RECOVERY POTENTIAL ASSESSMENT OF MOUNTAIN SUCKER (*Catostomus platyrhynchus*), MILK RIVER POPULATIONS (DU2)

Mountain Sucker Catostomus platyrhynchus
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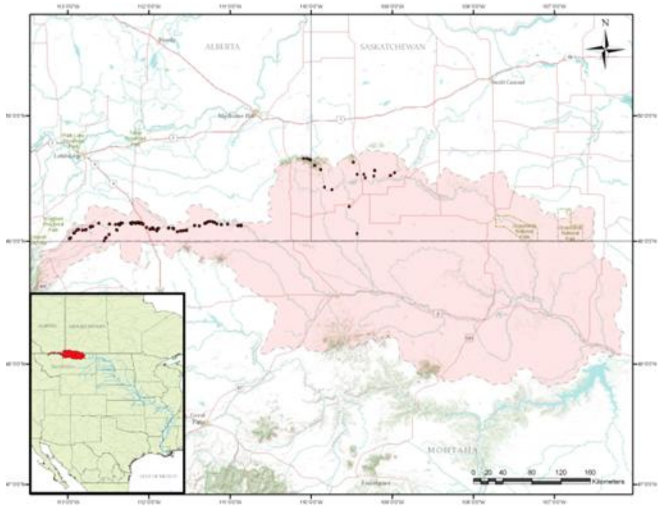

Figure 1. Distribution of Mountain Sucker, Milk River populations (DU2).Shading delineates the Milk River watershed in Alberta, Saskatchewan and Montana.

Context

*In November 2010, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed the Milk River populations of Mountain Sucker (*Catostomus platyrhynchus*) as a separate designatable unit (DU2) in Alberta and Saskatchewan and assigned them a designation of Threatened. They are now being considered for legal listing under the* Species at Risk Act *(SARA).*

A species Recovery Potential Assessment (RPA) was conducted by DFO Science to provide the information and scientific advice required to meet various requirements of the SARA and assess the recovery potential of Mountain Sucker in DU2. This Science Advisory Report is from the January 10-11, 2012 Recovery Potential Assessment of Mountain Sucker, Milk river Populations. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SUMMARY

- The known distribution of Mountain Sucker for DU2 is limited to three drainages areas within the Milk River basin: the North and Milk rivers; a few tributaries of the Frenchman River; and Battle Creek and one of its tributaries, Nine Mile Creek.
- This species is abundant in the North Milk and Milk rivers in Alberta and its population trajectory appears to have been stable for several decades. Abundance of Mountain

Sucker is low to medium in the Frenchman River system and low in the Battle Creek system; population trajectory is unknown in both systems.

- In DU2, Mountain Sucker generally inhabit clear, cool mountain streams ranging from 2 to 40 m in width with predominantly gravel and cobble substrates. Younger fish are usually found in shallower and slower water than adults. Spawning occurs in riffles adjacent to pools of swift to moderate mountain streams usually beginning in late spring to early summer. Little is known about overwintering habitat.
- A population of Mountain Sucker with a persistence probability of about 99% over 100 years and quasi-extinction threshold of 50 adults, experiencing a 15% chance of catastrophe (a one-time decline in abundance of 50% or more) per generation, would require a Minimum Viable Population (MVP) of at least 6,400 adults and at least 3 ha of suitable habitat.
- Modelling results suggest that the Mountain Sucker population in the Milk River system is not in imminent danger of extirpation (i.e., likely exceeds the MVP target of 6,400 adults and has more than the minimum suitable habitat) whereas the two Saskatchewan populations are at risk, although they have probably never had the densities necessary to achieve the MVP of 6,400 adults.
- In the absence of additional harm, recovery efforts or habitat limitations, a MVP of 6,400 adults was predicted to go extinct in 32 years. When survival of all ages was improved by 28%, the population nearly stabilized, and the risk of imminent extinction was eliminated.
- The dynamics of Mountain Sucker populations are very sensitive to perturbations that affect the survival of immature individuals (from hatch to age 2) and to the collective survival of adults (ages 2-6). Harm to these portions of the life cycle should be minimized.
- The greatest threats to the survival and persistence of Mountain Sucker in DU2 are related to cumulative effects of landscape changes causing habitat loss and degradation, especially as a result of flow alteration. Drought and anoxic conditions in combination with water regulation and extraction have the potential to significantly reduce the quantity and quality of sucker habitat.
- There are numerous sources of uncertainty related to Mountain Sucker in DU2, especially in Saskatchewan, including population abundance and trajectory; life history characteristics including rates of survival and population growth; habitat requirements including the distribution and extent of suitable habitat; movement between and among populations; and an understanding of the environmental factors that limit their existence.

BACKGROUND

COSEWIC determined three DUs for Mountain Sucker in Canada. In November 2010, COSEWIC assessed and designated the Milk River populations (DU2) of Mountain Sucker (Figure 1) as Threatened because they have a small area of occupancy and number of locations (eight) where they have been found that make them particularly susceptible to habitat loss and degradation from the altered flow regimes and drought that climate change is expected to exacerbate (COSEWIC 2010). They are now being considered for legal listing under the *Species at Risk Act* (SARA). This Recovery Potential Assessment (RPA) focuses on the Mountain Sucker (Milk River populations), and is a summary of the peer-review meeting that occurred on 10 -11 January 2011 in Lethbridge, Alberta. Two research documents, that provide technical details and the full list of cited material, were reviewed during the meeting. One of the research documents provides background information on the species biology of Mountain

Sucker, habitat preferences, current status, threats and mitigations and alternatives (Boguski and Watkinson 2013), and the other on allowable harm, population-based recovery targets, and habitat targets (Young and Koops 2013). The proceedings report summarizes the key discussions of the meeting (DFO 2013). This Science Advisory Report summarizes the main conclusions and advice from the science peer review.

