon movements can vary significantly between areas. For that reason, the participants decided to remove any references to specific distances travelled by Lake Sturgeon and keep the text more general. Information about habitat preferences of juvenile Lake Sturgeon, obtained from recent mark-recapture and acoustic telemetry research conducted in DU5, was incorporated into this and the critical habitat section of the working papers. Participants noted that Lake Sturgeon do not always spawn in tributaries so that detail was removed.

A two-step spawning movement is known to occur in the Lake Sturgeon populations that inhabit Lake Winnibago, Wisconsin, whereby spawners move to the spawning ground in the fall and overwinter there before spawning the following spring. In the Great Lakes there can be two spawning events, often temperature driven. Participants did not know whether this is a common occurrence in DUs 1-5. While there is no evidence of two-step spawning movements, migration has not been studied thoroughly enough to know for certain whether it occurs. Participants decided not to mention two-step spawning movements in the working papers.

A question arose about how sexual maturity is defined in Lake Sturgeon. Historically, sexual maturity was defined as the age at which eggs were first found in a fish. This was determined when fish were collected for caviar. More recently, sexual maturity has been defined according to the age at which a fish spawns for the first time. The working papers cited a published paper in which sexual maturity was identified as fish with eggs at any stage (i.e., egg stages 1-4). Participants decided that differences in methods should be explained in the working papers and caution taken in making comparisons.

It was decided that information about the biology of spawning should remain in this section but specifics related to spawning habitat should be elaborated on in the Critical Habitat section. Spawning periodicity in female Lake Sturgeon was corrected from 3-5 to 3-7 years to reflect the participants' knowledge. The 2-3 year cycle for males was thought to be correct and there is no evidence of reproductive senescence in this species.

Participants discussed the juvenile life stage. In some MUs, juveniles are relatively abundant and much is known about this stage in the life cycle. The transition from yolk sac larvae to exogenous feeding is short but likely a critical period in the life history of this species. Current data on changes in feeding behaviour in Lake Sturgeon from yolk to food are based on hatchery observations, however it is expected that wild fish are also very vulnerable at this stage (as are all fishes). This transitional period in the life cycle may be the time when Lake Sturgeon is most vulnerable and when habitat needs are poorly understood. Participants agreed that the period between hatching and first feeding should be highlighted as a critical stage in this and the Critical Habitat sections of the document. The discussion turned to larval drift sampling for age-0 (recently emerging) Lake Sturgeon. Most experts agree that the egg, incubation and drift stages cover about one month. The working paper was revised accordingly.

Growth rates in juveniles are more variable than was indicated in this section so the text was revised to reflect this. Participants noted that "total length" versus "fork length" (FL) should be identified for all body length measurements given in the working papers.

The group also examined the text regarding sex ratio. The group also noted that post spawning mortality was not observed, so the text was modified to reflect this as well. Sex ratio at birth is assumed to be 1:1 but the literature cited in the working papers included an adult sex ratio of 6:1. Participants indicated that the 1:1 ratio at birth is assumed, not documented, therefore it may not be accurate. It was also noted that the higher sex ratio cited may not be natural but the result of exploitation as it was based on data collected from the Lake Winnebago system where harvesting occurred. Sex ratio may vary depending on the sex selected for harvest. The text was changed to reflect these points. Variability in, and uncertainty about, the sex ratio would need to be captured in population models developed for Lake Sturgeon recovery and appropriate caveats about the conclusions drawn from the modelling. Following the meeting, participants provided additional information about Lake Sturgeon survival and mortality for the working papers and recruitment was defined.

Historic and current distribution and trends

It was decided the working papers would flow better if this section preceded the abundance section.

Participants discussed splitting DUs into management units (MUs), as had been done for Lake Sturgeon in the Great Lakes, to provide more manageable work units. The Chair described the process by which MUs were developed for the Great Lakes. Those populations were usually split based on physical separations (e.g., separate rivers, barriers, natural waterfalls) and genetic differences. Participants questioned if Lake Sturgeon can move upstream or downstream of barriers and whether it depends if the barrier is man-made (relatively recent) or has always been there (e.g., waterfalls). It is likely that a significant natural barrier, (e.g., large waterfall) or man-made barrier (e.g., hydroelectric generating station (GS) without fish passage) would block movement of Lake Sturgeon and, therefore, be used to define appropriate MUs. It was decided that in cases where a man-made barrier occurs at the upstream and downstream end of an MU, the barrier at the upstream end should be included in the MU. That detail was noted in the caption for Table 2.

For DUs where information is available, participants agreed that it would be useful to include a general description of each MU in the working papers. Those with knowledge of the DU would provide written text for review by the group later.

It was agreed that more detailed maps, showing place names mentioned in the text, were needed. They were developed for each DU following the meeting.

Historic and current abundance and trends

It was decided that this section should begin with a very short summary. Major threats may be briefly mentioned in this summary but details about individual threats would be fleshed out in the Threats section.

Table 1 summarizes current knowledge of the conservation status and population trajectory of Lake Sturgeon in each MU, the overall importance of each MU to recovery and the potential for recovery within each MU. The conservation status of Lake Sturgeon in each MU was determined on the basis of a precautionary approach framework (see Figure 2 in Cleator *et al.* 2010) previously developed by DFO. Participants discussed and agreed to use this approach for describing the status of Lake Sturgeon in each MU. For clarity, participants revised the heading for the third column in the Table to “importance to DU recovery”.

Information to support identification of critical habitat

The phrase “egg rearing” was changed to “egg incubation and juvenile rearing” for clarity.

Discussion focussed on age-0 and juvenile Lake Sturgeon using different habitat to avoid competition with adult fish. It was decided that a more thorough review of the literature, particularly recent research, was needed to broaden the description of habitat use in this section, especially for juvenile fish, and better define life stages for young fish. Little is known about juvenile and larval habitat; this is an emerging field of study.

The minimum spawning depth was changed from 0.1 m to 0.5 m. While eggs may be found at shallower depths, participants questioned whether Lake Sturgeon spawn at those locations or the eggs are moved there by water flow. The maximum spawning depth was also modified, from

2 m to 10 m, to reflect what was known about deep-water spawning in the Detroit/St. Clair, Winnipeg and St. Lawrence rivers, where Lake Sturgeon have been observed spawning in waters 10 m in depth.

The working papers contained a statement and cited reference about Lake Sturgeon avoiding seasonably unfavourable areas that contained low dissolved oxygen. Participants mentioned that captured Lake Sturgeon can be held in situations with low oxygen but given a choice would avoid these areas. Questions arose about whether there are other relevant references or the sentence should be removed. This section also examined the role of current and whether Lake Sturgeon avoid areas of high current or whether this was a reflection of sampling effort. It would make sense physiologically for adult fish to move away from areas of high current after they have spawned, but it is not completely understood how they behave. It was agreed a more thorough review of this section was warranted.

Participants noted that spawning habitat may be limiting for Lake Sturgeon as there was a feeling that spawning and age-0 fish are quite restricted when compared to the older ages which may be more plastic. This section of the working papers needs to be fairly broad as Lake Sturgeon exhibit a range of habitat uses depending on availability, activity (e.g., spawning, feeding) and/or life stage. The Lake Sturgeon uses a wider range of habitats than previously noted.

Limited data are available on overwintering habitat. Hydroacoustic telemetry provides the only means for pin-pointing overwintering locations. Habitat use during winter seems to depend on the river, water depth and life stage. Generally, deep, mid-velocity locations are expected to provide good over-wintering habitat. Research conducted in other regions, including the work that Hydro Quebec is known to have done, should be included in this section.

Some changes were made to the text in the last paragraph of this section. Participants changed the wording of “ecologically-significant base flows” to “ecologically-based flow regimes” to describe more accurately what was meant. The final sentence in this section stated that it is essential that migration routes and natural flow regimes be maintained. Some participants thought this statement was too prescriptive. After much discussion, the wording was changed to say it is essential that conditions that optimize survival and recovery of Lake Sturgeon be maintained.

Residence

The definition of “residence”, as understood for species at risk, does not apply to Lake Sturgeon as this species does not construct or change its physical environment (e.g., build nests) or defend habitat. This section will remain in the RPA document as it is a standard and required section for all RPAs, with the note that it does not apply.

Recovery targets

The Chair explained that recovery planning for species at risk had led DFO to develop models that could be used to generate recovery targets and examine allowable harm. These models had been developed for all species at risk, with species-specific modifications. One of the DFO modelling co-authors gave two presentations that outlined the population modelling work that had been completed for DUs 1-5.

Population, habitat and distribution targets for Lake Sturgeon: DUs 1-5
Presenter: Marten Koops

The first presentation detailed Population Viability Analysis (PVA) undertaken to set population, habitat and distribution targets for Lake Sturgeon. A 99% probability of persistence over 40 generations was used, based on the work of Reed *et al*. (2003). However, for Lake Sturgeon 40 generations is equal to about 1,200 years. COSEWIC assessments are generally based on 100 years, but for Lake Sturgeon this would equal only three generations, so for this model a 99% probability of persistence over 250 years (or seven generations) was used. The participants asked if the timeframe could be shortened, however the modeller felt that this would not provide enough time to determine if Lake Sturgeon were recovering.

Three steps comprised the modelling analyses to set population abundance and habitat targets:

- vital rates were used to build a stage-structure population projection matrix at equilibrium and a standard deviation matrix to represent populations in each DU;
- matrices were used to run stochastic simulations in RAMAS to estimate extinction risk at different population sizes and estimate minimum viable population size (MVP); and
- information on area per individual (API) was used, together with MVP, to estimate the minimum area for population viability (MAPV) (i.e., the minimum quantity of habitat required to support a viable population of Lake Sturgeon).

Modelling analysis aimed at setting distribution targets examined the relationships between probability of a catastrophe, population persistence within a DU and the number of populations needed. Assumptions used for the modelling analyses and population, habitat and distribution targets for all of the DUs were presented.

The participants asked about the vital rates used in the model and whether the population targets developed were determined for the MU or the DU as a whole. The model output was developed for each population (or MU) within the DU. It was recognized that there is not enough data to model for all areas within DUs 1-5, so extrapolation was used support the model assumptions. Stochastic simulations were run to determine extinction rates at different population sizes and estimate minimum viable population sizes. This analysis was based on work completed in the Great Lakes that looked at individuals and the amount of available habitat required for adult growth and survival. The modellers recognized two issues associated with their models: (1) lack of data and (2) the need for as much information as possible about potential biases in the data that is used.

Participants discussed how many MUs should be protected in each DU. As the risk of catastrophic extinction within a DU decreases as the number of MUs increases, it was agreed that the recovery goal for all DUs should be to protect and maintain Lake Sturgeon in all MUs.

