Species at Risk Act
Recovery Strategy Series

Recovery Strategy for the Rocky Mountain Sculpin (*Cottus* sp.), Eastslope populations, in Canada

Rocky Mountain Sculpin, Eastslope populations

2012

Canada

About the *Species at Risk Act* Recovery Strategy Series

What is the *Species at Risk Act* (SARA)?

SARA is the Act developed by the federal government as a key contribution to the common national effort to protect and conserve species at risk in Canada. SARA came into force in 2003, and one of its purposes is *"to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity."*

What is recovery?

In the context of species at risk conservation, **recovery** is the process by which the decline of an endangered, threatened, or extirpated species due to human activity is arrested or reversed, and threats are removed or reduced to improve the likelihood of the species' persistence in the wild. A species will be considered **recovered** when its long-term persistence in the wild has been secured.

What is a recovery strategy?

A recovery strategy is a planning document that identifies what needs to be done to arrest or reverse the decline of a species resulting from human activity. It sets objectives and identifies the broad strategies and approaches to be undertaken. Detailed planning is done at the action plan stage.

Recovery strategy development is a commitment of all provinces and territories and of three federal agencies — Environment Canada, Parks Canada Agency, and Fisheries and Oceans Canada — under the Accord for the Protection of Species at Risk. Sections 37–46 of SARA (www.sararegistry.gc.ca/approach/act/default_e.cfm) outline both the required content and the process for developing recovery strategies published in this series.

A proposed recovery strategy must be posted on the Species at Risk Public Registry within one year after the wildlife species is added to the List of Wildlife Species at Risk for endangered species and within two years for threatened species. A period of three to four years, respectively, was permitted for those species that were automatically listed when SARA came into force.

What's next?

One or more action plans will be developed to identify specific actions to be undertaken, thereby advancing the implementation of the recovery strategy. Directions set in the recovery strategy, however, are sufficient to begin involving land managers and users, communities, and stakeholders in recovery implementation. Cost-effective measures to prevent the reduction or loss of the species should not be postponed for lack of full scientific certainty.

The series

This series presents the recovery strategies prepared or adopted by the federal government under SARA. New documents will be added regularly as species get listed and as strategies are completed and updated.

To learn more

To learn more about the *Species at Risk Act* and recovery initiatives, please consult the Species at Risk (SAR) Public Registry (www.sararegistry.gc.ca).

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For copies of the recovery strategy, or for additional information on species at risk, including COSEWIC Status Reports, residence descriptions, action plans, and other related documents, see the Species at Risk Public Registry (www.sararegistry.gc.ca).

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PREFACE

The Rocky Mountain Sculpin is a freshwater fish and is under the responsibility of the federal government. The *Species at Risk Act* (SARA, Section 37) requires the competent minister to prepare recovery strategies for listed Extirpated, Endangered, and Threatened species. The Rocky Mountain Sculpin, Eastslope populations, was listed as threatened under SARA in August 2006. The development of this recovery strategy was co-led by Fisheries and Oceans Canada – Central and Arctic Region and Alberta Sustainable Resource Development, in cooperation and consultation with many individuals, organizations and government agencies, including:

- Province of Alberta – Alberta Sustainable Resource Development (ASRD) and Alberta Environment (AENV).
- Milk River Rancher's Association;
- Milk River Watershed Council of Canada;
- Southern Alberta Environmental Group;
- Blood Tribe;
- Counties of Warner, Cardston, and Forty Mile;
- The Villages of Coutts and Warner; and the Town of Milk River.

Also refer to Appendix B for a full record of public consultations. The strategy meets SARA requirements in terms of content and process (Sections 39-41).

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Fisheries and Oceans Canada or any other party alone. This strategy provides advice to jurisdictions and organizations that may be involved or wish to become involved in the recovery of the species. In the spirit of the National Accord for the Protection of Species at Risk, the Minister of Fisheries and Oceans invites all responsible jurisdictions and Canadians to join Fisheries and Oceans Canada in supporting and implementing this strategy for the benefit of the Rocky Mountain Sculpin, Eastslope populations, and Canadian society as a whole.

The goals, objectives and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new information. The Minister of Fisheries and Oceans will report on progress within five years.