Taxonomy

Mitochondrial and nuclear DNA sequencing data from Mountain Sucker provide evidence of at least four divergent lineages across the species' global range. These lineages include the upper Missouri drainage, the South Saskatchewan drainage, the lower Columbia/Fraser systems, and the upper Snake River. The three lineages that occur in Canada are found in different National Freshwater Biogeographic Zones and COSEWIC assigned them as separate designatable units (COSEWIC 2010). Each zone represents natural disjunctions with no possibility of natural dispersal since the end of the last glaciation. Thus, the loss of populations that comprise each DU would result in an extensive gap in the range of this species in Canada. The three DUs are named after the zones in which they are found: Saskatchewan-Nelson River populations (DU1), Milk River populations (DU2), and Pacific populations (DU3).

Species Biology and Ecology

There has been limited research conducted on the biology of Mountain Sucker in Canada. Although Canadian data are presented when available, some information comes from U.S. studies.

Morphology

The Mountain Sucker has a fleshy, broad, rounded snout and large ventral mouth with lips that often exceed width of the head, and have large papillae except on the front side corners and outer face of the upper lip. The mouth contains no teeth. Adult Mountain Sucker are dark green to grey or brown above and on the sides, finely speckled with black, and light yellow on the underside. Breeding males typically develop a rosy stripe along the side and small nuptial tubercles over the entire body.

Growth and Reproduction

The spawning season usually begins in late spring or early summer and is influenced by both latitude and altitude, generally being later in more northern latitudes or at higher elevations. Mountain Sucker typically spawn in riffles adjacent to pools of quick-moving water when water temperatures are between 11°C and 19°C, after which they retreat to deep pools and associated bank cover or near the transitions between pools and runs. Similar to other fishes, fecundity in Mountain Sucker is related to length and age, with older and larger females usually bearing more eggs. The eggs are scattered over the substrate and the incubation period is not known but speculated to be in the range of 8-14 days similar to other suckers. This species has multiple years of spawning so if spawning success is compromised in one year there is the potential for successful spawning in a subsequent year.

Mountain Sucker generally grows slowly in cool mountain streams. During mid-summer, the newly-hatched larvae are thought to stay in the gravel until they have reached 10 mm in length after which they drift into nursery habitats. Fry have been collected in shallow, low current habitats in streams and along shorelines in reservoirs and lakes. Many males mature by their second year while most females mature by the end of their third year. Mature female Mountain Sucker tend to be longer (about 90 to 175 mm) than mature males (about 64 to 140 mm) of the same age and they also usually live longer (about nine years versus seven years).

Ecological Role / Food Habits

The Mountain Sucker is an ecologically specialized periphyton scraper that uses the horny edges of its jaws to scrape algae from surfaces. Their diet mostly consists of diatoms, *Closterium*, and filamentous algae species. Because of their relatively small size, Mountain Sucker may be preyed on by many other species, including birds, mammals, and fishes.

Dispersal and Migration

Little information is available on the movements of Mountain Sucker in Canada. Elsewhere, mature fish have been reported to make short-term seasonal changes in distribution from pool habitat to riffles or from a reservoir to a tributary stream, to spawn. How far they travel to find suitable spawning habitat is unknown but no long-distance movements have been reported.

Interspecific interactions

The Milk River watershed, Battle Creek tributaries and Frenchman River tributaries include fish communities of both native and introduced species. The Mountain Sucker is sympatric with other catostomid species such as White Sucker (*C. commersonii*), Longnose Sucker (*C. catostomus*), Tahoe Sucker (*C. tahoensis*), Utah Sucker (*C. ardens*), and Bridgelip Sucker (*C. columbianus*) in parts of its range, and hybrids between Mountain Sucker and these species have been recorded. However, Mountain Sucker will form exclusive schools, separate from other suckers. This in conjunction with their highly specialized feeding likely reduces the risk of hybridization and direct competition with other sucker species.

Adaptability

Mountain Sucker is adapted to the fluctuating environments of higher-gradient streams of variable hydrology. In DU2, this species inhabits a wide range of stream habitats in isolated populations and is subjected to periodic natural disturbances such as fires, droughts, and floods. Multi-year spawning and longevity of up to nine years allows this species to survive poor spawning years and to take advantage of ideal conditions as they occur.

ASSESSMENT

Historic and Current Distribution and Trends

In DU2, Mountain Sucker has been recorded from at least 20 geographically distinct sampling sites within eight waterbodies: the North Milk and Milk rivers in the Milk River system in Alberta (Figure 2); Battle Creek and a tributary, Nine Mile Creek, in Saskatchewan and just into southern Alberta; and Belanger, Lonepine, Caton and Conglomerate creeks which are tributaries of the Frenchman River in Saskatchewan (Figure 3). These eight waterbodies are separated by barriers between the Milk and North Milk rivers to the west and the remaining locations to the east, thereby preventing gene flow and potential rescue except from nearby areas (Figure 1).