Participants asked how age at maturity affected the model and whether reproductive senescence (i.e., growing older) was considered in the model. Given the long generation times in Lake Sturgeon, changing age at maturity did not affect the model results. The model assumed that once a fish reached sexual maturity, age did not affect reproductive output. Participants asked what Lake Sturgeon habitat is and how it was used in the model. The habitat descriptions used were based on literature, however, it was recognized that there were differences between lake and river habitats and that different life stages require different habitat. The modellers wondered whether different populations interact with each other as that would change the parameters of the model. Participants asked how long it would take to know whether the status of the species has changed from Endangered to Threatened if the recovery targets were followed. COSEWIC reviews and monitors the populations, and will continue to do so, and as changes occur within the populations, changes will be made with status.

Detailed questions were raised about the population models given the lack of data and potential differences in spawning ages for different populations and how this could affect the estimates presented. The model presents the upper and lower bounds, but these can be adjusted as more information is provided for both the species and habitats utilized and available. New research is critical to adjusting the models.

The participants discussed restructuring the Recovery targets section to more clearly reflect the modelling information including the assumptions used (.e.g., a 1:1 sex ratio). Participants also wanted to include a clear definition of habitat (e.g., not just “wetted habitat”). This information is captured in the critical habitat section of the working papers.

In the working papers, the timeframe for reaching the recovery goal was within three generations (i.e., about 90 years). Participants thought that a recovery timeframe longer than three generations would result in people losing interest in the recovery plan. The generation time was corrected to 36 years, and corresponding recovery timeframe to 108 years, based on current knowledge for the five DUs.

Recovery potential modelling for Lake Sturgeon (*Acipenser fulvescens*) in Canadian Designatable Units
Presenter: Marten Koops

The second presentation began with an overview of species at risk that are typically poorly studied with limited population and habitat data, and may have habitat loss or degradation issues. The model tried to take these factors into account using PVA which uses a stage-based, life history, stochastic approach. The modellers noted that if too much of the data are pooled, especially when limited, the model will lose sensitivity for different life stages. The growth rates equations used in the model were detailed. The participants asked if more Lake Sturgeon data would help to refine the model, and it would. Three models were built for each DU which examined (1) the whole DU, (2) MUs within the DU and (3) one general model for Lake Sturgeon. The three versions are detailed in the modellers’ reports. The original models developed for DFO species at risk were driven by marine fish and included a large bycatch component that was removed for freshwater species. It was also noted that harm to the species can occur at many locations along the model and the harm can be additive. The more life stages affected, the more difficult recovery will be.

The modelling results demonstrated the effect of recovery efforts for age-0 and early juvenile fish, with protection of earlier life stages offering better potential for improving survival. As with harm to the species, recovery strategies/efforts are additive, but it also depends on the number of Lake Sturgeon at the start of the recovery plan. Differences in recovery plan outcomes can be very dramatic, depending on how aggressive the plans are and the population starting point.

The effects of protecting different life stages for Lake Sturgeon were discussed. For many management agencies the focus of protection was the spawning (female) stock, with size-based targets for catching fish. The modelling results presented here seemed counter-intuitive to the group, with the smaller fish being as or more valuable. The presenter indicated that for many species larger individuals are more important because they are older and/or have more eggs. Although this is the case for Lake Sturgeon, their survival is already so high that there is little potential for improvement. However, if fished for the caviar trade (targeting the larger females) there would be definite negative consequences for Lake Sturgeon populations.

Participants asked whether the demographic structure presented in the model accounted for year classes, habitat, and target numbers for juveniles. The model took these elements into account, but this information was not detailed in the modelling papers. This gap will be addressed in updated versions. A table showing all parameters used in the model for all DUs was suggested.

Threats to survival and recovery

The format of the threats table (Table 2) was discussed and several changes were made.

In the working papers, fishing was identified as a general threat category and population fragmentation was considered in terms of habitat degradation or loss. Participants agreed that mortality, injury or reduced survival of Lake Sturgeon resulting from entrainment, impingement and turbine mortality, population fragmentation and fishing should appear in the Table under one general category of threats that impact individual fish.

The wording of “hydroelectric dams/impoundments and activities: changes in flow regime” was generalized so that it included all man-made barriers, not just hydroelectric ones, and included all impacts of man-made structures (e.g., the structure’s footprint) including changes in flow regime.

The word “aquaculture” was changed to sturgeon culture to clarify that only those impacts related to culture of sturgeon and not other species were being assessed.

Predation by fishes had been included in Table 2 as a potential threat in DUs 1-5 as it had been identified as a population-level threat for Lake Sturgeon in DU8. Participants discussed what life stage and size would be vulnerable to predation and potential predators. It would be difficult, if not impossible, to mitigate this threat. Predation of Lake Sturgeon is unknown in western Canada, though cormorant predation may be an issue in DU2. This threat was removed from the Table.

Not all non-indigenous species are deliberately introduced, so participants revised the wording of this threat to “non-indigenous and invasive species”.

Limiting factors for population recovery

Several changes were suggested by participants for this section of the working papers. Lake Sturgeon exhibits a high degree of fidelity to spawning sites, which has the potential to limit recovery. A specific range of temperatures and flow and substrate requirements are needed for spawning. Participants also noted that critical habitat for age-0 Lake Sturgeon should be included, even though information regarding this life-stage is limited.

Mitigation, alternatives and enhancements

Participants thought that a table outlining potential mitigation measures and alternatives to threats, similar to one developed for DU8, would be a useful addition to the working papers for DUs 1-5, with the option to add specific details for each DU.

The opening paragraphs in this section described the results of the recovery potential modelling. Following the opening paragraphs, mitigation measures and alternatives were combined into a sub-section and enhancements were added as a second sub-section. Participants debated whether the text in these two sections should be common or specific for each DU. Agreement was reached to use standard text to the extent possible with specific wording added for a DU when necessary. Some measures are specific for one or more life stages and were worded accordingly. Mitigations and alternatives were presented for only those threats that had been rated in Table 2 as moderate or higher, in terms of their likelihood of occurrence and severity of impact on Lake Sturgeon in one or more MUs.

Participants discussed the effects of dams/control structures and impoundments on Lake Sturgeon. Some participants wondered whether it is necessary to distinguish between the effects of man-made versus natural barriers. A lengthy discussion ensued about whether future man-made barriers would cause fragmentation and habitat degradation. Some participants felt the evidence was quite strong in support of further damage, though it may be at least partially mitigated with fish passage, while others did not. Is fish passage always necessary even when no habitat is available upstream or downstream? Is upstream and/or downstream passage required? There will always be bottlenecks in a river system, but some will be more limiting than others.

Some participants wanted threats related to entrainment, impingement and turbine mortality, as well as fragmentation, removed from the working papers because they thought they pose relatively minor threats to the survival or recovery of Lake Sturgeon in DUs 1-5 compared to other threats such as fishing and changes in flow regimes. They felt the text detailing no new construction of man-made structures on spawning sites was too prescriptive. This was countered by other participants who agued that the role of the participants during this meeting is to give advice for the survival and recovery of the species based on the best available scientific evidence and expert opinion. It makes sense to not damage spawning habitat in order to maintain and enhance their survival and recovery.

Following the meeting, the wording of some of the mitigation bullets was revised and participants reviewed the new text.

Participants discussed at length the value of improving survival in age-0 and early juveniles through stocking. Some participants thought that stocking should be considered only after great deliberation and caution because of its potential to introduce disease and genetic contamination and reduce the genetic fitness of naturally-reproducing Lake Sturgeon. It was also pointed out that COSEWIC views “recovery” only in very strict terms thus stocking may not be considered an effective recovery method. Others thought that it had considerable benefit, especially for MUs in which Lake Sturgeon had almost disappeared or gone extinct (e.g., in parts of DU4). Stocking protocols are already in place and currently being met for various locations (e.g., in DU3). In some cases, stocking was the only option available (e.g., the stocking of a forebay) and upstream passage would not be provided at these locations to prevent contamination of indigenous stocks upstream. Some participants argued that stocking (re-introduction) would not be viewed as a recovery measure per say, but could be used to shorten the time to recovery and/or supplement recovering habitat. In the end, participants agreed to add generic text to this section describing the costs and benefits of stocking to the survival and recovery of Lake Sturgeon, and circumstances under which it could be considered an enhancement to the presented mitigation measures and alternatives. Generic text about the use of stocking as an enhancement tool was also added to this section below the list of possible mitigations and alternatives.

Participants recognized that the purpose of RPA document is to provide scientific advice related to the recovery of the species. However, some wanted to avoid including mitigation measures and alternatives in the RPA that they thought were too prescriptive. They felt that this should be the work of recovery teams. They wanted a caveat included in the document to indicate that these measures may not be the only options available for recovery teams to consider while developing recovery plans for Lake Sturgeon. They also felt that recovery teams should not determine what or where man-made structures are built. Others thought that mitigations, alternatives and enhancements were an essential component of the document that should be included. Participants asked if and how the Minister might take into account the socio-economic costs and benefits of the mitigation measures, alternatives and enhancements outlined in the RPA documents during the listing decision process. The Chair explained that this section of the RPA is intended to provide science advice on possible mitigation measures, alternatives and enhancements to anthropogenic threats that pose threats to Lake Sturgeon survival and recovery. The Minister may also take other factors into account elsewhere in the SARA process.

Allowable harm

The working papers initially framed the science advice on allowable harm in terms of a recommended amount of allowable harm for each MU within the five DUs. Participants reviewed and revised, as necessary, that science advice during the meetings. In the view of some, this approach was thought to be too prescriptive for managers and recovery planners. Following the meetings, the science advice was re-framed in terms of the level of risk (e.g., low, moderate, high, very high) to Lake Sturgeon populations from activities that damage or destroy functional components of their habitat or negatively affect key life components of their life cycle (e.g., spawning, recruitment and survival). Participants reviewed the revised documents.

Data and knowledge gaps

Participants agreed that the relationship between key life history stages, especially age-0 fish, and habitat, as well as current levels of domestic harvest, need to be better understood.

Sources of uncertainty

Participants thought it would be useful to include quantitative information about the level of uncertainty associated with age estimates for Lake Sturgeon made using growth increments on pectoral fin spine cross sections. Additionally, text was added to this section about the difficulty of sampling and surveying this species given its behaviour and ecology.

Conclusions

The conclusions sections was revised following the meetings once the working papers had been updated.

DU1

Historical and current distribution trends

In the working paper, DU1 had been split into three MUs (upper Churchill, lower Churchill and Little Churchill rivers) based on the presence of the Island Falls GS, Missi Falls Control Structure (CS) and a significant tributary, the Little Churchill River. Participants felt that Lake Sturgeon in the Little Churchill River did not warrant separate MU status because there was no evidence to suggest they comprise a separate stock. All available data for that part of the DU were obtained from the confluence of the Little Churchill and Churchill rivers. For that reason, participants decided to combine the Little Churchill River with the lower Churchill River. References to the Little Churchill River as a separate MU were removed from the document.