This strategy will be complemented by one or more action plans that will provide details on specific recovery measures to be taken to support conservation of the species. The Minister of Fisheries and Oceans will take steps to ensure that, to the extent possible, Canadians interested in or affected by these measures will be consulted.

PARTNER JURISDICTIONS

Under the *Species at Risk Act*, the responsible jurisdiction for the Rocky Mountain Sculpin is Fisheries and Oceans Canada. The Government of Alberta (Alberta Sustainable Resource Development and Alberta Environment) cooperated in the production of this recovery strategy.

AUTHORS / CONTRIBUTORS

The Rocky Mountain Sculpin, Eastslope populations, Recovery Strategy was developed by the Rocky Mountain Sculpin, Eastslope populations, Recovery Team, comprised of the following individuals:

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ACKNOWLEDGMENTS

The Rocky Mountain Sculpin, Eastslope populations, Recovery Team extends its sincere appreciation to the many organizations that supported the development of this recovery strategy and to their representatives who contributed their knowledge and hard work. This report was compiled by D.B. Stewart of Arctic Biological Consultants (Winnipeg, MB) and by S. Pollard (currently with BC Ministry of the Environment), who at different times acted as secretariat to the Recovery Team. Prior to their retirements, Fred Hnytka of Fisheries and Oceans Canada (DFO) Co-chaired the Recovery Team and Emma Hulit represented the counties of Cardston, Forty Mile, and Warner, the Villages of Coutts and Warner, and the Town of Milk River. They made many worthwhile contributions to this strategy and their efforts are most appreciated. Funding to support Recovery Team meetings was provided by DFO and Alberta Sustainable Resource Development (ASRD). Doug Watkinson of DFO in Winnipeg, MB and Terry Clayton of ASRD in Lethbridge kindly provided photographs of the Rocky Mountain Sculpin. The Recovery Team also benefited from the participation of Annabelle Crop Eared Wolf of the Blood Tribe at the first meeting. Shane Petry of DFO and Terry Clayton (ASRD) provided facilities for

Recovery Team meetings in Lethbridge. Blair Watke of ASRD prepared the drainage basin maps. The Recovery Team would especially like to thank Don McPhail of the University of British Columbia, Dave Neely of the California Academy of Sciences, and Doug Watkinson for providing unpublished results from their work. Don Bell and Jeff Burrows of BC Environment generously provided sculpin samples for future genetic and age comparisons.

STRATEGIC ENVIRONMENTAL ASSESSMENT

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below.

This recovery strategy will clearly benefit the environment by promoting the recovery of the Rocky Mountain Sculpin, Eastslope populations. The potential for the strategy to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this strategy will clearly benefit the environment and will not entail any significant adverse effects. The reader should refer to the following sections of the document in particular: Appendix A. Effects on the Environment and other Species and 6. Broad Strategies and Approaches to Recovery.

This recovery strategy describes a number of research, monitoring, management, regulatory, and public education approaches required for the conservation and recovery of the Rocky Mountain Sculpin, Eastslope populations. Aside from the acquisition of further knowledge, the recovery strategy focuses on eliminating or mitigating threats to the species including species introductions, habitat loss or degradation, and pollution. In addition, to generally improving environmental conditions, the reduction or elimination of these threats may benefit other co-occurring species (Appendix A). The recovery strategy also recommends rationalizing existing or proposed stocking programs in the St. Mary and Milk river watersheds with potential impacts of any changes considered within that process.

RESIDENCE

The concept of residence and how it applies to the Rocky Mountain Sculpin is discussed later in this plan. Further information as well as residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA public registry:

http://www.sararegistry.gc.ca/sar/recovery/residence_e.cfm

EXECUTIVE SUMMARY

In August 2006, the Rocky Mountain Sculpin (*Cottus* sp.), Eastslope populations, in the St. Mary and Milk river watersheds of Alberta were officially listed as "Threatened" under Schedule 1 of the *Species at Risk Act* (SARA). Under SARA a recovery strategy is required within two years of listing for threatened species. In December 2007, the species was similarly listed under Alberta's *Wildlife Act*, which also requires the completion of a recovery plan within two years.