Milk River system

Mountain Sucker is widely distributed within the Canadian portion of the North Milk and Milk rivers but not in the smaller tributaries, most of which are ephemeral in nature. The potential for re-colonization from both upstream and downstream sections of the Milk River system in Montana is limited.

Figure 2. Distribution of Mountain Sucker in the Milk River system in Alberta.

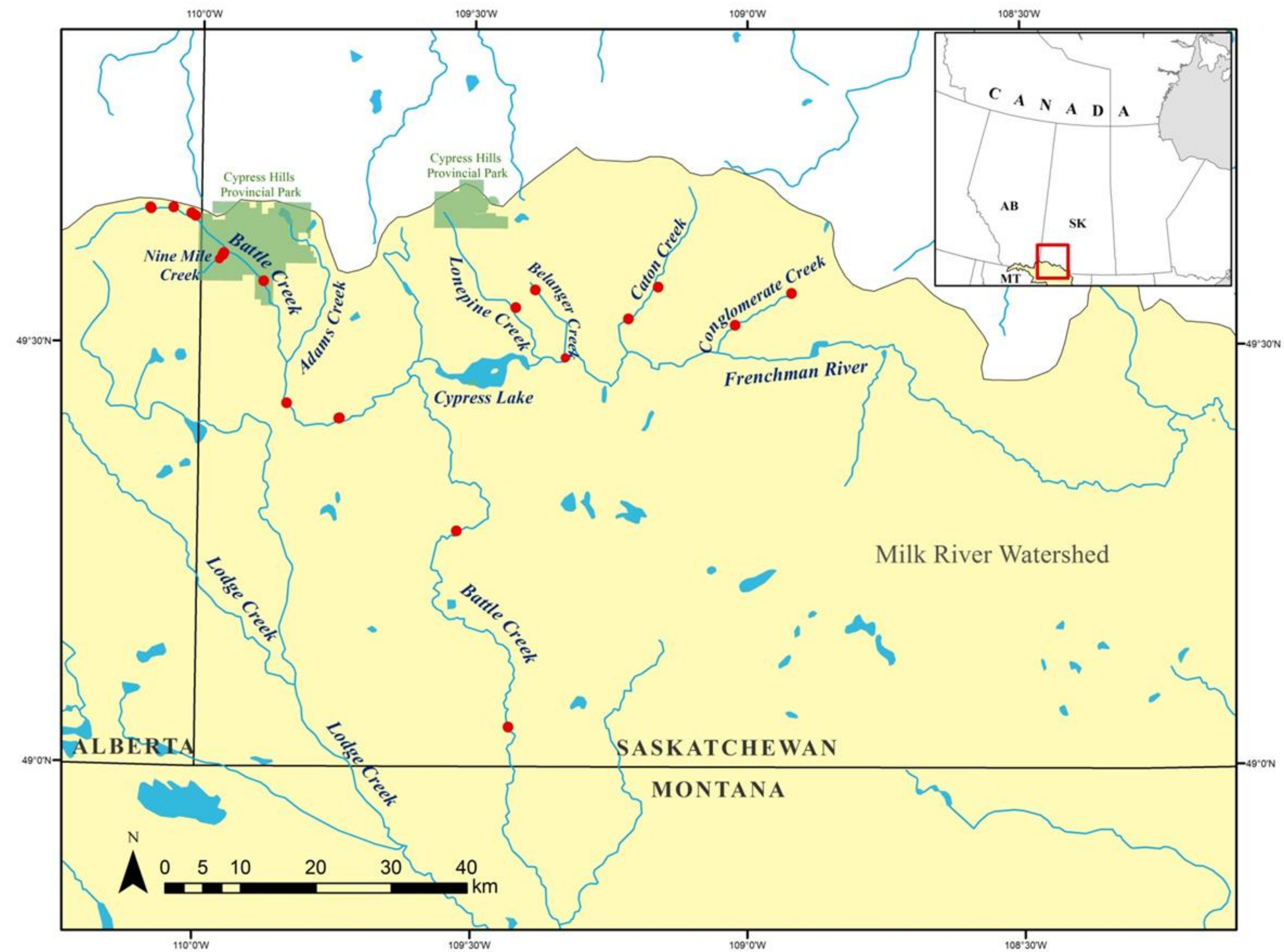

Figure 3. Distribution of Mountain Sucker in the Battle Creek and Frenchman River systems. Distribution records for lower Battle Creek, Lonepine Creek and upper Belanger Creek are from before 1970.

Battle Creek system

Sampling for this species in the Battle Creek and its tributaries has been very limited. Approximately 40 fish have been collected since 1905. In more recent years, between 1970 and 2008, Mountain Sucker has only been found near the headwaters of this system.

Frenchman River system

Over the years, specimens have been collected from various tributaries of the Frenchman River including Belanger, Lonepine, Caton and Conglomerate creeks but not the mainstem. Recent sampling effort resulted in captures in both Caton and Conglomerate creeks yet not in Belanger and Lonepine creeks.