Within the Churchill mainstem, there may be downstream mixing of Lake Sturgeon but potentially little upstream movement. It was not known if the Island Falls GS had been a historical barrier to Lake Sturgeon movement. After much discussion, participants decided to have one MU for the upper Churchill River (above the Missi Falls CS) and one MU for the lower Churchill River (below the CS). During e-mail communication following the meetings it came to light that in recent decades there have been reports of Lake Sturgeon upstream of the Island Falls GS, so a third MU was added (above the GS).

The need for a map of the Churchill River, to show the MUs and place names mentioned in the text, was identified.

Historic and current abundance trends

The text in this section was reviewed and the first two columns of Table 1 (conservation status and population trajectory, respectively) were discussed and filled in. Participants noted that there is very little subsistence fishing in the upper Churchill River, but those fish that are caught are very large. On the Saskatchewan side only very large, old fish are also caught, indicating that recruitment failure may be occurring throughout the river. References to larval drift assessment were removed from the working paper as it did not apply to that section of the river. A mark-recapture study conducted in the lower Churchill River MU produced a population estimate of 1,812 ± 508 adults. The text in the working paper was revised to clearly indicate the population estimate “may be positively biased”, as indicated in the COSEWIC status report, because some juveniles may have been included in the estimate.

Participants questioned the threat level imposed on the lower Churchill River MU by the Lake Sturgeon subsistence fishery. Large fish are not specifically targeted by the subsistence fishery, however significant harvesting has occurred since the mark-recapture study was conducted. Size of fish targeted, gear selectivity, timing of fishing and recruitment failure may contribute to stress on the lower Churchill River MU. As DU1 is at the northern edge of the geographic range for Lake Sturgeon, that may affect their size and thus the impact of gear selectivity. The existing population structure in this MU may reflect one or more of these factors. Participants thought there has not been enough study to accurately estimate the numbers of Lake Sturgeon in the Churchill River but a statement was added to indicate there are an estimated 1,300 (lower confidence limit of population estimate) mature individuals in the lower Churchill River.

Discussion then focussed on population trajectory for the two MUs. There is virtually no data for this region (other than the population estimate for the lower Churchill River) and little or no local knowledge, historical data or current work to inform these decisions. Participants discussed the potential for a depleted but stable population category for the lower Churchill River. They also examined the meaning of “potential for recovery”. That column of the Table considers whether the DU can be recovered if the MU in question disappears. Participants discussed what measures would be needed, and what lengths responsible jurisdictions would be willing to go, to recover an MU.

Recovery potential of the lower Churchill River system was evaluated. While there are an estimated 1,300 adults currently in the MU, controlled flows below the Missi Falls CS have reduced the river from 33,000 cubic feet per second (cfs) to approximately 500 cfs. There are no plans to rehabilitate habitat in this section of the river. For these reasons, the potential for recovery of Lake Sturgeon in the lower Churchill River is viewed as low.

Information to support identification of critical habitat

Information about critical habitat for age-0 Lake Sturgeon is limited. Lake Sturgeon larvae have been collected in the Little Churchill River, thus spawning is occurring in that part of the DU.

Recovery targets

A question was raised about whether the recovery target should be to protect and maintain viable populations of Lake Sturgeon in one or both MUs. Participants discussed the relationship between current levels of exploitation, which are low, and the potential for future exploitation. The Chair indicated that this information would likely be included in the Recovery Team documents, assuming DU1 Lake Sturgeon are listed, not the RPA documents, though it can be noted.

Based on the modelling analyses, two MUs in DU1 must have at least 586 spawning females (i.e., 5,860 adults) each year in order to protect and maintain healthy Lake Sturgeon populations in the DU. The model presenter noted that the total number of adults does not have to be the only indicator for the population. Other parameters such as the number of juveniles could also be used.

Participants discussed how suitable habitat is defined in terms of the recovery targets. The amount and availability of Lake Sturgeon habitat in DU1 is currently unknown as so little habitat work had been done. Water flow regimes are critical in determining the quantity and quality of available habitat. A suggestion was made to talk with First Nations communities along the lower Churchill River, that have had the most contact with Lake Sturgeon since the Missi Falls CS was constructed, to ask how changes in water flow have affected the abundance and movements of spawners and juveniles over the past thirty years.

Threats to survival and recovery

Threats to Lake Sturgeon in DU1 were discussed and the threats section and Table 2 in the working paper reviewed and revised based on discussions. The effects of fishing in DU1 were discussed first. The model results indicate that removal of late juveniles and early adults would have the greatest effect on the population recovery. Participants discussed how juvenile Lake Sturgeon were defined and differences between early and late juveniles (pre-spawning adults). The current level of harvest (legal and illegal) in DU1 is largely unknown. Participants evaluated the likelihood of occurrence and level of severity from fishing, and filled in Table 2, based on their knowledge of the DU. The potential for hooking mortality resulting from catch-and-release fishing was discussed.

Participants discussed whether natural waterfalls were present at the sites of the Island Falls GS and Missi Falls CS prior to their construction and, if so, whether they might have been a barrier to Lake Sturgeon movements. It was noted that Island Falls may have fragmented Lake Sturgeon populations but not as severely as the GS. Participants discussed the genetic implications of fragmentation. It was decided that statements in the working paper regarding fragmentation should be revised to indicate that historically there were natural barriers at the GS and CS locations that may have restricted Lake Sturgeon movements. At the same time, the Missi Falls CS may have opened up new areas for Lake Sturgeon that were not previously accessible. Revisions were made to the working paper based on the discussion.

Possible mortality of Lake Sturgeon and habitat degradation and loss, resulting from operation of the Island Falls GS and Missi Falls CS, were also discussed. There are seasonal changes in flow regime in the upper Churchill River MU, both upstream and downstream of the GS. High flows below the GS and significant dewatering below the CS were considered a more serious threat for Lake Sturgeon than habitat fragmentation or entrainment and impingement. Participants also discussed the importance of mercury contamination, and its effects on fish, resulting from terrestrial vegetation being flooded upstream of the Missi Falls CS. It was agreed this threat should be considered in the section of Table 2 that evaluates the effects of habitat degradation or loss from dam/impoundments and other barriers because flooding from the CS caused the mercury contamination.

Participants thought that likelihood of stocking Lake Sturgeon in DU1, and possible associated risks of genetic contamination and disease, was low. Non-indigenous species are also not a significant threat for DU1. Water warming in response to climate change could have many effects on Lake Sturgeon populations in the future.

Mitigations, alternatives and enhancements

Two key threats to Lake Sturgeon in DU1 were recognized: fishing and habitat degradation or loss.

Mortality, injury or reduced survival: fishing

Saskatchewan and Manitoba have different fishing regulations for the Churchill River. Enforcement issues and the tourist trade are at a conflict as some places allow for catch and release of Lake Sturgeon and others have strict no fishing (closed) areas. Participants felt there will be many jurisdictional obstacles to overcome in order to balance the protection of Lake Sturgeon with the fishery/tourist industry. A catch-and-release fishery can offer the benefits of additional data collection through a managed reporting structure, as has been done for other species at risk.

The potential need for seasons or closures (full or by location) to prevent bycatch by the commercial fishery was discussed. A healthy Lake Sturgeon population may be able to tolerate some harvest and the modelling results provide a ranking of allowable harm by age class. However, would the public know the difference between a small adult (male) and a juvenile? Participants agreed the only option would be to use fish size (slot size) versus age class, which may not work based on the earlier model discussions. It would come down to enforcement, which would be difficult. Public education may help.

Habitat degradation or loss: dams/impoundments and other barriers

Participants agreed that a primary focus of the working paper should be the protection, and mitigation if necessary, of suitable habitat to ensure the survival and recovery of Lake Sturgeon.

There may be times when water flow does not need to be enhanced, just better managed to provide stable flows or no dewatering during spawning. Flow management needs to cover the all components of the life cycle (e.g., spawning, incubation, overwintering) to ensure reproductive success.

While no new hydro installations are currently proposed for DU1, participants felt this should be addressed in case of any future development. Mitigation measures should include fish passage and protection and rehabilitation of key habitat (especially spawning and rearing) to ensure that the survival and recovery of Lake Sturgeon is not jeopardized. Some participants did not want construction of fish passage required for all hydro developments and instead wanted it left optional on a case-by-case "when appropriate" basis. Other participants objected to changes in the draft wording because they felt it was important to keep fish passage for the river. Questions about fish passage in general were discussed: why and when is it necessary to pass fish and do we have technology that works? Some questioned whether the issue of fish passage is about biological or political/social needs. Is there value in providing fish passage if the passed fish has no place to go? Comments were made about existing rivers where Lake Sturgeon are currently trapped between GSs and the effect it has had on the population. To maintain passage within the river, new hydro installations should either include fish passage or, if that is not possible, not be constructed. Some participants felt this was a very important issue for First Nations communities along the Churchill River.

Allowable harm

The upper Churchill River MU is thought to have few Lake Sturgeon while the lower Churchill River MU is estimated to have about 1,300 adults in one area. It was suggested the text be reworded to indicate that stocks are low and levels of harm will need to be reduced if the population is to recover. Participants sought clarification on the allowable harm modelling for DU1. The presented rates apply after the population has recovered. The text was modified to reflect the change from three to two MUs, as was done for other sections of the document.

Some participants asked whether the number of adults killed by impingement and entrainment at hydro installations can be translated into some number of fry to develop a relative scale for harm. Others felt that more subtle and long-term changes in flow regimes and habitat alterations are more significant threats than impingement and entrainment. Participants noted that harm was not simply mortality but also should encompass negative effects on reproduction (including declines), survival, recovery, access to spawning and other key habitat, lower growth (food limitations) and increased emigration. Some participants thought that activities that harmed the current population should not be lumped together with activities that negatively affected the availability of critical habitat necessary for the "recovered" population.

The modelling results demonstrated the maximum reduction in survival or fertility rates for different life stages that occur in a population while still allowing it to recover, once the main causes of population decline are removed. These reductions are not additive. Participants discussed whether an activity (e.g., catch-and-release fishery) could be allowed if it did not cause harm over the long term. No baseline estimates of harm are available for DU1 so it is not known if current levels are close to the maximum allowable for this DU. This information is needed for DU 1, and DUs 2-5 as well, prior to making decisions about adding any more harm. Some participants recommended taking the safest approach to management of Lake Sturgeon in the absence of quantitative information. Population trend may provide some qualitative indication of current levels of harm.

Data and knowledge gaps

Participants noted that the relationship between key life history stages, particularly age-0, and habitat in DU1 needs to be better understood. Current levels of domestic harvest also need to be obtained. As new information about vital rates comes available for DU1, the MVP modelling should be updated.