The Rocky Mountain Sculpin, Eastslope populations, Recovery Team (the Recovery Team) was formed in 2006 to expand on earlier work by the Milk River Fish Species Recovery Team, which initiated studies of Milk River watershed populations of the Rocky Mountain Sculpin. Ultimately, the Recovery Team was tasked with developing a recovery strategy that would consider both the St. Mary and Milk river watershed populations, and satisfy both federal and provincial requirements. The team represented a broad range of conservation, regulatory and stakeholder interests, with membership from Fisheries and Oceans Canada; Alberta Sustainable Resource Development; Alberta Environment; the Milk River Watershed Council of Canada (MRWCC); the Southern Alberta Environmental Group; the Milk River Ranchers' Association; the Counties of Cardston, Forty Mile and Warner; Villages of Coutts and Warner; and Town of Milk River.

While there is no evidence that populations of the Rocky Mountain Sculpin in Alberta have declined since the species was first identified there, this small, bottom-dwelling fish is deemed to be at risk due to its extremely limited range. Within Canada it only occurs in the St. Mary and Milk river watersheds of Alberta, and in the Flathead River of British Columbia. Only the Alberta populations, which COSEWIC (2005) considered a single designatable unit, are considered here.

The goal and objectives of this recovery strategy are directed towards the conservation and maintenance of the existing Alberta populations. This recovery strategy describes the species and its needs, incorporates a threats assessment, and outlines a broad recovery approach for the Rocky Mountain Sculpin based on the available information. This recovery strategy goal is:

> "***To protect and maintain self-sustaining populations of the Rocky Mountain Sculpin within its current range in the St. Mary and Milk river watersheds in Canada***".

Key objectives of this recovery strategy are to:

1) Quantify and maintain current population levels of Rocky Mountain Sculpin in the St. Mary and Milk river watersheds (within the population's range of natural variation), as determined from standardized surveys;
2) Increase knowledge of the taxonomy, life history, basic biology, and habitat requirements of the Rocky Mountain Sculpin and;
3) Increase our understanding of how human activities affect Rocky Mountain Sculpin survival, so that potential threats to the species can be avoided, eliminated, or mitigated.

To help achieve this goal and meet the objectives, four general approaches are proposed: 1) Research, 2) Monitoring, 3) Management and Regulatory Actions, and 4) Education and Outreach. Within each of these, a number of individual strategies are outlined that capture the range of tools available to protect and manage the species and to reduce or eliminate threats to its survival.

RECOVERY FEASIBILITY SUMMARY

The following criteria and analyses were used to evaluate the biological and technical feasibility of recovery for the Rocky Mountain Sculpin, Eastslope populations.

Reproductive Potential: There is currently no impediment to the reproductive potential of Rocky Mountain Sculpin, Eastslope populations, in Canada. Viable populations exist in the St. Mary and Milk river watersheds. The Rocky Mountain Sculpin is one of the most abundant fishes in the North Milk River, where the population may be supplemented by the downstream emigration of fish from the St. Mary River population in Montana.

Habitat Availability: The occurrence of viable populations documented over a number of years from St. Mary and Milk river watersheds suggests that there is adequate habitat to support all life stages of the species at these locations. Habitat availability is currently not limiting for maintaining the species.

Threat Mitigation: Most specific threats to the Rocky Mountain Sculpin, Eastslope populations, (Section 4) are of low concern for fishery managers, either because they pose little threat or because little can be done to mitigate the threat. Flow alterations and dam construction and operations are of medium to high concern, but their impacts can be somewhat mitigated. At present, none of the threats identified are known to influence the species' survival; the future impacts of climate change remain speculative. While future species introductions may have the potential to disrupt Alberta's Rocky Mountain Sculpin populations, these impacts may be avoided by applying appropriate regulatory controls and management actions. The potential impact from most of the habitat related threats may also be reduced, or eliminated, if appropriate regulatory reviews and management actions are exercised, and best management practices are applied to existing or proposed projects.

There are viable populations within the St. Mary and Milk river watersheds in Canada and the United States. Conservation and threat mitigation efforts targeted at these populations should be able to secure and maintain their continued viability. The presence of these fish in two watersheds significantly reduces the potential for serious impacts at the population level. Threat mitigation may be complicated in some instances by the fact that Montana controls the flows diverted through the St. Mary Canal, subject to the provisions of the *1909 Boundary Waters Treaty* and administration by the International Joint Commission IJC. Changes in flow conditions could influence proposed conservation measures for the species and as such any recommended changes should be guided, at least in part, by this recovery strategy. Continued international cooperation on trans-boundary water management issues is crucial to the conservation of this species. Overall, the identified threats are not likely to impede the survival or recovery of the species. However, any improvement in our knowledge base for the species would improve our understanding of the potential impact of threats to it, and of the efficacy of any proposed mitigation measures.