Historic and Current Abundance and Trends

The abundance and population trajectory of Mountain Sucker was assessed individually for the Milk River, Battle Creek and Frenchman River systems (Table 1). Each watershed was treated as a separate population although there are no studies to support genetic differences between them. The Relative Abundance Index is a relative parameter in that each population is assigned a value relative to the most abundant population which, for Mountain Sucker, is the Milk River system.

Milk River system

This species is known to be common in the Milk River system, resulting in a Relative Abundance Index of High. The proportion of Mountain Sucker in the catch relative to the combined abundance of common species, whose population trajectory is expected to remain relatively stable over time, was 12.4% in 1969 and 12.7% between 2000 and 2010. Based on these data, the Population Trajectory appears to have been Stable over the past several decades, producing a Population Status of Good.

Battle Creek system

In the Battle Creek system only presence-and-absence data were recorded historically and current sampling is limited. In 2003 and 2004, Mountain Sucker was captured in Battle and Nine Mile creeks at an average rate of 0.12 fish/minute based on about 86 minutes of shocking effort. The Relative Abundance Index is Low and Population Trajectory is Unknown for the Battle Creek system, resulting in a Population Status of Poor.

Frenchman River system

In the Frenchman River system only presence-and-absence data were recorded historically and current sampling is limited. In 2003 and 2004, Mountain Sucker was captured in Caton and Conglomerate creeks (2.8 fish/minute and a single specimen, respectively), but not in Belanger or Lonepine creeks. The last reported collection made in Belanger Creek was in 1983. The Relative Abundance Index is Low-Medium and Population Trajectory is Unknown for the Frenchman River system, resulting in a Population Status of Poor.

Table 1. Relative Abundance Index, Population Trajectory and Population Status of Mountain Sculpin in the three systems where they are known to occur in DU2. The level of Certainty associated with the Relative Abundance Index and Stock Trajectory rankings is based on quantitative analysis (1), CPUE or standardized sampling (2) or expert advice (3). Stock Status results from an analysis of both the Relative Abundance Index and Stock Trajectory. Certainty assigned to each Stock Status is reflective of the lowest level of certainty associated with either initial parameter (Relative Abundance Index, or Population Trajectory.)

Population	Relative Abundance Index	Certainty	Population Trajectory	Certainty	Population Status	Certainty
Milk River system[1]	High	2	Stable	3	Good	3
Battle Creek system[2]	Low	2	Unknown	3	Poor	3
Frenchman River system[3]	Low-Medium	2	Unknown	3	Poor	3

[1] North Milk River and the Milk River below the confluence
[2] Battle and Nine Mile creeks
[3] Belanger, Lonepine, Caton and Conglomerate creeks

Assessing the Habitat use of Mountain Sucker

Habitat Requirements

In Canada, no systematic surveys have been conducted to characterize habitat used by this species and most information on habitat are dependent on casual field observations. In DU2, Mountain Sucker generally inhabit clear, cool mountain streams ranging from 2 to 40 m in width, although they appear to be tolerant of a variety of water conditions ranging from turbid to clear with daytime water temperatures as high as 21.2°C. Substrates range from silt to boulder, dominated by gravel and cobble. Underwater observations indicate that Mountain Sucker associate with the substrate and typically form small groups near areas of cover.

Young-of-the-Year (YOY) and Juvenile

Fry aggregate out of the main current in warmer and shallower waters. Young-of-the-year (YOY) Mountain Sucker (20–35 mm) have been collected in moderate currents, often retreating behind an obstacle (e.g., rocks, submerged logs) at depths of 15–40 cm. Young fish are commonly found in shallow (<20 cm) embayments and blind side-channels associated with mid-channel gravel bars. Juvenile fish are usually found in shallower (<1 m) and slower (<0.5 m/s) water than adults.

Adult

Larger fish are often found at the margins of runs, retreating to deeper water when disturbed. In the Milk River where 53 adult Mountain Sucker were collected during boat electrofishing survey, water depth ranged from 0.1 to 1.4 m, velocity from 0 to 1.98 m/s, and substrates were dominated by gravel (46%) and cobble (33%).

Spawning

Based on research conducted in the United States, spawning Mountain Sucker are most abundant in riffle areas below pools in 0.1 to 0.3 m of water with velocities of 0.06 to 0.20 m/s.

Overwintering

There is very limited information available on overwintering habitat of Mountain Sucker. In Alberta in most winters there is usually some open water in the rivers, thereby reducing the likelihood of anoxic conditions and possible winter kill. Winter conditions in the Battle and Frenchman systems are unknown.

Milk River system

Droughts occur in the Milk River system and Mountain Sucker may have adapted by adopting a broad tolerance to various habitat conditions. Mountain Sucker has been collected at 59 sites in the Milk River system where water depths ranged from 0.1 to 1.4 m, velocity from 0 to 1.98 m/s, Secchi disk readings from 0.14 to 0.7 m, and substrate from silt to boulder with gravel (38%) and cobble (27%) dominating.

Battle Creek system

Mountain Sucker has been collected in Battle and Nine Mile creeks where stream widths were 5–10 m, depths were <0.5 m with moderate velocities, Secchi disk measurements were 0.5 m, and substrates were predominantly gravel and cobble.

Frenchman River system

Mountain Sucker has not been collected in the Frenchman River but it is presumed to connect the populations that inhabit its tributaries. In those tributaries, this species has been collected at two sites in riffle pools where water depth was <1 m, Secchi disk readings ranged from 0.2 to 0.5 m, and substrates were dominated by gravel.