DU2

Species biology and ecology

Various studies conducted in the Saskatchewan River have reported that Lake Sturgeon can move as move as 400 km downstream, or 500 km upstream, between the Pas to the E.B. Campbell GS or almost no distance. This information is generally captured in the common text for this section of the working paper.

Spawning periodicity cited in the working paper was 3-7 years for females and 2-3 years for males. In the Saskatchewan River system, participants noted that the spawning frequency for females is four to eight years and every two years for males. The female spawning periodicity was added to the working paper. Accuracy of the male spawning interval was discussed and left as it was.

Historic and current distribution and trends

Six MUs were identified in the working paper for DU2, separated by GSs and different rivers (i.e., the North Saskatchewan, South Saskatchewan and Saskatchewan rivers) within the system. Participants suggested using the Bighorn GS, located about 130 km upstream of Rocky Mountain House (AB) on the North Saskatchewan River, as the upstream boundary of MU1. This was changed in the text. It should be noted in the working paper that some barriers within the Saskatchewan River system are multipurpose structures (e.g., for hydroelectric generation, irrigation, flood control).

Several other revisions were suggested for this section of the working paper. The description drafted for MU2 was considered complete. A participant noted that the South Saskatchewan is known to have dried up at least twice since 1930.The temperature information provided for MU3 was thought to unnecessary and was removed. Participants felt there may be little or no suitable habitat for Lake Sturgeon in MU3. The description of MU4 was modified to include “The Forks” as a location. Participants noted that the François-Finley GS, upstream of the E.B. Campbell GS, is not as high as the E.B. Campbell GS but does block fish within the river. There is a fishway in the structure and water is released on a daily basis, however stranding issues and other water control issues, including additional barriers on other tributaries, are of concern. In addition, the Torch River is no longer a spawning site. For MU6, Namew Lake (SK) and Moose and Cedar lakes (MB) were added to the description. Lake Sturgeon was known to historically occur in Namew Lake but it is unknown whether the species occurs there now. Habitat quality in the upper reaches of MU6 is degraded due to low water, erosion and water management issues due to operation of the E.B. Campbell GS.

Participants discussed the need for more detailed habitat descriptions for each MU and agreed to provide text for inclusion in the working paper.

Historic and current abundance and trends

The text in this section was reviewed and the first two columns of Table 1 (conservation status and population trajectory, respectively) were discussed and filled in. The discussion began by talking over the cause of the decline of Lake Sturgeon in DU2. Some thought the E.B. Campbell GS was the main culprit, not commercial harvest, because it was built on the main spawning grounds in the region. Some felt the regulated fishery over the past century had led, or contributed, to the decline with the GS preventing recovery. Points were made regarding provincial regulations regarding the fishery closure and this was clarified in the threats section.

The COSEWIC status report indicated that Lake Sturgeon in DU2 had undergone a severe decline in abundance over the past century and current estimates are consistently very low. Female spawners do not exceed a few dozen annually in any one spawning location. Participants noted there is no new assessment data for many parts of the DU and the population is substantially reduced from that of pre-settlement days. However, there are indications that some Lake Sturgeon populations are stable or increasing in at least some parts of the DU. For example, fishermen report an increase in Lake Sturgeon in the South Saskatchewan River. Participants discussed wording for this section. Lake Sturgeon stocks are still in some trouble in DU2, as they are substantially reduced from historic times, but some are showing signs of recovery.

Most of the information contained in Table 1 of the draft working paper came from the COSEWIC report which reported that population and habitat trends were declining throughout DU2. Participants discussed and revised the first two columns in the Table (conservation status and population trajectory) based on their knowledge. It is unclear whether the fishermen's reports of capturing more Lake Sturgeon in MU2 reflect an increased fish population or an increase in fishing pressure for the area. Participants noted that there have also been anecdotal reports from fishermen of more Lake Sturgeon in MU4, between The Forks and François-Findley GS. There was considerable debate about the status and trajectory of Lake Sturgeon in MU6. Construction of the E.B. Campbell GS coincided with a loss of approximately half of all mature fish over a five-year period in the 1960s as a result of overharvesting by construction workers and stranding due to GS operations. During recent mark-recapture work conducted in this section of the river, only 54 fish were captured over four days with some being recaptures. Potential spawners are present, but it is unknown if they successfully spawn. In a paper published in 1999, Lake Sturgeon in MU6 was described as being low in number, with a shift towards smaller fish. Current surveys do not sample for younger fish so it is not known what proportion of the population they currently comprise in MU6.

Information to support identification of critical habitat

Although DU2 has more barriers (e.g., GSs) on it and some are spaced closer together than other rivers, participants thought it unlikely that these barriers would cause serious fragmentation within the DU. Participants discussed how area of occupancy was determined: by calculating the number of 1 x 1 grids on a map occupied by the species within the area.

The potential for juvenile habitat in the Saskatchewan portion of MU1 was questioned. The answer was unknown, but should be looked at. Information in the working paper about MUs 4 and 5 was correct, while the studies of juvenile habitat in MU6 were adjusted to the correct date of completion in 2001.

Forage habitat is plentiful in DU2 but participants discussed whether spawning habitat may be limited. Spawning fish and juveniles are present so spawning habitat must be available. In MU6, juvenile Lake Sturgeon are located in Torch Lake, at E.B. Campbell GS and Cedar Lake, indicating that spawning is occurring within that portion of the Saskatchewan River. Potential spawning areas have been identified downstream of The Pas, Manitoba, (MU6) in a 10-km stretch of river between Bucks Island and Wooden Tent (Metikewap). Iskwao Rapids, located at the site of the E.B. Campbell GS, was added to the working paper as having historically contained suitable spawning substrate. Information about the artificial spawning habitat that had been developed in the North Saskatchewan River, within the city limits of Edmonton, was included in the working paper.

Over wintering habitat was also discussed. Information is available for the mainstem but little is known for smaller tributaries. Participants agreed to check their data for over-wintering information, as information was not at hand to be able to determine this during the meeting.

Recovery targets

Based on the modelling analyses, each MU in DU2 must have at least 586 spawning females (i.e., 5,860 adults) each year in order to protect and maintain healthy Lake Sturgeon populations in the DU. The working paper only reported the number of annual female spawners but participants also wanted the number of adults included. Participants noted that the model target should not be thought of as the “maximum” number attainable.

Participants discussed whether MUs 3 and 4 should be combined given the low number of adults and limited habitat thought to be present. It was decided not to combine them as recent research in MU4 suggests more Lake Sturgeon may be present there than previously thought.

The third and fourth columns in Table 1 (importance to DU recovery and recovery potential) were discussed and revised by the participants based on their knowledge of the DU. The population of Lake Sturgeon in MU3 is believed to be near extinction and may not recover, thus it may not be an important population. Recent research in MU4 suggests that potential for recovery is moderate. MU6 is thought to contain sufficient habitat and local interest that the potential for recovery is high.

Threats to survival and recovery

Types of fishing that occur, or have occurred, in DU2 were discussed and some changes were made to the working paper to more accurately reflect historic and current conditions. Lake Sturgeon catch-and-release fisheries are permitted in the Alberta portion of MUs 1 and MU2. A conservation closure was established for subsistence fishing. The commercial harvest was closed decades earlier due to mercury levels though Lake Sturgeon may still be taken in the bycatch. In Saskatchewan, there may still be some subsistence fishing for Lake Sturgeon; it is the only remaining form of legal harvest of this species in the province. Bycatch may still be an issue. Poaching is known to occur in MU1. Participants agreed to check their sources to determine if it was occurring in other areas as well.

Sustainable harvest rates for Lake Sturgeon were discussed. Some harvest studies have identified that annual harvest rates of 5% or less are needed to maintain Lake Sturgeon abundance and rates of 3% to allow for population growth. The estimated 2001-02 harvest rate for MU6 was 12.3%, though the sampling methods were not well documented so the authors concluded that the estimate should be viewed with caution. Participants thought that if the harvest had been close to that rate, it would not be sustainable over the long term.

Participants noted that some GSs in DU2 were built to provide services (e.g., flood control and irrigation for agriculture) in addition to, or for reasons other than, hydroelectric power.

Table 2 was filled in by the participants. Changes in flow regimes and agriculture were considered the highest threats among most, if not all, of the MUs. Participants would review the threats ratings in more detail once Table 2 and the threats section had been updated, following the meeting.

The discussion moved to proposed activities for the DU. New activities would require completion of an Environmental Assessment. If the authorized work would affect a listed wildlife species or part of its critical habitat then a Species at Risk agreement or permit may be required.

Mitigations, alternatives and enhancements

MU5 has been used for the collection of eggs for stocking purposes (2003-2007). Almost all were stocked in MU6. Eggs were also collected from MU6 in 1999-2001 and used in MU6. While stocking is not currently undertaken in DU2, the potential for the return to stocking is available.

The list of potential mitigations and alternatives in the working paper were reviewed. The text in this section was revised following the meeting based on the meeting discussion.

Allowable harm

This section was later re-written based on the information provided in Tables 1 and 2.

DU3

Species biology and ecology

In the first paragraph, a participant corrected the length and weight measurements for Lake Sturgeon surveyed in the Kelsey GS to Kettle GS reach, and its corresponding reference. In the paragraph that describes Lake Sturgeon longevity, the majority of aged fish from the Nelson River were from the upper portion of the river. Out of the small sample from the lower Nelson River, the oldest fish aged was 43 years. It is thought that fish in this section of the river are much older, but limited aging has been completed to date. Ageing information about the oldest Lake Sturgeon caught in the upper Nelson River was also discussed. The text was later modified to reflect these changes.

Historic and current distribution and trends

The initial draft of the working paper had partitioned DU3 into four MUs with a gap between Kettle GS and Limestone GS. Participants agreed that it would be inappropriate to exclude that portion of the Nelson River given that Lake Sturgeon are known to occur there, though the viability of those populations is unknown. Two additional MUs were added (Kettle GS – Long Spruce GS and Long Spruce GS – Limestone GS) for a total of six MUs.

Two participants with detailed knowledge of the Nelson River provided written descriptions of the physical conditions in each MU. Participants reviewed the updated text and felt that the MU descriptions were appropriate with a few minor exceptions. For MU2, the term “rock controlled” was revised for clarity to read “predominately bedrock substrate not vulnerable to erosion”. Missing information was identified for MU3 and participants agreed to provide it following the meeting. It was noted that flows below the GS in MU4 are similar to conditions in MU5. On weekdays, the reservoir is drawn down for hydroelectric generation and on weekends it recharges as demand for electricity is lower. Changes were made to the description about GS operation for MUs 4 and 5. Historically there were rapids at the Kettle railway bridge but the persistence of spawning at this site was unknown.