Technical Capabilities: The techniques contemplated for the conservation of the Rocky Mountain Sculpin, Eastslope populations are well founded in current science and management practices. Given the relative abundance of the species within its limited distribution, the focus of recovery efforts should be on the mitigation of habitat impacts and the exclusion of unwanted species. The technical knowledge on how to deal with potential habitat impacts is well documented and generally applied. The avoidance of species introductions is best afforded through public education and management programs, both of which are entirely within the competence of the responsible jurisdictions. No impediments to the recovery of the Rocky Mountain Sculpin, Eastslope populations, have been identified by any of the responsible agencies.

Biological and Technical Feasibility: Given the above analysis, recovery, as defined by the recovery strategy goal, is deemed to be biologically and technically feasible for the Rocky Mountain Sculpin, Eastslope populations.

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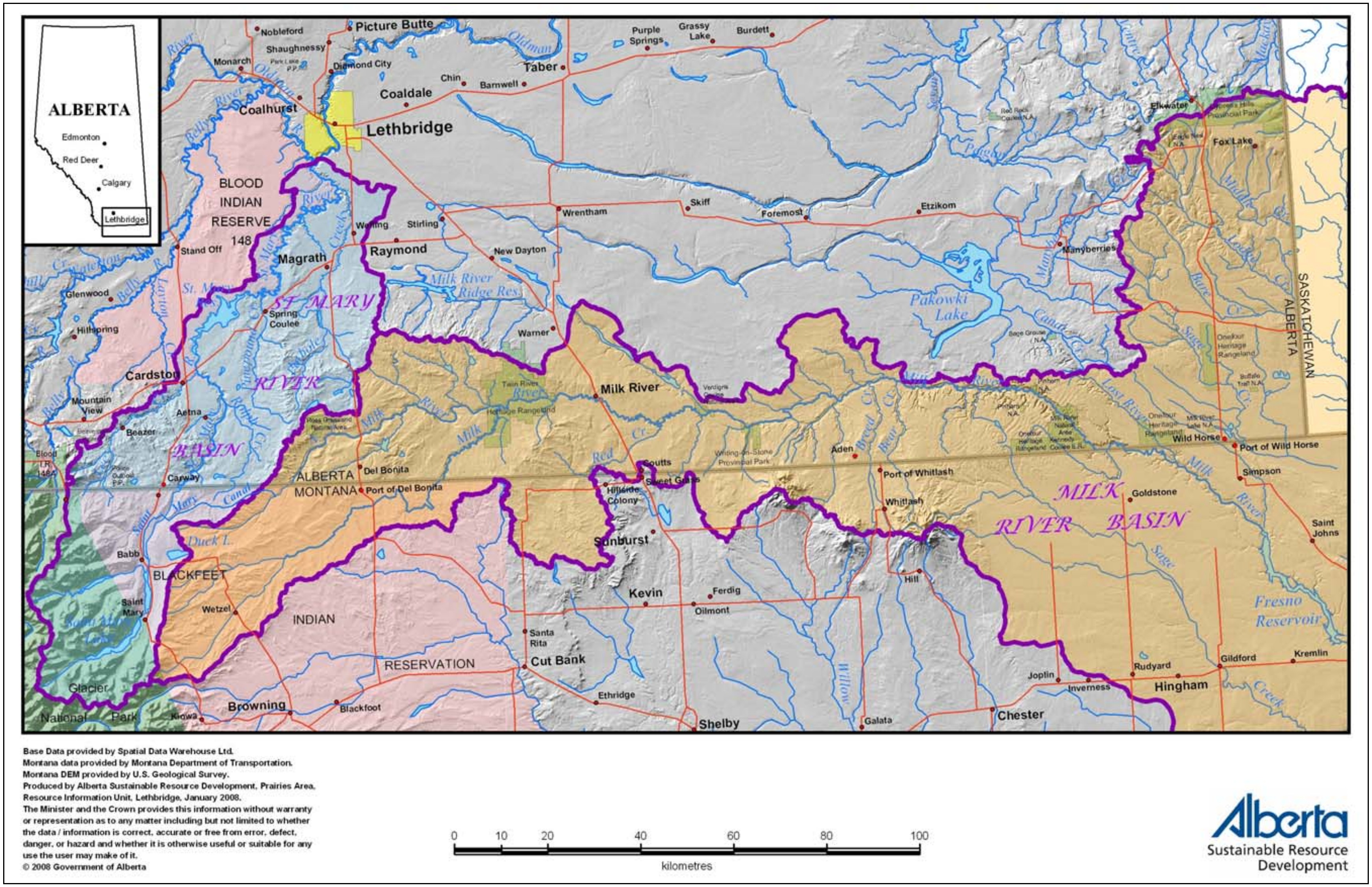

