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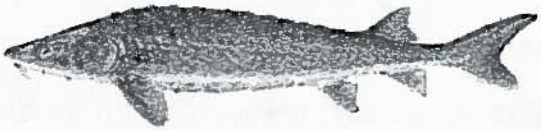
RECOVERY POTENTIAL ASSESSMENT OF LAKE STURGEON: NELSON RIVER POPULATIONS (DESIGNATABLE UNIT 3)



Lake Sturgeon Acipenser fulvescens
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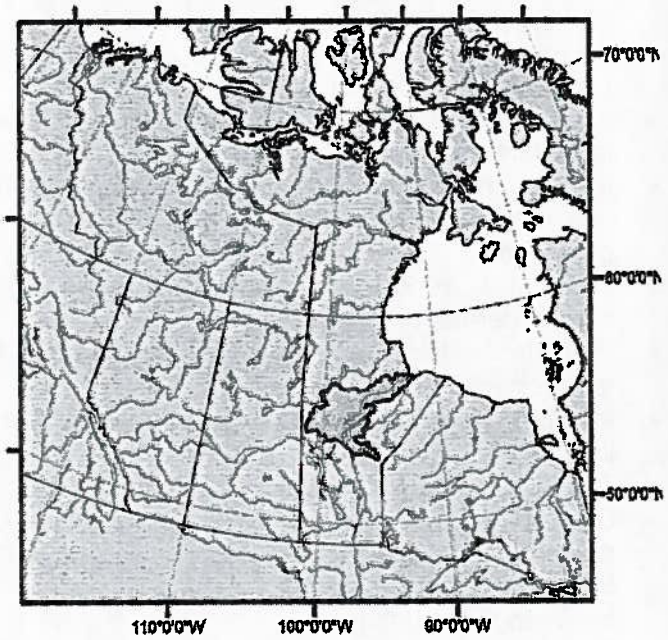

Figure 1. DU3 for Lake Sturgeon (coloured area).

Context:

The Lake Sturgeon (Acipenser fulvescens) was common in nearshore waters across much of Canada in the nineteenth century, but intensive fishing, habitat loss and degraded water quality caused severe reductions in population size or extirpation across their range. Today they remain extant from the North Saskatchewan River in Alberta, to Hudson Bay in the north, and eastward to the St. Lawrence River estuary. In November 2006, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed Lake Sturgeon in Canada. Designatable Unit (DU) 3, the Nelson River populations, includes Lake Sturgeon in the Nelson River in northeastern Manitoba, downstream of Lake Winnipeg (to Hudson Bay), and all related drainages. The Lake Sturgeon in this region is considered a distinct DU unit on the basis of distinguishable variation in three nuclear microsatellite loci. COSEWIC assessed and designated DU3 as Endangered as Lake Sturgeon in this DU declined severely over the past century. Historically, over-exploitation from commercial fisheries probably was the primary threat which led to depletion of Lake Sturgeon in DU3. More recently, habitat degradation or loss associated with dams/impoundments and other barriers and impacts of fishing have become the most important threats.

DU3 Lake Sturgeon is being considered for legal listing under the Species at Risk Act (SARA). In advance of making a listing decision, Fisheries and Oceans Canada (DFO) has been asked to undertake a Recovery Potential Assessment (RPA). This RPA summarizes the current understanding of the distribution, abundance and population trends of Lake Sturgeon in DU3, along with recovery targets

and times. The current state of knowledge about habitat requirements, threats to both habitat and Lake Sturgeon, and measures to mitigate these impacts for DU3 are also included. This information may be used to inform both scientific and socio-economic elements of the listing decision, 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 sections 73, 74, 75, 77 and 78 of SARA.