Recent research indicates that Lake Sturgeon and whitefish are moving between the Nelson River (DU3) and the Hayes River (in DU7). Participants thought these movements were not related to habitat fragmentation but more likely due to the freshwater corridor along this section of the Hudson Bay coast, caused by plumes from the rivers extending into bay. Genetic testing to date indicates that Lake Sturgeon in the Hayes River are more closely related to those in the in the Gull Lake area than the lower Nelson. Further sampling work is planned. Participants felt the movement data was more significant than the genetics information. They also agreed that further consideration should be given to whether the Hayes-Gods rivers systems should be included in DU3 or whether MU6 (Limestone GS to Hudson Bay) in DU3 should be included in DU7. The text for MU6 was revised based on the discussion.

Historic and current abundance and trends

The text in this section was reviewed and the first two columns of Table 1 (conservation status and population trajectory, respectively) were discussed and filled in. Participants identified missing information and several inaccuracies in this section. The working paper was updated based on the meeting discussions.

In MU1, stocks in Cross and Playgreen lakes are considered nearly extirpated and any remaining fish would be part of a remnant population. Since 1994, this population was at a very low level and either stable or declining. Stocking has occurred in MU1 in most years since 1994. Participants assessed the population status of Lake Sturgeon in MU1 as critical as no spawning habitat has been identified. Local fishers report increasing numbers of small fish. The increase in population trajectory was attributed to stocking. The group felt it was important to distinguish between stocking based on broodstock versus offspring, so this information was added in a footnote to Table 1. The Nelson River Sturgeon Co-management Board had chosen the broodstock and stocking locations with genetics in mind, however at that time Lake Sturgeon stocks in MU1 were considered extirpated. The group debated the value of stocking fish for a species at risk. If stock from another DU is used, COSEWIC would not consider the species to be recovered even if it were to reach a high level of abundance.

In MU2, the description of spawning at the mouth of the Landing River and at Bladder Rapids was clarified. In the 1990s, the Nelson River Sturgeon Board produced a report for this section of the Nelson River. References from the report will be added to the working paper following the meeting. Participants agreed that the population trajectory in MU2 is likely stable or possibly increasing as the harvest and management board are effective in the area.

In MU3, the numbers reported in the working document were for tagged adults. Participants discussed why many juveniles were counted but the number of adults remained low and whether it was a recruitment problem. Participants with knowledge of the area indicated that the numbers reported referred to the distribution of several year classes, with strength varying between years. Recruitment varies within the MU with no recruitment in some sections though several spawning locations and stocks exist. Participants rated the conservation status of MU3 as cautious.

Lake Sturgeon are known to occur in MUs 4 and 5, however data are limited. There is evidence of fish younger than the age of the impoundment in both MUs, however spawning success has not been confirmed. Participants noted that it is important to distinguish the lack of spawning success on the basis of evidence obtained from areas that were sampled versus those that were not. The population trajectory of Lake Sturgeon in MUs 4 and 5 is unknown as few fish stay in the area and this section of the river is very small and highly impacted.

In MU6, the approximately 130 km of river below Limestone GS experience large daily fluctuations in water flow due to hydroelectric operations. Lake Sturgeon populations in MU6 are isolated from humans, thus exploitation rates are likely low. Even today, spawning areas are unreachable in spring due to the ice conditions, which make them relatively protected. Lake Sturgeon in MU6 are believed to be at a healthy level of abundance. In the past, the harvest rate was 3.5% but the current rate of harvest is unknown. As it not known whether the current rate of harvest is sustainable, the population trajectory was assessed as unknown.

Information to support identification of critical habitat

Known and suspected spawning locations were identified and added to this section. There is no confirmed evidence of spawning in MUs 4 and 5. Lake Sturgeon typically move upstream to spawn. Most spawning appears to occur in fast flowing areas of the main stem of the Nelson River with only two documented instances of significant spawning runs in tributaries (Landing River and Weir River). In some cases, downstream movement to spawning areas in the main stem appears to be happening.

Gull Lake is a known overwintering location in the upper Nelson River. During winter, Lake Sturgeon in lacustrine environments may have to move into deeper waters to avoid shallower areas where water freezes to the bottom. Participants agreed to keep the information about fish movements in the working paper fairly broad.

Recovery targets

DU3 is comprised of six MUs, two of which (MUs 4 and 5) are short in length with uncertain populations. Based on the modelling analyses, each MU in DU3 must have at least 413 spawning females (i.e., 4,130 adults) each year in order to protect and maintain healthy Lake Sturgeon populations in the DU. Participants discussed the limitations in meeting the recovery target, especially those with limited numbers of fish and habitat. After some discussion, it was decided that all six MUs should be identified for recovery.

The third and fourth columns (importance to DU recovery and recovery potential, respectively) in Table 1 were discussed and filled in. Recovery potential in MU1 was assessed as low for the indigenous population because it had been nearly extirpated. The “recovery” of the stocked population to target levels within three generations was rated as unknown as the stocked fish have not yet reached reproductive age. An explanatory footnote was added to the table. Text in the recovery targets section of the working paper was revised to match the conclusions reached while filling in Table 1.

Threats to survival and recovery

Some inaccuracies and missing information were identified in the description about fishing activities in the DU. Corrections were made based on participants’ knowledge. During the discussion of GSs along the Nelson River, information was added to the text including a missing dam and the age of facility. Compared with the rest of the Nelson River, fragmentation is thought to be one of the limiting factors for Lake Sturgeon in MUs 4 and 5. In general, most participants felt the fragmentation issue resulted from the alteration of habitat, not necessarily the footprint of the dam.

Table 2 was filled in by the participants. The greatest threats to Lake Sturgeon in DU3 were thought to be habitat degradation or loss, resulting from changes in flow regimes, and mortality, injury or reduced survival resulting from fishing or population fragmentation in some or all MUs.

Mitigation, alternatives and enhancements

The list of potential mitigations and alternatives in the working paper were reviewed. Some participants questioned if it was necessary to include mitigation measures related to habitat alterations (e.g., adjust water management operating conditions for existing GSs) or to commercial fishing (e.g., netting off the bottom) as these sources of harm occurred decades ago. Mitigation measures for these threats are already covered in Table 4. These measures were left in this section to provide more detailed explanations than was possible in the Table.

DU4

Species biology and ecology

Information about movements of tagged and stocked fish in DU4 was included this section while the more detailed information about stocking (e.g., locations, numbers) was included in the abundance and trends section. Participants noted that the movements recorded from larger Lake Sturgeon that were stocked in the Ottertail River in Minnesota, and later recaptured in the Manitoba portion of the Red River and Lake Winnipeg, are not the same as migratory movements of indigenous fish. The larger stocked fish simply drifted downstream. More recently, smaller fish (e.g., fry and fingerlings) have been used for stocking, as was the case for the Assiniboine River. Stocking records for DU4 have not been published. It is not known whether stocking in DU4 has ceased.

Historic and current distribution and trends

The original version of the working paper for DU4 contained nine MUs. Round Lake, on the Pigeon River, was combined with the Pigeon River to form one MU, leaving a total of eight MUs. Participants with detailed knowledge of the Assiniboine (MU1), Red (MUs 2 and 3) and Ontario portion of the Berens (MU6) rivers provided written descriptions of the physical conditions in those MUs. Participants reviewed the updated text and suggested a number of changes or actions.

For MU1, the length of the Assiniboine River, in river km, between Lake of the Prairies and Portage Diversion should be checked. Participants agreed that river lengths should be confirmed for all MUs in DU4. The stream order of the Assiniboine River at the Manitoba-Saskatchewan border should also be confirmed. Underwater visibility is usually less than 300 mm in the Assiniboine River, however upstream it is greater than 600 mm. As there are seasonal and site location differences, the text was changed to say “low but seasonably variable”. The number of fish species in the Assiniboine River, and all other MUs in DU4, should be confirmed and appropriate references added. Participants also discussed the presence of barriers on the river and whether they allow Lake Sturgeon to pass up and downstream. The working paper was revised according to the discussion.

While reviewing the text for MUs 2 and 3, participants debated whether to identify tributaries within MUs based on their size and/or the presence of Lake Sturgeon. Some smaller tributaries had been included in some MU descriptions because data or expert opinion was available for those waterbodies. It was decided that, in general, only the main tributaries should be identified in DU4, to be consistent with other DUs, unless a minor tributary was thought to be of historic or current importance for Lake Sturgeon.

Participants agreed to add missing river length information for the Ontario portions of the Bloodvein (MU4) and Berens (MU6) rivers. A natural barrier is present at Mikami Falls on the

Ontario side of Berens River. Participants discussed if the river was different between Manitoba and Ontario, however, the river has such varying sections (i.e., lakes, riverine, falls and rapids) that unless it is divided into segments, it should be considered as a whole.

The surface area of MU8 was added to the working paper. Participants discussed the number of fish species in Lake Winnipeg. There are known to be 60 native species and at least 10 introduced species.

Historic and current abundance trends

The text in this section was reviewed and the first two columns of Table 1 (conservation status and population trajectory, respectively) were discussed and filled in. The discussion began with a debate on stocking as DU4 has experienced the most stocking activity to date. Some participants argued that in areas where Lake Sturgeon were extirpated or functionally extirpated (e.g., MUs 1-3 in DU4), stocking provides the only means of recovering the species. For that reason, they felt that stocking was acceptable. Others argued that COSEWIC does not consider a species to have been "recovered" on the basis of stocking from other DUs. In the case of DU4, Lake Sturgeon was stocked into the Assiniboine River (MU1) from the Saskatchewan, Nelson and Winnipeg rivers (DUs 2, 3 and 5, respectively). Participants wondered how other stocking programs have been assessed by COSEWIC. The only other stocking program that participants knew about was Atlantic Salmon in Lake Ontario. The success of that program is unknown at this time. Regardless, participants agreed that before stocking is undertaken, a conservation stocking plan should be developed. Past stocking efforts in DU4 have not followed a plan. One participant noted that DFO has developed a paper on conservation stocking though it is likely too late to be incorporated into the Lake Sturgeon RPA documents.

Participants wondered if Lake Winnipeg was the melting pot for Lake Sturgeon stocks in the region and, if so, whether it would be possible to bring back the same mixture as was originally found in the DU. It is unlikely as the genetic profile of the indigenous populations is not known. Some wondered if DNA could be obtained from skin, from mounted Lake Sturgeon with known catch locations. Currently DNA analysis has not been successful with this approach, but that may change in the future.

For MUs in DU4 in which Lake Sturgeon have been stocked (MUs 2-3), it was agreed that Table 1 should present assessments for both indigenous and stocked populations to show the value in both. The table caption was revised to highlight indigenous versus stocked fish in some MUs.