Figure 1. Location of the Milk and St. Mary river watersheds in Alberta.

1. COSEWIC SPECIES ASSESSEMENT INFORMATION

COSEWIC ASSESSMENT SUMMARY

Date of Assessment: May 2005 (New)
Common Name: Eastslope Sculpin (St. Mary and Milk river populations)
Scientific Name: *Cottus* sp.
COSEWIC Status: Threatened
Status Criteria: D2
Reason for Designation: This species has a very restricted area of occurrence in the St. Mary and Milk rivers in Canada where it has been impacted by habitat loss and degradation from water diversion, conditions that have been exacerbated in recent years by drought.
Canadian Occurrence: AB
Status History: Designated Threatened in May 2005. Assessment based on a new status report.

ALBERTA SUMMARY

Common Name: St Mary Sculpin
Scientific Name: *Cottus Bairdi*.
Rank: Threatened
Designated: 2007
Reason for Designation: This species has a very restricted area of occupancy. The only locations in Alberta where this species is found are in the Milk River basin and upper St. Mary River basin of southern Alberta. Dispersal and exchange with adjacent populations is limited.
Status History: Designated "May be at Risk" in 2000. Upgraded to Threatened in 2004 based on a new status report (Alberta Sustainable Resource Development 2004). Listed in the *Wildlife Act* as Threatened in 2007.

Note: The above species summaries are based on information available to COSEWIC and the Alberta Endangered Species Conservation Committee (ESCC) at the time of the species assessment updates and are included for reference purposes. The species was initially reviewed under the common name 'Eastslope Sculpin", which has been renamed "Rocky Mountain Sculpin".

2. SPECIES STATUS INFORMATION

The Rocky Mountain Sculpin (*Cottus sp.*) is a small, freshwater fish belonging to the predominantly marine sculpin family (Cottidae). It has also been referred to as the St. Mary Shorthead Sculpin (ASRD 2004), and the Eastslope Sculpin (COSEWIC 2005; Taylor and Gow 2008). These fish are locally abundant in cool, clear reaches of the St. Mary and Milk river watersheds of Alberta. Their taxonomic relationship to other sculpins in North America is uncertain. However, the natural rarity of this taxon in Canada, in terms of both distribution and abundance, makes the sculpin vulnerable to extirpation. Elsewhere, freshwater sculpin populations have been most impacted by alterations to flow regimes particularly where riverine conditions have been replaced by lake conditions. Loss of the Rocky Mountain Sculpin from either river would be a significant loss to the species complex.

In August 2006, Rocky Mountain Sculpin, Eastslope populations in the St. Mary and Milk river watersheds of Alberta were listed as “Threatened” under Schedule 1 of the *Species at Risk Act* (SARA) (P.C. 2006-768 August 15, 2006). Listing afforded immediate protection for the species and required development of a recovery strategy within two years. In December 2007, the species was also listed as “Threatened” under Alberta’s *Wildlife Act*. Under the federal and provincial species at risk processes, Rocky Mountain Sculpin, Eastslope populations in Alberta were listed as threatened primarily because of their limited distribution, which makes them vulnerable to habitat loss or degradation.

3. DESCRIPTION OF THE SPECIES AND ITS NEEDS

Recovery efforts should be based on a sound understanding of the species, including its biology, ecology, and the environmental conditions under which it exists. The following sections describe the environmental setting of the St. Mary and Milk river watersheds, what is known about the Rocky Mountain Sculpin, and what can be inferred from other closely related species.