SUMMARY

- Six Management Units (MUs) have been identified for DU3: MU1 is located between Playgreen Lake and Whitemud Falls, MU2 between Whitemud Falls and Kelsey Generating Station (GS), MU3 between Kelsey GS and Kettle GS, MU4 between Kettle GS and Long Spruce GS, MU5 between Long Spruce GS and Limestone GS and MU6 between Limestone GS and Hudson Bay.
- Available data and expert opinion indicates that Lake Sturgeon abundance in DU3 ranges from very low to moderate.
- In MU1, the current status is critical, population trajectory is increasing due to stocking but recovery potential is low for the indigenous population and unknown for the stocked population.
- The status, trend and recovery potential of MU2 is cautious, stable or possibly increasing and moderate, respectively.
- The status, trend and recovery potential of MU3 is cautious, unknown and moderate, respectively.
- In MUs 4 and 5, population status is critical, trajectory is unknown and recovery potential is low.
- The status of MU6 is healthy, trajectory is unknown and recovery potential is high.
- Survival and recovery of Lake Sturgeon in DU3 depend on maintaining the functional attributes of habitat, including the ecologically-based flow regimes needed for spawning, egg incubation, juvenile rearing, summer feeding and overwintering, as well as migration routes between these habitats.
- The long-term recovery goal for DU3 is to protect and maintain healthy, viable populations of Lake Sturgeon in all MUs in the Nelson River system.
- The most important current threats to survival and recovery of Lake Sturgeon in DU3 are habitat degradation or loss resulting from the presence of dams/impoundments and other barriers, mortality, injury or reduced survival resulting from fishing, and population fragmentation resulting from the presence of dams/impoundments and other barriers.
- Mitigation measures that would aid recovery include prevention of mortality, protection of habitat and public education.
- Activities that damage or destroy functional components of habitat or key life components of the life cycle pose a very high risk to the survival or recovery of Lake Sturgeon in MUs 1, 4 and 5, a moderate to high risk in MUs 2 and 3 and a moderate risk in MU6.

BACKGROUND

Rationale for Assessment

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated Lake Sturgeon in DU3 as Endangered in 2006 (COSEWIC 2006) and it is now being considered for listing under the *Species at Risk Act* (SARA). When COSEWIC designates an aquatic species as Threatened or Endangered and the Governor in Council decides to list it, the Minister of

Recreational angling directed at Lake Sturgeon is allowed in this DU, though it is minimal, and any captured individuals must be released.

Annual rates of harvest for Lake Sturgeon are not available for this DU. Regardless, it is worth noting that annual harvest rates that are thought to be sustainable for Lake Sturgeon are typically 5% or less (Cleator *et al.* 2010). A guideline developed for rehabilitation of Lake Sturgeon in the State of Michigan, for populations that currently exist, specifies maintaining fishing mortality below 3% for an expanding population and below 6% to maintain Lake Sturgeon abundance (Cleator *et al.* 2010).

Five hydroelectric GSs were developed on the Nelson River: Kelsey (completed in 1960), Kettle (1970), Jenpeg (1975), Long Spruce (1977) and Limestone (1990). At least two more hydroelectric GSs (Keeyask, formerly called Gull, and Conawapa) are planned (Figure 2). Dams and control structures elsewhere have been shown to alter the natural flow regime and fragment habitat resulting in degradation and/or loss of Lake Sturgeon habitat, loss of genetic diversity, reduced spawning success, reduced prey availability and mortality (Cleator *et al.* 2010). Dam construction can extirpate local Lake Sturgeon populations (Cleator *et al.* 2010) by preventing fish from accessing spawning areas and stranding fish between impassable barriers. Larger structures, like hydroelectric dams, can also cause direct mortality, injury or reduced survival by entrainment[1], impingement[2] and fish passing downstream through the turbines. However, the intakes of most hydroelectric GSs are covered by bars or grates spaced such that they prevent passage of adult Lake Sturgeon through turbines. By the late 1970s, the perception of community fishermen on the Nelson River was that all combined Lake Sturgeon harvests had drastically decreased in response to the construction and operation of hydroelectric GSs (Cleator *et al.* 2010). Fragmentation is one of the limiting factors for MUs 4 and 5 on the lower Nelson River, however changes in flow regime and alteration of habitat are more significant throughout the DU.

In summary, the most important current threats to survival and recovery of Lake Sturgeon in DU3 are habitat degradation or loss resulting from the presence of dams/impoundments and other barriers, mortality, injury or reduced survival resulting from fishing, and population fragmentation resulting from the presence of dams/impoundments and other barriers (Table 2). The likelihood and severity of individual threats may vary by MU. All other threats that have been identified for other DUs in Canada are relatively unimportant or their impacts are unknown in DU3. The timeframe and impacts of climate change are unknown.