The conservation status and trajectory of the indigenous and stocked populations in MUs 1-3 were debated at length. The conservation status of Lake Sturgeon in MU1 was assessed as extirpated. Participants decided that the indigenous populations in MUs 2 and 3 should be identified as functionally extirpated. There have occasionally been large Lake Sturgeon found in these MUs, but they are few in number. North Dakota referred to stocking of Lake Sturgeon in the Red River as a reintroduction, not a supplement, and COSEWIC currently lists Lake Sturgeon in this area as "virtually extirpated". The population trajectory of the indigenous populations in MUs 1-3 was rated as nil. The conservation status of the stocked populations in these three MUs are thought to be critical because the stocked fish are not of reproductive age thus it is unknown whether they will reproduce and the population will become sustainable over the long term. Participants discussed whether the trajectory of the stocked populations in MUs 1-3 was increasing. The population is increasing only through stocking, not as a result of a natural increase. However, as it was thought that stocking would continue in MUs 1-3, the trajectory of the stocked populations was assessed as increasing.

Participants provided missing citations and other errors or omissions found in this section of the working paper. For example, participants noted that in at least two MUs the working paper reported that Lake Sturgeon has not been captured during recent management surveys. However the surveys had targeted smaller fish and sport fish, so it is possible Lake Sturgeon was missed based on the fishing gear used. The text was revised accordingly.

In MU1, the reported catch records from 2002 most likely measured fish by TL versus FL, as the data were obtained from anglers. Participants noted that the best stocking and angler records were found on the Manitoba Government web page, with records dating back to 2002 (see http://www.gov.mb.ca/waterstewardship/fisheries/habitat/index.html). The data are slowly being updated over time. Suitable spawning habitat is thought to be currently available in both Assiniboine River mainstem and tributaries. There are a few historical spawning sites that could be used in the future if fish passage was available (e.g., in the Little Saskatchewan, Souris and Qu'Appelle rivers). The stocked Lake Sturgeon in this MU are currently too young to spawn.

Some text for MU2 was revised for clarification. Additionally, participants reported that a relatively small number of juveniles had been stocked in the Assiniboine River near Whitehorse Plains. Following the meeting a participant provided the stocking date and numbers. The current fishing regulations in Manitoba allow for fishing of Lake Sturgeon on a catch-and-release basis. A few Lake Sturgeon have been caught in the Red River in recent years. It was decided that MUs 2 and 3 should not be combined, as suggested by some, as a set of locks separating the two MUs is closed during some times of the year.

No Lake Sturgeon data are available for MUs 4, 5 (except Round Lake), 7 and the Manitoba portion of MU6. In MU5, participants wondered if there is a set of rapids or falls between Round Lake and the Pigeon River that may hamper movements of Lake Sturgeon. Any pertinent information in the Dick 2004 report about the Pigeon River would be incorporated into the working paper. The Province of Ontario has data for MU6 based on radio telemetry of Lake Sturgeon below Mikami falls. Large gill nets were used but only smaller fish were caught. The project is ongoing. The Province of Ontario has assessed the status of Lake Sturgeon on the Ontario side of Berens River as cautious or healthy. Given the paucity of information for the Manitoba side, participants felt the status and trajectory of Lake Sturgeon in MU6 should be assessed as unknown. On the basis of limited data currently available for Ontario, participants rated status and trajectory there as cautious and increasing, respectively.

Participants noted that standard gill net surveys (2-5¼" mesh) were used in MU8. Lake Sturgeon was overexploited in Lake Winnipeg between the late 1880s and early 1990s, resulting in severe population declines. The Lake is a reservoir for many of the major rivers in Manitoba; indigenous and stocked fish have entered the Lake for over 100 years. Currently Lake Sturgeon are not stocked directly into Lake Winnipeg, but they are entering from other areas, including the Red River which has been receiving fish tagged and released in the Ottertail River. Indigenous fish may also be present in the Lake though likely in very low numbers. Participants thought that even with all of the fish additions, Lake Sturgeon stocks have not re-established in MU8 over the past century and are unlikely to do so.

<u>Information to support identification of critical habitat</u>

Spawning locations in Ontario were provided by the Province of Ontario. For the other sections of the DU, there is historical spawning data for the Roseau, Assiniboine and Red rivers. The COSEWIC status report indicated that Lake Sturgeon spawning habitat was gone in these areas. Participants had no information on spawning habitat though they reported that Lake Sturgeon currently occur in those waterbodies. The Rat River is not passable. The regulation of water, and substances in the water, is needed in DU4 especially in MUs 1-3 and 8. Possible mitigation measures and alternatives were included in the section of the working paper that deals with that.

Recovery targets

Based on the modelling analyses, each MU in DU4 must have at least 413 spawning females (i.e., 4,130 adults) each year in order to protect and maintain healthy Lake Sturgeon populations in the DU. As Lake Sturgeon is likely extirpated in MUs 1-3, participants questioned if different recovery targets are needed for those MUs or if indigenous and stocked populations should be added together. Participants recognized that the restoration of indigenous fish is preferred. However, in MUs 1-3, indigenous Lake Sturgeon are extirpated or functionally extirpated and their genetic profile is unknown, thus true recovery is highly unlikely or impossible. Stocking is the only way to return Lake Sturgeon to those MUs. Following the meeting, the recovery target was revised based on the discussion and reviewed by the participants.

Participants discussed White Sturgeon in British Columbia in an area where the stocked and indigenous fish have been similarly treated by the SAR permitting process. It is unknown if the Lake Sturgeon in the river are the same genetic strain as the indigenous population. SARA permits were not issued for the GS because it is expected the fish would be harmed and it was not possible to visually distinguish stocked from indigenous fish. The permitting process focused on individual fish not the population. Would that approach also apply to DU4? Participants pointed out that stocked fish are worth protecting in areas where indigenous fish are absent or nearly so.

The third and fourth columns (importance to DU recovery and recovery potential, respectively) in Table 1 were discussed and filled in. Recovery potential of stocked fish in MUs 1-3 is unknown because it is not yet a reproducing population. Participants discussed the importance of MUs 1-3 to DU recovery. They felt that even though Lake Sturgeon in those MUs would not be thought of as “recovered” if the stocked fish reach the recovery target sometime in the future, this species would be present in an area where they had been previously extirpated, or functionally extirpated, and that has value for species recovery in DU4. This was noted in the Table 1. Participants agreed that the importance of MUs 2 and 3 to DU recovery should be rated as moderate given they represent a large section of river and suitable habitat is available. If Lake Sturgeon could be recovered in the Red River, this would be of great value to the entire DU. The recovery potential of Lake Sturgeon in MU8 was assessed as being low due to bycatch from the commercial fishery.

Participants debated which MUs would provide the best options for recovering DU4. Recovery of indigenous Lake Sturgeon in MUs 1-3 is not possible due to extirpation and while recovery in Lake Winnipeg is a desirable goal, given the size of the area, it will be difficult. The recovery goal should be to recover all the MUs while recognizing that re-establishing indigenous populations in MUs 1-3 will not be possible. The long-term goal of healthy populations of Lake Sturgeon in all MUs will feed into the Lake Winnipeg MU as well. The group noted that DU4 is very different from DUs 1-3 and 5 and that overall recovery within it would be very difficult if recovery efforts were limited to just a few MUs.

Threats to survival and recovery

Some participants noted that the information in this section about Thermal Generating Stations was outdated. Operational changes since the 1980s have mitigated this as a threat to Lake Sturgeon and therefore it should be removed from the threats section. Other participants recommended leaving it in to provide a record of what had happened. The text was left in but revised a little. Some participants thought that other human activities, notably agriculture and urban development, had a much bigger impact on Lake Sturgeon, especially in southern Manitoba and warranted a more detailed description in this section. Water CSs are also present in DU4 and may be a threat to Lake Sturgeon. The text was updated following the meeting based on the discussion and additional information provided by participants.

Participants began filling in Table 2. They discussed whether entrainment, impingement and turbine morality occurs in DU4. The Shellmouth CS in MU1, Lockport CS in MU3, water intakes in MUs 1-3 associated with urban and agricultural activities, and Grand Rapids and Pine Falls GSs in MU8 were identified as potential threats. These structures were also identified as threats in terms of habitat degradation or loss. Urban development, agricultural and industrial activities, and to a lesser degree mining and forestry exploration and extraction, were also identified as sources of habitat degradation or loss in at least a few MUs.

The possibility of population fragmentation was then evaluated for each MU. Participants talked about whether the Pine Falls and Grand Rapids GSs are a threat for Lake Sturgeon in MU8. In a situation like the Pointe du Bois GS on the Winnipeg River (MU5 in DU5), the GS acts as a barrier because the population below the GS is likely at carrying capacity and any further population growth is limited because Lake Sturgeon cannot move beyond the MU, at least not upstream. The Pointe du Bois GS is a threat, in terms of population fragmentation, to the Lake Sturgeon in MU5. Participants thought that circumstances in MU8 of DU4 do not appear to warrant a similar rating.

The Red River Floodway could impact movements of Lake Sturgeon. When the gates are raised, water flow is partially blocked and flooding occurs. There has been discussion in recent years about changing usage of the Floodway from only during flood conditions to more widespread usage. This has the potential to block upstream movements during times of operation.

Does the Lockport CS and its operation act as a partial barrier? Although the Lockport CS has a fishway, it does not always allow fish passage. There are also screens in this structure that are used at times. For these reasons, Lockport CS was considered a barrier to Lake Sturgeon.

Bycatch from the commercial fishery in MU8 poses a significant threat to the recovery of Lake Sturgeon. In MU6, there is a risk of commercial bycatch in the Ontario portion of the MU but not the Manitoba portion, so a separate rating was given for each. Participants agreed there is a subsistence (food) fishery occurring in both jurisdictions in MU6, as well as in the other MUs. There is a difference in recreational fishery regulations between the provinces, with catch-and-release fishing still legal in Manitoba, but not in Ontario. The incidence of Illegal harvest, which would be harmful to Lake Sturgeon, is largely unknown.

Participants debated whether genetic contamination should be identified as a threat for MU1. The Lake Sturgeon stocked into MU1 were from other DUs but the indigenous stocks had been extirpated by that time, thus genetic contamination could not have occurred. In MUs 2 and 3, genetic contamination from stocked fish may have occurred though Lake Sturgeon are thought to be virtually extirpated in those MUs. Participants noted that the fish moving downstream in MUs 2 and 3 include stocks from DUs 2, 3, 5 and 6, so there is a lot of mixing within these MUs. Tagged fish have moved from the U.S. to Lake Winnipeg suggesting that any indigenous Lake Sturgeon that may remain in MU8 could also be subject to genetic contamination. Elsewhere in DU4, genetic contamination is thought to be low. There is an unknown risk of disease from stocking.