Residence

Residence is defined in SARA as a, “dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding, or hibernating”. Residence is interpreted by DFO as being constructed by the organism. In the context of the above narrative description of habitat requirements during YOY, juvenile and adult life stages, Mountain Sucker is not known to change their physical environment or invest in a structure during part of its life cycle.

Allowable Harm

Allowable harm was assessed in a demographic framework with the assessment involving perturbation analyses of population projection matrices and including a stochastic element. Outputs of the analyses included calculation of a population growth rate and its sensitivity to changes in vital rates. (See Young and Koops (2013) for complete details of the model and results.) Current vital rate estimates suggest the population may be in decline ($\lambda = 0.78$). Modelling indicated that the population dynamics were very sensitive to perturbations that affect the survival of immature individuals (from hatch to age 2), and to the collective survival of adults (ages 2-6). Uncertainty in sensitivity can be largely attributed to uncertainty in the estimate of age-0 survival. The modelling results indicated that human-induced harm to the overall survival of all life stages need be minimal to avoid jeopardizing the survival and future recovery of Mountain Sucker in DU2.

Recovery efforts that alleviate current harms or improve current conditions are recommended. For example, stabilization of the population (target growth rate of $\lambda = 1$) could require as much as 78% improvement in juvenile survival, or 46% improvement in survival of all ages. The required improvement to adult survival (114%) was not within the scope of improvement for a survival rate. These efforts will be sufficient when abundance exceeds the Minimum Viable Population (MVP) recovery targets described below. For populations that do not exceed MVP, simulations showed that an 84% improvement to juvenile survival and a 28% improvement to adult survival are expected to result in mean population growth of $\lambda = 1.2$. These levels represent the maximum plausible increases, based on parameter confidence intervals. It is important to note that estimates of recovery efforts assume that the population growth rate before harm (λ) is 0.78. If research indicates that any of the parameters were underestimated, required recovery efforts will be reduced; stability or growth of DU2 populations is within the confidence interval for the estimated population growth rate.

Recovery Targets

Recovery Targets and Times

Demographic sustainability was used as a criterion to set recovery targets for Mountain Sucker. Demographic sustainability is related to the concept of a minimum viable population (MVP), and was defined as the minimum adult population size that results in a desired probability of persistence over 100 years (approximately 30 generations of Mountain Sucker). Catastrophic decline in population size, defined as a 50% reduction in abundance, was incorporated into the simulations, and assumed that the chance of catastrophic decline was 10% or 15% per generation (0.031 or 0.047 annually). MVP was estimated for individual populations, not the species in total.

Maximum MVP was defined as the point where the reduction in extinction risk per investment in recovery is maximized. Calculated in that way, the mean MVP was 260 adults aged 2-6 when the probability of catastrophic decline was assumed to be 10% per generation (3.1% annually). If catastrophes occurred at 15% per generation (4.7% annually), the mean MVP was 570 adults. In both scenarios, the probability of extinction for the respective MVPs was approximately 0.01 over 100 years (Figure 4). The MVP simulations assumed a quasi-extinction threshold of one adult female (two adults). If the true extinction threshold is greater than two adults then larger recovery targets should be considered. For example, if the quasi-extinction threshold is defined as 50 adults, and the chance of catastrophe is 15% per generation, then the mean MVP increases from 570 to 6,400 adults (range: 4,600-8,400). The model assumes random mating and complete mixing of the population (i.e., all individuals interact and can reproduce with one another). (See Young and Koops 2013 for additional estimates of MVP based on alternative risk scenarios.)

Under current estimated conditions, and in the absence of recovery efforts or additional harm, a mean MVP of 6,400 was predicted to go extinct in 32 years (Figure 5). When survival of all ages was improved by 28% (the plausible scope for change), the population nearly stabilized, and the risk of imminent extinction was eliminated. The scope for improvement to fecundity was small, and did not result in a decrease in extinction risk. Population growth ($\lambda = 1.08$) was achieved by improving juvenile survival by 84% (the plausible scope for improvement). At this rate, a population at 10% of MVP (i.e., 640 adults) was predicted to have a 95% chance of recovering (i.e., reaching MVP = 6,400 adults) within 43 years. If adult survival was additionally improved by 28%, the resulting growth rate ($\lambda = 1.20$) reduced the recovery time to 21 years.