3.1 Environmental Setting

In order to fully understand the implications of the information in the following pages, it is important to understand the context around which the St. Mary and Milk river watersheds are managed through international agreement. The agreement discussed below does not likely negatively affect recovery of the Rocky Mountain Sculpin, Eastslope populations, since the population and distribution objective is one of maintenance and protection of self-sustaining populations. However, it does potentially inhibit the types and scale of activities that could occur within the watersheds of the St. Mary and Milk rivers.

The St Mary and Milk river watersheds are shared between Canada and the United States (U.S.) and as such, they are subject to provisions in the Boundary Waters Treaty of 1909 (the Treaty) between Canada and the United States. The Treaty is administered by a binational organization called the International Joint Commission (IJC) (ISMMRAMTF 2006; see also Dolan 2007; Halliday and Faveri 2007a,b; Rood 2007). The IJC has appointed members by both Canadian and American governments and the Treaty itself provides the principles and mechanisms to resolve disputes concerning shared waters. Both the Milk and St. Mary river watersheds were historically, and are currently intensively managed for agricultural purposes (largely irrigation of crops).

In 1921, an order was made by the IJC, defining the apportionment of the waters in the St. Mary and Milk river watersheds. The context of the apportionment is best considered temporally regarding the irrigation season (April 1 to October 31 annually) and the non-irrigation season (November 1 to March 31). It was agreed that, for the purposes of irrigation and power, both Canada and the U.S. would treat the management of water in the Milk and St. Mary rivers as one stream for the benefit of both countries. Generally, it was resolved that during the irrigation season Canada is entitled to three fourths of the water in the St. Mary River and the U.S. is entitled to one fourth. Whereas in the Milk River, Canada is entitled to one fourth of the water and the U.S. is entitled to three fourths of the water. During the non-irrigation season both countries are to share the flows of both rivers equally. In addition it was agreed that the channel of the Milk River may be used at the convenience of the U.S. for conveyance of water from western Montana to reservoirs in eastern Montana. There are numerous rules and caveats to this water use (e.g. timing and baseline volume of flow, shared tributaries, record keeping etc.) and reference to the Treaty and 1921 Order should be made for more specific information (International Joint Commission Order 1921).

To supply additional water to irrigators in Milk River watershed, a large canal and siphon was constructed to divert water from the St. Mary River in northwestern Montana via the “St. Mary Canal” into the North Milk River (ISMMRAMTF 2006) and subsequently the mainstem Milk River. This water flows eastward in the mainstem Milk River through southern Alberta before entering northeastern Montana, where it is used for irrigation. Canada has limited access to waters in the Milk River that are diverted from the St. Mary River, as per the Treaty and 1921 Order, Canada must let much of the diverted water pass into the U.S. for their use.

Over the past two decades, the St. Mary Canal has transported an average volume of about 2.08×10^8 m^3 of water annually into the North Milk River (U.S. Bureau of Reclamation 2004). At present, the operating capacity of the St. Mary Canal is about 18.4 m^3/s (<650 cfs), which is significantly less than its original design capacity of about 24 m^3/s. These lower flows and overall volume of water are issues for Montana and they hope to replace or rehabilitate the aging canal infrastructure and thereby return the canal to its original capacity of 24 m^3/s (K. Miller, pers. comm. April 2010; see also Alberta Environment 2004; U.S. Bureau of Reclamation 2004). This increased capacity would likely only be used during the period of peak runoff each year. However, its use will lead to a surge of flow in the North Milk and Milk rivers in June. Studies are planned to examine the effects of higher flows on erosion in Canadian reaches of both rivers. Sites of particular interest for restoration and/or protection are located at Hilmer Bridge, north of Del Bonita on the North Milk River, and at Goldsprings Park and Weir Bridge on the Milk River.

In summary, the waters in the Milk and St. Mary rivers are intensively managed for irrigation use both in Canada and the U.S. The approach to the management of water in the Milk River watershed and St. Mary River is essentially that water (it varies but about 18.4 m^3/s) is diverted from the St. Mary River into the North Milk River commencing by April 1 (or earlier) in any given year. The natural winter flows in the Milk River are generally very low at this time (could be <1 m^3/s) so the increase in flows is significant, rising up to 15 m^3/s or more in a relatively short period of time. These higher flows continue in the Milk River until September or October when the flows are reduced to natural or close to natural flows as the end of the irrigation season approaches. Both rivers have low winter flows; however, the Milk River watershed flows in the winter are natural flows whereas the flows in the St. Mary River are managed via storage facilities in Montana (Sherburne Reservoir and St. Mary Lake).