Non-indigenous species occur throughout DU4. The Red River is the most contaminated with invasive fish, algae, and invertebrates found within its waters.

Habitat degradation or loss from agricultural activities, urban development, dam/impoundments and other barriers and industrial activities, as well as bycatch from commercial fishing in Lake Winnipeg were considered the greatest impediments to recovery of Lake Sturgeon in DU4. As discussed earlier, recovery of indigenous stocks is highly unlikely or impossible in MUs 1-3. Returning Lake Sturgeon to MU1, or to significant numbers in MUs 2 and 3, would rely on stocking.

Mitigation, alternatives and enhancements

The list of potential mitigations and alternatives in the working paper were reviewed. Participants discussed the need for Provincial regulations in relation to Lake Winnipeg and the commercial fishery that is currently operational. They discussed potential strategies for mitigation of the commercial bycatch in MU8 including changes to net depth and location, sanctuary areas, seasonal changes and fishery closures. They noted that the socio-economic impact of a fishery closure would need to be included in the calculations as this could have serious consequences for DU4.

Stocking is an important enhancement method for MUs 1-3, but has potential negative consequences. Participants talked about the importance of using genetic stock from the same small geographical area, or at least the same DU. In this DU, there were no controls on the stock source used, numbers stocked or where they were stocked. The original stocking took place prior to the *Species at Risk Act* so no permitting was issued. The working paper should emphasize the importance of developing a comprehensive conservation stocking program before stocking occurs.

Allowable harm

Participants debated whether any harm could be justified given the low numbers of Lake Sturgeon in the MUs, with the possible except of the Ontario portion of MU6. They noted that in some parts of DU4 no information is currently available, thus it is possible that some areas with Lake Sturgeon populations may exist. Following the meeting the text in this section was reframed in probabilistic terms, as was done for the other DUs, and the participants reviewed the revised text.

DU5

Species biology and ecology

Information about Lake Sturgeon length and weight and the depths at which they occur in DU5 was corrected by participants. A participant reported that when spring is delayed Lake Sturgeon at Caribou Falls have been found to congregate at water temperatures as low as 6º C and spawn at 8º C. Water temperature can take up to one month to rise from 6º C to 11º C. Thus while 11º C is preferred for spawning, if spring is late Lake Sturgeon will spawn as soon as possible.

Participants discussed whether there are genetic distinctions between the DU5 and DU6 (Rainy River) Lake Sturgeon. Genetic analyses completed to date show the two DUs are genetically different, but analyses aimed at investigating genetic differences within DU5 are still ongoing.

The source stock for some past stocking introductions in DU5 is unknown. The working paper will provide available information on stocking.

Historic and current distribution and trends

All of the GSs constructed in this DU were built on rapids or falls, and historical evidence was not available to indicate if all were passable. Evidence presented demonstrated that downstream passage does occur, with two of more than 1,800 tagged Lake Sturgeon tagged in the Slave Falls reservoir (MU5) between 2006 and 2009 captured down river of the tagging MU (i.e., downstream of Slave Falls GS). Participants recommended searching out more recent data for inclusion in the working paper.

The MU descriptions were reviewed and some errors (e.g., water depths) were identified. It was noted that not all GSs in DU5 produce a lake-like impoundment. Participants noted that in the COSEWIC status report the English and Wabigoon rivers were lumped together and there was virtually no data and little discussion about either river. Participants questioned why Manitou Falls GS had been chosen as the upstream end of MU2 in the working paper, instead of including Lac Seul. There are no historical or current records of Lake Sturgeon in Lac Seul. There is a waterbody called Sturgeon River in the upper English River system but no Lake Sturgeon records are known for that area. Following the meeting, the Ontario Ministry of Natural Resources (OMNR) provided additional information about what is currently known about the historical and current distribution of Lake Sturgeon in MUs 1 and 2 and the revised text was reviewed by participants.

Historic and current abundance and trends

The text in this section was reviewed and the first two columns of Table 1 (conservation status and population trajectory, respectively) were discussed and filled in.

No data and little knowledge of Lake Sturgeon are available for MU1. OMNR may broaden the current survey area in MU2 to include MU1.

Participants indicated that the index netting conducted in MU2 had not targeted Lake Sturgeon as the study focused on contaminant fish collection. Information based on a recent study conducted in MU2 was incorporated into this section following the meeting and distributed to participants for review. It was thought that while the status of Lake Sturgeon in MU2 may be critical, the data need to be examined before that can be determined.

Stocking of Lake Sturgeon fry into MU3 from DU6 (Rainy River) was discussed by the participants, as well as whether there are any signs of recovery. MU3 was stocked in recent years but juveniles have not been found, thus stocking may not be working because the life stage stocked and/or the method used. The group felt that not enough information is available to determine the reason for the lack of stocking success to date. To determine population status of MU3, participants referred back to an earlier discussion during the RPA for DU3 when the status of MU1, where stocking occurs, was rated as critical because spawning habitat was unknown. Although habitat degradation in MU3 (DU5) dates back to the 1960s or possibly earlier, MU3 is known to contain some spawning habitat. No Lake Sturgeon have been found in MU3 within about 20 km of the Whitedog Falls GS although there are no known reasons for their absence. Although the group considered rating the population status of MU3 at the low end of cautious, they decided to rate it as critical because the long-term prognosis for recovery is uncertain given the stocked fish have not yet reach reproductive age. Based on available information, participants thought the remnant population was likely declining at a slow rate.

In the Ontario portion of MU4, hundreds of Lake Sturgeon have been tagged in recent years. Adult fish are relatively uncommon and there is evidence of low and sporadic recruitment. It is suspected that spawning is occurring below Caribou Falls and Whitedog Falls GSs and at the Manitoba border. Participants discussed what may be limiting the population in this section. No commercial harvest is occurring and any subsistence harvest in this section is thought to be minimal. MU4 experiences impact from Ontario Power Generation operations. Although considerable research effort is currently underway, some questions are difficult to answer when few adult fish are available for study. The group questioned if older female Lake Sturgeon had been removed from the population in this area, but that was unclear based on information available at the meeting. The Lake Sturgeon population in the Manitoba portion of this MU is less dense than in MUs 5 and MU 6. Between 2006 and 2009, 6 adults and 14 juveniles were captured and released below Lamprey Rapids. Following the meeting, participants familiar with MU4 incorporated additional information in the working paper for review by all. On the basis of those data, the status and trajectory of Lake Sturgeon in MU4 was assessed as critical and unknown or possibly decreasing, respectively, with a footnote added to Table 1 that says there is evidence of recruitment.

Catch per unit effort (CPUE) data were reported for some MUs. Participants remarked that comparisons of CPUE data may be useful for analysis of trends in abundance but not for absolute comparison of numbers unless standard net sizes were used to collect all data.

The MUs 5 and 6 support relatively abundant numbers of Lake Sturgeon. Participants questioned the population estimate for MUs 5 and 6 derived from the 1994-97 surveys given in the working paper. They wanted a better summary of the earlier data. The group agreed that the 2007 population estimate of 2,205 Lake Sturgeon greater than 80 cm in length is valid. If MU6 has the similar level of abundance then a combined estimate of 4,500 Lake Sturgeon greater than 80 cm in length is reasonable, though participants thought it was likely higher than that for the two MUs combined. Participants noted that there is a large juvenile population in certain sections of MU6. A population estimate is not currently available for juveniles (i.e., 250-700 mm FL), however it is an important component of the population. It was agreed that additional information about juveniles in MUs 4 and 5 should be added to the working paper.

Tagging of Lake Sturgeon in DU5 was discussed. It was noted that tagging work is ongoing in MU6. New tagging studies, which include the use of Passive Integrated Transponders (PIT) and tagging outside of the spawning period/areas, are providing additional population estimates but the duration of these datasets are too short to provide better estimates at this time. In addition, early tagging studies were marked by high tag loss, which also affect population estimates.

Participants discussed stocking in DU5 (i.e., where the stock was from, numbers stocked and stocking locations). It was noted that juveniles are not part of the stocking program, but are part of the natural reproduction from the MUs. Stocking in this DU has occurred primarily for research purposes but the exact source stock and hatchery strains are not known. Stocking in MU3 may have been from DU6 (Rainy River). Stocking in MUs farther downstream were from eggs collected from fish captured in MUs 5 and 6. Participants agreed that it would be useful to include what is known about stocking events in the RPA. A participant provided information about stocking in MUs 5-9 following the meeting.

Population data for MU7 are relatively limited, though currently Lake Sturgeon is thought to be relatively common below the Seven Sisters GS and recruitment is occurring. Participants noted that the late 1990s population estimate given in the working paper included data for MUs 5-6 and 6-7 so it is not possible to separate the data by MU to obtain a historical population estimate for MU7. Fishing is currently occurring in all habitats in MU7 and fish of all sizes have been collected. Whitemouth Falls (at Seven Sisters GS) is good spawning habitat and tagging has taken place there. It was noted that Atomic Energy of Canada Limited (AECL) also conducts environmental monitoring in MU7 however those data were not included in the working document.

Lake Sturgeon data are very limited for MU8. A few days of netting have been conducted and Lake Sturgeon is present. This section of the Winnipeg River is short.

Available information for MU9 is also very limited as little sampling has been conducted. Juveniles and adults are captured in this MU and there are rapids and falls. Research and interest in this MU is just starting.

Information to support identification of critical habitat

Historic and current spawning locations in DU5 were identified. One published source reported that Pinawa Channel had been an important spawning area prior to construction of the Seven Sisters GS. Some participants thought that was unlikely. The availability of spawning habitat was also discussed. Participants thought that it is more likely that spawning habitat has been altered rather than becoming restricted due to fragmentation and destruction. Spawning occurs below GSs although Lake Sturgeon do not spawn at some locations. If spawning habitat is not limited, what other factors may restrict Lake Sturgeon in DU5? The group debated whether movements of juveniles or others were part of the equation and whether habitat for any or all life stages may be missing. There are behavioural differences due to water management issues but it is not known whether genetic influences also play a role. It was thought that as long as fragmentation does not overwhelm spawning concerns in DU5, it would be acceptable. Participants noted there is nursery habitat in MU6 and thousands of slow-growing juveniles have been found there.

Recovery targets

Based on the modelling analyses, each MU in DU5 must have at least 413 spawning females (i.e., 4,130 adults) each year in order to protect and maintain healthy Lake Sturgeon populations in the DU. The habitat target was also presented. The working paper initially recommended keeping Lake Sturgeon in four of the seven MUs within the Winnipeg River. Participants decided that the recovery target should include all MUs in the Winnipeg River and the MU in the lower English River, unless serious problems (e.g., no habitat), were found. With the MUs currently bracketed by GSs, Lake Sturgeon populations in DU5 may be losing genetic diversity, due to isolation and lack of migrants. This could lead to genetic differentiation among MUs, as has occurred in the Grass River/St. Lawrence system, which would not be a desirable outcome for DU5.