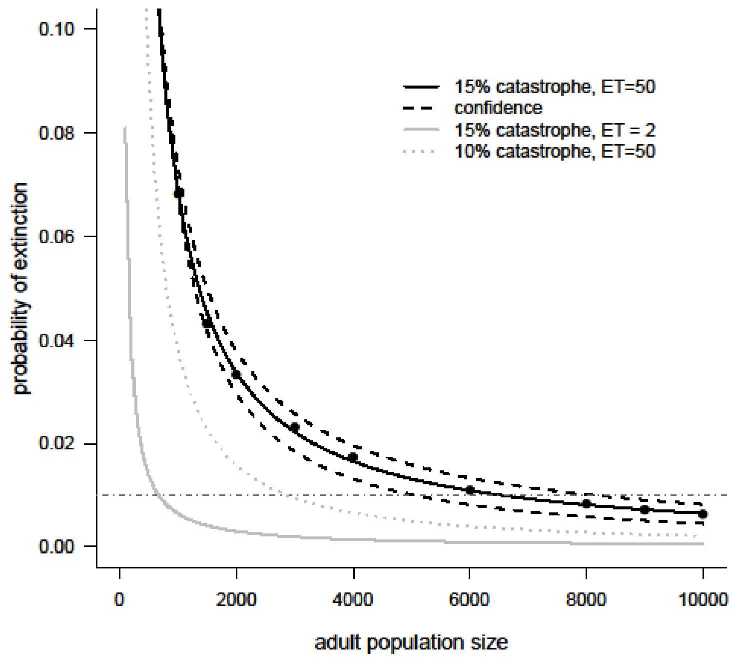

Figure 4. Probability of extinction within 100 years of 10 simulated Mountain Sucker populations, at equilibrium, as a function of adult population size. Black curves assume a 15% probability of catastrophic decline (solid = mean, dotted = max and min of 10 runs), and an extinction threshold of 50 adults. Grey curves represent 10% probability of catastrophe (dotted), or 15% probability of catastrophe and an extinction threshold of 2 adults. Dashed horizontal reference line is at 0.01 and intersects curves at the associated MVPs.

Minimum Area for Population Viability

The minimum area for population viability (MAPV) was estimated at a first order quantification of the amount of habitat required to support a viable population. With a target MVP of 6,400 adults, under a 0.15 probability of catastrophe per generation and assuming an extinction threshold of 50 adults, a population of this size was predicted to require between 3.0 ha and 16.6 ha of suitable habitat. These calculations also do not account for any overlapping (sharing) of individual habitats and assumes that habitat is of suitable quality. The recommended habitat target is very uncertain due to a lack of information about the density at which Mountain Sucker can persist, as well as any additional space they may require for seasonal movement.

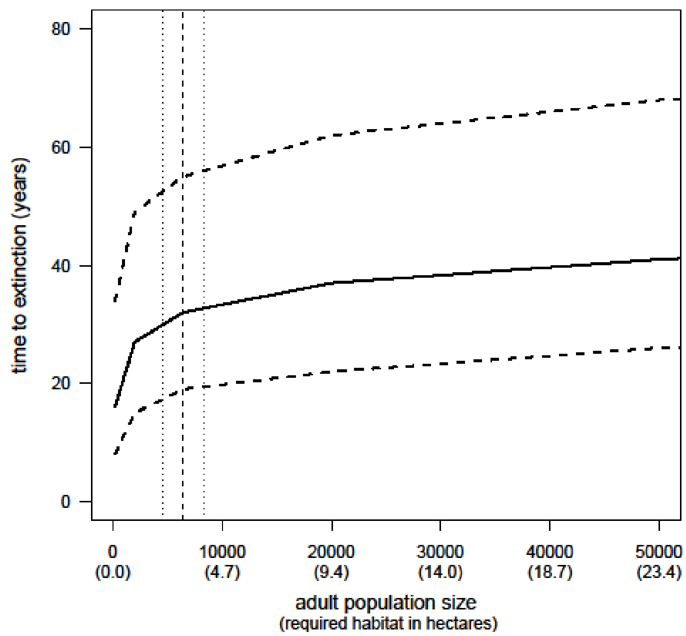

Figure 5. Time to extinction of 10 simulated Mountain Sucker populations in decline (λ = 0.78), as a function of adult population size. Median (solid) and 95% bootstrapped confidence interval (dashed). Vertical reference lines represent the Minimum Viable Population size (MVP = 6,400 adults) and stochastic confidence interval. Minimum Area for Population Viability (MAPV), in hectares, for each population size is also shown (brackets).

Based on available data and expert opinion, the Mountain Sucker population in the Milk River system likely exceeds the MVP target of 6,400 adults and has available approximately 12 ha of potential habitat, including the North Milk River and the Milk River downstream of its confluence. The density of Mountain Sucker in this system is thought to surpass the implied required density of $0.5/m^2$ adult Mountain Sucker, although without evidence of population growth or stability, achieving the MVP target is not sufficient to guarantee a “recovered” status of the population. Harm to the overall survival of this population is not recommended if it is in decline. Further study is needed to confirm or correct the estimated downward trajectory.

The Battle Creek and Frenchman River systems are much smaller than the Milk River system and, based on available data and expert opinion, densities in Saskatchewan are unlikely to achieve MVP and probably never have. Since a target of 6,400 adults may not be feasible for the Saskatchewan populations, they will be subject to a higher risk of extinction (Figure 4). Threats to Mountain Sucker will likely have a greater impact on the Battle Creek and Frenchman River populations than the same threats on the Milk rivers population.

Threats to Survival and Recovery

There are multiple and possibly cumulative threats to Mountain Sucker populations across its range. As Mountain Sucker in DU2 has a small area of occupancy and number of locations the greatest threats to its survival and persistence are related to the cumulative effects of landscape changes causing habitat loss and degradation. Such threats in the Milk Rivers, Battle Creek and Frenchman River systems include changes in flow resulting from dams, diversions and culverts; water removal for irrigation, municipal, recreational, industrial and domestic use; and livestock use of the flood plain. Drought is a natural occurrence in the region which is expected to increase in frequency and contribute to habitat loss and degradation in response to climate change. Introductions, especially non-native fish, contaminants and toxic substances, and fragmentation have also been identified as potential threats to this species.