Limiting Factors for Population Recovery

The Lake Sturgeon possesses several intrinsic or evolved biological characteristics that make this species susceptible to over-exploitation and habitat changes and may naturally influence or limit potential for recovery: (1) slow growth and late maturation, (2) intermittent spawning intervals, (3) specific temperature, flow velocities and substrate requirements to ensure uniform hatching and high survival of eggs and (4) high fidelity to spawning areas. The early age-0 stage (transition from larvae to exogenous feeding) is a critical life stage for Lake Sturgeon.

[1]Entrainment occurs when fish eggs and larvae are taken into a facility's water-intake systems, pass through and back to the water body.
[2]Impingement occurs when fish are trapped or pinned by the force of the intake flow against the intake.

Mitigation, Alternatives and Enhancements

The Lake Sturgeon in DU3 is most sensitive to harm on early adults, followed by late adults, late juveniles, early juveniles and age-0 (in decreasing order) (Cleator *et al.* 2010). These results highlight the importance of reducing mortality on, and maximizing survival of, adults and late juveniles as the key to recovering this DU. However, the potential for improving survival of adults is low relative to the potential in age-0 and young juveniles (Table 3), therefore the possibility of implementing recovery strategies that improve age-0 and juvenile survival (e.g., habitat rehabilitation) should also be considered. For example, conservation stocking using fish from the same genetic stock has the potential to improve survival of age-0 and young juvenile fish so long as it also addresses potential impacts on genetic variability, artificial selection and transmission of disease from cultured to native fish. Conservation stocking should be undertaken only after careful consideration and as part of a comprehensive conservation stocking strategy for the DU, not a substitute for other effective mitigation or alternate measures outlined in this document.

Fertility rates in both early and late adult stages are less sensitive to perturbation (Cleator *et al.* 2010). Regardless, continuous and intense recruitment failure caused by blocking spawning migration by dams and barriers or habitat degradation can still produce more apparent population constraints than adult mortality (Cleator *et al.* 2010). Complete blockage of spawners at barriers can eradicate a population in a generation from continuous reproductive failure and strong site fidelity for spawning (Cleator *et al.* 2010).

Table 4 provides an inventory of possible mitigation measures, alternatives and enhancements to anthropogenic activities that pose threats to Lake Sturgeon survival and recovery. Mitigations, alternatives and enhancements for the most important threats for DU3, as identified in Table 2, are shown below.

Mitigations and alternatives

Habitat degradation or loss: dams/impoundments and other barriers

- Adjust water management operating conditions of dams/impoundments and other barriers for those currently in place and those planned in the future to optimize the survival and recovery of Lake Sturgeon, especially during the spawning and incubation periods.
- Rehabilitate habitat in key areas to mitigate habitat degradation or loss of important habitat (e.g., spawning sites) and to improve age-0 and juvenile survival.
- Ensure design of new dams and modernization of existing dams does not jeopardize the survival and recovery of Lake Sturgeon (e.g., consider possible need for fish passage).
- Protect spawning and rearing habitat.

Mortality, injury or reduced survival: fishing

- Immediate release of bycatch to promote survivability.
- Examine ways and means of altering commercial net fisheries to reduce impacts on recovering Lake Sturgeon populations (e.g., trapnets versus gillnets, netting off the bottom, area closures such as limiting fishing near river mouths, close fishery).
- Regulate or encourage fishing practices that improve fish survival for catch-and-release fisheries, such as cutting lines of deeply-hooked fish, tight-line fishing, and minimizing "playing" and handling of hooked fish.
- Consider closure (e.g., conservation closures, closed seasons and areas), or at least reduce mortality, for adults through the use of legal size limits.

Table 2. Current status of threats to Lake Sturgeon in DU3 by Management Unit (MU), defined in terms of the likelihood of occurrence followed by level of severity, based on current knowledge of the MUs and the areas in which they occur. (0=Nil, L=Low, M=Moderate, H=High, U=Unknown). The most important threats are highlighted. Note: In cases where a man-made barrier occurs at the start (upstream end) of an MU, it is included in the MU. For example, Limestone GS is included in MU6.