Participants discussed the idea of stocking in MUs where numbers are thought to be low, however this approach was thought to be too complicated to sort through until the underlying problems with stocking are resolved. There is not enough genetic information currently available for DU5 to determine the best course of action for maintaining genetic diversity. Participants discussed if it is possible to determine if genetic differences are due to a population bottleneck or other reasons. Geneticists have shown that on the basis of 12 microsatellites, it is possible to determine genetic differences. It was noted that COSEWIC has not accepted stocked fish for recovery of a DU, as a lower conservation value is given to stocked fish versus indigenous fish. The group determined there was not enough expertise currently available to determine how stocking would aid recovery, as it does not address the causes of the decline. Additional experts are needed to explore the potential value of stocking Lake Sturgeon in DU5 given the complexity of the issue.

MU5 is a short section of river with a population that is potentially near carrying capacity and stable. Is it possible for Lake Sturgeon there, as well as the short stretch of river in MU8, to attain the recommended recovery target for abundance? MUs 5 and 8 are too small to meet the recommended modelling distribution recovery target and, thus, reach the recommended modelling abundance recovery target. However, that should not be used as justification for not trying to maintain and recover Lake Sturgeon in all MUs in the Winnipeg River. The original text in the working paper included a statement related to MUs 5 and 8 that said there should be “no loss of current sturgeon habitat” which some participants found unnecessarily prohibitive. They felt that in some cases some operational flexibility was needed. Others noted the Fisheries Act and the SARA will be the legislative tools used by DFO to handle its responsibilities for Lake Sturgeon habitat. Participants agreed to revise the text to say “maintain or enhance habitat required to support the population”.

Other habitat-related questions related to MU5 were also discussed. The century-old Pointe du Bois GS, at the upstream end of MU5, will likely be modernized sometime in the next few years. What impact, if any, will that have on the Lake Sturgeon population? Participants discussed whether the habitat that currently exists within MU5 is sufficient for certain life stages, if there is more spawning habitat available than is currently used by Lake Sturgeon and if it is possible to recover habitat. Rehabilitation of old pulp and paper mill sites has been shown to facilitate the recovery of Lake Sturgeon. More research is needed to fully answer these questions.

The third and fourth columns (importance to DU recovery and recovery potential, respectively) in Table 1 were discussed and filled in.

The original version of the working paper rated the importance of MU3 to DU recovery as High based on the notion that if the MU could be recovered it would be an important contributor of Lake Sturgeon to lower sections of the river over the long term. The recovery potential of MU3 had been rated as moderate. However, the current population status of MU3 is likely critical because the remnant population is probably declining at a slow rate. Participants discussed the potential for a “rescue effect” from the Lake of the Woods population but it was felt that something else was affecting the population at the Norman GS. The participants felt that without a massive stocking effort, MU3 will not recover. The current stocking program is not working; a move to stock yearling fish would be needed to improve success of the program. After much discussion, the importance to DU recovery was changed to moderate and recovery potential to low.

Historically, exploitation in this MU was high but subsistence harvest was low. Operation of Whitedog Falls GS is the main cause of disruptions in this MU. It is a peaking plant and historically there have been years without spilling at the dam. In the years without spill, there are no year classes whereas in years of spill, recruitment occurs. This is an important note for the recovery of Lake Sturgeon in MU4. Participants rated the importance of MU4 to DU recovery as high but the potential for recovery as only moderate.

The importance of MU5 to DU recovery is thought to be high and its potential for recovery relative to the carrying capacity of available habitat is also high. However, its potential for reaching the recommended modelling recovery target for abundance is low because the population is likely already near its carrying capacity yet not able to meet the recovery target generated by the model. An explanatory footnote was added to Table 1.

Participants rated the importance of MU6 to DU recovery as high. They debated the potential for Lake Sturgeon in MU6 to increase in abundance and reach the recommended modelling recovery target. A population assessment is not available. The population may be healthy but have low potential for growth or recovery as it may be near carrying capacity. Participants decided to rate its potential for recovery as high.

The original text in this section that described times-to-recovery for individual MUs was revised based on the meeting discussions.

Threats to survival and recovery

Participants compared historic and current fisheries in Manitoba and Ontario, including closing dates of the commercial fisheries. The commercial fishery in the Manitoba portion of the Winnipeg River had closed in the 1960s but not due to mercury contamination, as had occurred elsewhere. Fisheries in many locations aside from the Winnipeg River reopened in 1970, but not in the Winnipeg River. In Ontario, the commercial fishery was identified as an issue in the 1960s and closed in the 1970s. In Manitoba, a species conservation closure for Lake Sturgeon was instituted in 1993, which included the subsistence harvest. A catch-and-release fishery exists, with a zero catch limit for Lake Sturgeon. In Ontario, with the new listing under endangered species, no catch-and-release-fishery or commercial fishing for Lake Sturgeon are allowed. A subsistence fishery is permitted under consultation with First Nations. Poaching was not identified as a problem in Ontario although remains a problem in Manitoba.

Participants debated the impacts of GSs along the Winnipeg River on Lake Sturgeon. The GSs predated the commercial fishery and may have contributed to the decline and lack of recovery of Lake Sturgeon. Some participants thought that GSs may have contributed to habitat fragmentation thereby adding to the decline of Lake Sturgeon. Others disagreed with this point suggesting that there was no evidence of this. They argued that natural rapids on the river had caused historical fragmentation before construction of the GSs. They felt there was too much focus on fragmentation as a threat. The GSs in the Manitoba portion of the Winnipeg River are operated with limited peaking and ponding. The maximum daily output is based on the flow of the river, not “on/off” as in other locations. Participants agreed that overall, habitat degradation resulting from changes in the natural flow regime caused by operation of the GSs was a more consistent threat throughout the DU than fragmentation. That having been said, the Pointe du Bois GS was considered a threat, in terms of population fragmentation, to the Lake Sturgeon in MU5 (see explanation on page 25).

Table 2 was filled out on the basis of the meeting discussions.

Mitigations, alternatives and enhancements

The list of potential mitigations and alternatives in the working paper were reviewed. The text in this section was revised following the meeting based on the meeting discussion.

SOURCES OF INFORMATION

Cleator, H., K.A. Martin, T.C. Pratt and D. Macdonald. 2010. Information relevant to a recovery potential assessment of Lake Sturgeon: western Hudson Bay populations (DU1). DFO Can. Sci. Advis. Sec. Res. Doc. 2010/080. vi + 26 p.

COSEWIC. 2006. COSEWIC assessment and update status report on the lake sturgeon *Acipenser fulvescens* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 107 p. (http://www.sararegistry.gc.ca/sar/assessment/status_e.cfm).

Reed D.H., J.J. O'Grady, B.W. Brook, J.D. Ballou and R. Frankham. 2003. Estimates of minimum viable population sizes for vertebrates and factors influencing those estimates. Biol. Conserv. 113: 23–34.

APPENDIX 1: TERMS OF REFERENCE

Terms of Reference

Recovery Potential Assessment of Lake Sturgeon: Western Hudson Bay (Designated Unit (DU) 1), Saskatchewan River (DU2), Nelson River (DU3), Red-Assiniboine rivers - Lake Winnipeg (DU4) and Winnipeg River - English River (DU5)

Regional Advisory Meeting (Central and Arctic)

Freshwater Institute, Winnipeg, Manitoba

20 October 2009 to 21 October 2009 8:30 a.m. to 4:30 p.m. (Central Daylight Time)
22 October 2009 8:30 a.m. to 10:00 a.m. (Central Daylight Time)

Chairperson: Tom Pratt

Background

In November 2006, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed the status of Lake Sturgeon (*Acipenser fulvescens*). The populations in western Canada, Western Hudson Bay (Designated Unit (DU) 1), Saskatchewan River (DU2), Nelson River (DU3), Red-Assiniboine rivers – Lake Winnipeg (DU4) and Winnipeg River - English River (DU5), were designated as Endangered based on evidence that the populations had declined significantly from historic levels in each of the DUs primarily as a result of overexploitation. Habitat degradation (e.g., dams) increasingly threatens populations (COSEWIC 2006). Lake Sturgeon are now being considered for legal listing under the *Species at Risk Act* (SARA).

In advance of making a listing decision for Lake Sturgeon (DUs 1-5), Fisheries and Oceans Canada (DFO) Science has been asked to undertake a Recovery Potential Assessment (RPA). DFO Science developed the RPA framework to provide the information and scientific advice required for the Department to meet various requirements of the SARA including listing decisions, authorizations to carry out activities that would otherwise violate the SARA and development of recovery strategies. The information in the RPA may be used to inform both scientific and socio-economic elements of the listing decision, as well as development of a recovery strategy and action plan, and to support decision-making with regards to the issuance of permits, agreements and related conditions, as per section 73, 74, 75, 77 and 78 of SARA.

A preliminary fact-finding workshop was held in February/March 2006 to consider information available for recovery planning. A second workshop was held in March 2007 to consider the scientific data available for development of an RPA. This advisory meeting is being held to assess the recovery potential of Lake Sturgeon (DUs 1-5). The resulting RPA Science Advisory Report (SAR) will summarize the current understanding of the distribution, abundance and trend of these DUs, along with recovery targets and times to recovery while considering various management scenarios. The current state of knowledge about habitat requirements, threats to both habitat and Lake Sturgeon, and measures to mitigate these impacts, will also be included in the SAR.

Objectives

The intent of this meeting is to assess the recovery potential of Lake Sturgeon (DUs 1-5) using the 17 steps in the RPA framework outlined in the Summary section of the Revised Protocol for Conducting Recovery Potential Assessments (available at: http://www.dfo-mpo.gc.ca/csas/Csas/status/2007/SAR-AS2007_039_e.pdf). The advice will be provided to the DFO Minister for his consideration in meeting various requirements of SARA including any listing decision for Lake Sturgeon DUs 1-5.

Products

The meeting will generate a proceedings report summarizing the deliberations of the participants. This will be published in the Canadian Science Advisory Secretariat (CSAS) Proceedings Series on the CSAS website. Also, the advice from the meeting will be published as an RPA SAR. Detailed supporting information for the SAR will be published as a CSAS Research Document.

Participation

DFO, provincial governments, academia, industry and aboriginal experts are invited to this meeting.

APPENDIX 2: MEETING PARTICIPANTS

Name	Affiliation	E-mail	Participation [1]
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[1] 1=attended part of all of 20-22 October 2009 meeting; 2=attended 3 December 2009 meeting; 3=attended 17 December 2009 meeting

[2] Reviewed Alberta portion of DU2 prior to October meeting and some portions afterwards.