To assess the status of threats with respect to Mountain Sucker in DU2, each threat was ranked in terms of its Threat Likelihood and Threat Impact. It is important to note that threats may not always act independently. One threat may directly affect another, or the interaction between two threats may introduce an interaction effect. As it is quite difficult to quantify these interactions, each threat is evaluated independently. The Threat Likelihood and Threat Impact ratings were subsequently combined in the Threat Level Matrix resulting in the final Threat Level (Table 2). The Spatial Extent of each threat was categorized as Widespread or Local and the Temporal Extent as either Chronic or Ephemeral (Table 3). (See Boguski and Watkinson 2013 for definitions of threats-related terms and a description of each threat and its potential impacts on Mountain Sucker.)

Table 2. Threat Level for all Mountain Sucker populations in DU2, resulting from an analysis of both the Threat Likelihood and Threat Impact. H=High, M=Medium, L=Low, UK=Unknown.

Threats	Milk River system	Battle Creek system	Frenchman River system
Drought	H	H	H
Anoxia	H	H	H
Changes in flow	H	M	M
Livestock use of flood plain	L	H	H
Fish species introductions	L / M / H	L / M / H	L / M / H
Point source contamination	L / M / H	L / M / H	L / M / H
Dam construction and operation	UK	L / M / H	M / H
Surface water extraction: irrigation	L	H	M / H
Surface water extraction: non-irrigation	L / M / H	L	L
Fragmentation	L	M	M
Changes in habitat quality and availability	L / M	L / M	L / M
Non-point source contamination	L	L / M	L / M
Groundwater extraction	L	L	L
Other species introductions	UK	L	L
Scientific sampling	L	L	L
Changes in geomorphology	L / M	UK	UK

Table 3. Overall effect of threats on Mountain Sucker in DU2.

Threat	Spatial Extent	Temporal Extent
Drought	Widespread	Chronic
Anoxia	Widespread	Chronic
Changes in flow	Widespread	Chronic
Livestock use of flood plain	Widespread	Chronic
Fish species introductions	Widespread	Chronic
Point source contamination	Widespread	Ephemeral
Dam construction and operation	Widespread	Chronic
Surface water extraction: irrigation	Widespread	Chronic
Surface water extraction: non-irrigation	Local	Chronic
Fragmentation	Widespread	Chronic
Changes in habitat quality and availability	Widespread	Chronic
Non-point source contamination	Widespread	Chronic
Groundwater extraction	Local	Chronic
Other species introductions	Local	Chronic
Scientific sampling	Local	Ephemeral
Changes in geomorphology	Local	Chronic

Mitigation and Alternatives

Habitat Loss/Degradation

Many of the threats affecting Mountain Sucker populations are related to habitat loss or degradation. Habitat-related threats to Mountain Sucker have been linked to the Pathways of Effects developed by DFO Fish Habitat Management (FHM) (Coker et al. 2010), 17 of which apply to the freshwater system. This guidance should be referred to when considering mitigation and alternative strategies for habitat-related threats. They were developed to mitigate or limit threats, however since they were not developed to specifically consider species at risk they may need to be modified for this purpose. Additionally, site-specific mitigations may be warranted and should be discussed with local conservation managers. Table 4 identifies the relevant Pathways of Effects for Mountain Sucker.

Contaminants and Toxic Substances

The DFO mitigation guide (Coker et al. 2010) also provides guidance on generic mitigation measures for Pathways of Effects related to contaminants and toxic substances from point and non-point sources. Table 4 identifies the relevant Pathways of Effects for Mountain Sucker. These measures combined with legislative control/licensing at the provincial and federal levels, public education and developing plans to contain and clean up spills and other releases of pollutants have the potential to mitigate this threat.

Table 4. Threats to Mountain Sucker populations in Canada and the Pathways of Effect associated with each threat as per Coker et al. 2010. 1 - Vegetation clearing; 2 – Grading; 3 – Excavation; 5 – Use of industrial equipment; 6 – Cleaning or maintenance of bridges or other structures; 7 – Riparian planting; 8 – Streamside livestock grazing; 9 – Marine seismic surveys; 10 – Placement of material or structures in water; 11 – Dredging; 12 – Water extraction; 13 – Organic debris management; 14 – Wastewater management; 15 – Addition or removal of aquatic vegetation; 16 – Change in timing, duration and frequency of flow; 17 – Fish passage issues; 18 – Structure removal; 19 – Placement of marine finfish aquaculture site.

Threats	Pathways of Effect
Habitat loss and degradation	1, 2, 3, 4, 5, 7, 8, 10, 11, 12, 13, 14, 15, 16, 18
Altered flow regimes	10, 16, 17
Barriers to movement	10, 16, 17
Turbidity and sediment loading	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16, 18
Non-point source contamination	1, 4, 7, 8, 11, 12, 13, 14, 15, 16
Point source contamination	1, 4, 5 , 6 ,7 ,11 ,12 ,13 ,14, 15, 16 ,18

Species Introductions

Non-native aquatic vegetation and fish species introduction and establishment could have negative effects on Mountain Sucker populations. Preventing introductions is a more effective strategy for mitigating this threat than removal once they have become established. The potential for mitigating the impacts of species introductions once they occur is likely low.