THREATS	Playgreen Lake – Whitemud Falls	Whitemud Falls – Kelsey GS	Kelsey GS – Kettle GS	Kettle GS – Long Spruce GS	Long Spruce GS – Limestone GS	Limestone GS – Hudson Bay
	MU1	MU2	MU3	MU4	MU5	MU6
Mortality, injury or reduced survival						
Entrainment, impingement and turbine mortality (e.g., from hydroelectric dams and other barriers, urban or irrigation intakes)	L,L	L,L	L,L	L,L	L,L	0,0
Population fragmentation (e.g., from dams/impoundments and other barriers)	L,L	L,L	L,L	H,H	H,H	L,L
Fishing: commercial net (bycatch)	H,L	H,M	H,L	0,0	0,0	0,0
Fishing: domestic / subsistence	M,L[1]	H,H	H,H	0,0	0,0	H,H
Fishing: recreational / commercial tourism	0,0	0,0	0,0	0,0	0,0	0,0
Fishing: illegal harvest	0,0	M,M	M,M	0,0	0,0	M,M
Habitat degradation or loss[2]						
Dams/impoundments and other barriers (e.g., hydroelectric dams or water control structures)	H,M	H,M	H,M	H,H	H,H	H,M
Industrial activities (including oil and gas, and pulp and paper)	0,0	0,0	0,0	0,0	0,0	0,0
Forestry exploration/ extraction	H,0	H,0	0,0	0,0	0,0	0,0
Mining exploration/extraction	L,0	0,0	M,L	0,0	0,0	0,0
Agricultural activities	0,0	0,0	0,0	0,0	0,0	0,0
Urban development	H,L	0,0	0,0	H,L[3]	0,0	0,0
Sturgeon culture						
Genetic contamination	L,L	L,L	0,0	0,0	0,0	0,0
Disease	U,U	U,U	U,U	U,U	U,U	U,U
Non-indigenous and invasive species	H,L	H,L	H,L	H,L	H,L	H,L
Climate change[4]	U,U	U,U	U,U	U,U	U,U	U,U

[1]Subsistence fishery does not target Lake Sturgeon in this MU.
[2]Examples: changes in flow regime, water temperature, concentrations of sediments, nutrients and contaminants, habitat structure and cover, food supply and migration/access to habitat, surface hardening and pollution.
[3]The Town of Gillam discharges its sewage into the Kettle River which flows into the Nelson between Kettle and Long Spruce GS (MU4).
[4]Examples: changes in water temperature, patterns of precipitation, river morphology and hydrology.

Table 1. Assessment of the current conservation status, population trajectory, overall importance to species recovery and recovery potential of the six Lake Sturgeon Management Units (MUs) in the Nelson River system. Conservation status was based on the best available information and Precautionary Framework (see Cleator et al. 2010 for explanation); population trajectory was rated as Unknown, Stable, Increasing or Decreasing; importance to species recovery evaluates the importance of the MU to the overall recovery of Lake Sturgeon within DU3. For example, if a DU contained only one Lake Sturgeon MU whose conservation status was considered to be Healthy, then its importance to species recovery would be rated High as catastrophic loss of that MU would result in extirpation of the DU. Recovery potential is based on a combination of current conservation status and current threats status. Importance to species recovery and recovery potential were rated as Nil, Low, Moderate, High or Unknown; Ind=Indigenous, St=Stocked.

MU	Location	Conservation status	Population trajectory	Importance to DU recovery	Recovery potential
1	Playgreen Lake – Whitemud Falls	Critical	Increasing[1]	Low	Low (Ind) Unknown (St)[2]
2	Whitemud Falls – Kelsey GS	Cautious	Stable or possibly Increasing	High	Moderate
3	Kelsey GS – Kettle GS	Cautious	Unknown	High	Moderate
4	Kettle GS – Long Spruce GS	Critical	Unknown	Low	Low
5	Long Spruce GS - Limestone GS	Critical	Unknown	Low	Low
6	Limestone GS – Hudson Bay	Healthy	Unknown	High	High

[1]As a result of stocking of offspring from MU2 broodstock.
[2]The stocked fish have not yet reached reproductive age.