Mitigation

- Physically remove non-native species from areas known to be inhabited by Mountain Sucker.
- Monitor watersheds for exotic species that may negatively affect Mountain Sucker populations directly, or negatively affect Mountain Sucker preferred habitat.
- Coordinate with Montana/U.S. agencies to evaluate all introductions of exotic species in the Milk River system.
- Develop a plan to address potential risks, impacts, and proposed actions if monitoring detects the arrival or establishment of an exotic species.
- Introduce a public awareness campaign and encourage the use of existing exotic species reporting systems.
- Carefully consider barrier removal as this may increase the likelihood of species introductions.

Alternatives

- There are no alternatives to unauthorized introductions.
- For authorized introductions use only native species of the same genetic stock.

- For authorized introductions follow the National Code on Introductions and Transfers of Aquatic Organisms for all aquatic organism introductions (DFO 2003).

Scientific Sampling

Targeted and incidental harvest of Mountain Sucker may occur while undertaking scientific sampling. It was recognized as a low risk threat.

Mitigation

- Non-lethal sampling
- Sampling under a SARA permit

Sources of Uncertainty

There is limited knowledge of the biology, taxonomy, life history, and habitat requirements of Mountain Sucker in DU2, especially in Saskatchewan, preventing an accurate evaluation of potential threats and critical habitat. In particular, knowledge of the species' reproductive strategy and habitat requirements for eggs and fry, as well as overwintering, is needed. To date, there are no reliable estimates of population abundance or trend for Mountain Sucker in the Milk River, Battle Creek and Frenchman River systems, or the densities at which Mountain Sucker can persist. Recent studies have at minimum confirmed their persistence. Thus it is not yet possible to set a conservation population target size or to confirm whether changes in abundance have occurred. Data are also required on survival rates, particularly during early life; patterns of movements; and the frequency and extent of catastrophic events. The magnitude of natural variability in population size is also unknown, making it difficult to determine if changes in abundance over the short term are related to natural fluctuations or if there are extrinsic factors leading change in population status. Better delineation of the range of Mountain Sucker in the Battle Creek and Frenchman River systems and associated habitat would also improve the accuracy of this assessment.

Some potential threats cannot be fully evaluated because detailed information on the stressors and the mechanisms by which they might affect these fish are lacking. Accurate predictions of the effects of threats on fish survivorship, productivity and habitat quality and quantity, and how mitigation measures, alternatives and activities might reduce impacts, requires better knowledge of how they may affect the species given its life history and habitat requirements. Knowing how Mountain Sucker in DU2 respond to potentially limiting environmental factors, including temperature extremes, sediment load, turbidity, and flow is also necessary.

OTHER CONSIDERATIONS

The North Milk and Milk rivers, Battle Creek, and Frenchman River each cross international boundaries between Canada and the U.S. and as such are subject to their respective jurisdictional laws. Rapid dissemination of information concerning these river systems should be negotiated to alleviate impacts on fish health.

The 1909 Boundary Waters Treaty (the Treaty), which is administered by the International Joint Commission (IJC), provides principles for Canada and the United States to follow for the management of shared waters including the St. Mary and Milk rivers. In 1917, the United States constructed a canal to divert water from the St. Mary River in northwestern Montana through the Milk River system, across southern Alberta, to northeastern Montana for irrigation. An average of about 2.08×10^8 m^3 of water has flowed annually through the St. Mary Canal into the North Milk River over the past two decades. In 2003, Montana requested that the Treaty be re-opened to reconsider how the diverted water is apportioned. However, at the time of writing, this issue had not yet been resolved. At present the operating capacity of the St. Mary Canal is about 18.4 m^3/s, significantly less than its original design capacity of 24.1 m^3/s. Montana is considering whether to rehabilitate the aging canal infrastructure and return the canal to its original capacity, or whether to increase its capacity to 28.3 m^3/s.

Additionally, there may be implications of species introductions by U.S. jurisdictions to Mountain Sucker in Canadian waters as there is no joint agreement currently in place between Alberta and Montana regarding species introductions in the Milk and St. Mary rivers.

SOURCES OF INFORMATION

This Science Advisory Report is from the January 10-11, 2012 Recovery Potential Assessment of Mountain Sucker, Milk River populations. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

Boguski, D.A., and Watkinson, D.A. 2013. Information in support of a recovery potential assessment of Mountain Sucker (*Catostomus platyrhynchus*), Milk River populations (Designatable Unit 2). DFO Can. Sci. Advis. Sec. Res. Doc. 2013/028. v + 42 p.

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

COSEWIC. 2010. COSEWIC assessment and status report on the Mountain Sucker *Catostomus platyrhynchus* (Saskatchewan – Nelson River populations, Milk River populations and Pacific populations), in Canada. Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Update Status Report, CWS, Ottawa. xvii + 54 p.

DFO. 2003. National code on introductions and transfers of aquatic organisms. Ottawa, ON. Unpubl. rep. 53 p.

DFO. 2013. Proceedings of the regional recovery potential assessment of Mountain Sucker (*Catostomus platyrhynchus*), Milk River populations (Designatable Unit 2); 10-11 January 2012. DFO Can. Sci. Advis. Sec. Proceed. Ser. 2012/013.

Young, J.A.M. and Koops, M.A. 2013. Recovery potential modelling of Mountain Sucker (*Catostomus platyrhynchus*), Milk River populations. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/029. iii + 17 p.

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