3.1.1 St. Mary River

Both the St. Mary and Milk river watersheds originate in Montana along the eastern slopes of the Rocky Mountains and flow north and northeast, respectively, into Alberta (Figure 1) (ISMMRAMTF 2006). The St. Mary River flows into the Oldman River near Lethbridge, Alberta, and eventually to Hudson's Bay via the South Saskatchewan River, Saskatchewan River, Lake Winnipeg, and Nelson River. The North Milk River flows about 90 km through southern Alberta before its confluence with the Milk River, which continues east parallel to the international boundary for another 235 km before crossing back into the U.S. The Milk River is a tributary of the Missouri River and eventually drains into the Gulf of Mexico via the Mississippi River. Both the St. Mary and Milk river watersheds include lowlands that are viable for agriculture, particularly when irrigated.

The St. Mary River has a total drainage area of about 3,600 km^2, of which about 2,400 km^2 is in Alberta (ISMMRAMTF 2006). The river rises at Gunsight Lake in Montana's Glacier National Park and flows northeast about 65 km through St. Mary and Lower St. Mary lakes before crossing the international border. Close to the outlet (approximately 1 km) of St. Mary Lake in Montana there is Swiftcurrent Creek. This creek has been dammed to create Sherburne Reservoir. The creek has been channelized such that it no longer discharges into the St. Mary River but rather flows into lower St. Mary Lake which then discharges into the St. Mary River. The St. Mary River then meanders north about 55 km through mainly shrub-grassland to the St. Mary Reservoir in Alberta. In the U.S., the drainage basin receives about 1,200 mm of precipitation on average annually, mostly as snow (ISMMRAMTF 2006). Within Alberta the average annual precipitation in this drainage ranges from 470 mm in the Foothills Fescue Natural Subregion in the south to 394 mm in the Mixedgrass Natural Subregion in the north (Natural Regions Committee 2006).

Flow in the St. Mary River is maintained during the summer by melt water from the high elevations of Glacier National Park (ISMMRAMTF 2006). At the international border, the average monthly flow is <6 m^3/s from December through March (WSC 2008c). Flow usually increases abruptly in the spring to peak in June at 73.0 m^3/s on average. It then decreases abruptly over the summer and gradually over the fall. Winter flow is sustained by ground-water base flow. Land use practices that may impair fish habitat do not appear significant in the St. Mary River drainage in either Montana (Mogen and Kaeding 2005a) or Alberta.

Lee Creek is a small tributary stream of the St. Mary River (Mogen and Kaeding 2005b). The creek originates in Montana as snow melt and flows north 13 km before crossing the international border. It then meanders 64 km through the mostly shrub-grassland habitat of southern Alberta before entering the St. Mary River, near the town of Cardston, upstream from the St. Mary Reservoir. The average monthly flow in Lee Creek at Cardston rarely exceeds 1 m^3/s from August through February (WSC 2008a). Flow increases over the spring to peak in June at a mean of 5.8 m^3/s and then declines abruptly back to the seasonal low flow values by August. Timber is harvested from parts of the Lee Creek drainage on the Blackfeet Reservation in Montana, and along its Tough Creek tributary in Alberta (Mogen and Kaeding 2005b; T. Clayton, pers. comm. 2008).

3.1.2 Milk River

The Milk River is a northern tributary of the Missouri-Mississippi Basin, with a 6,500 km^2 watershed (http://www.environment.alberta.ca/apps/basins/default.aspx?Basin=11). It flows north from Montana into Alberta, eastward through the southern portion of the province, and then south back into Montana. The average annual flow entering Alberta is 1.06×10^8 m^3 and leaving Alberta is 1.67×10^8 m^3. The Town of Milk River is one of the few communities in the Milk River watershed.

As the Milk River in Alberta flows east from the Montana Border, it crosses the Foothills Fescue, Mixedgrass, and Dry Mixedgrass subregions of the Grassland Natural Region (Natural Regions Committee 2006; Milk River Watershed Council Canada 2008). It flows within the confines of a defined valley with limited road access. The surrounding land is semi-arid, short grass prairie that is used primarily for cattle grazing. The river is shallow and turbid, with dynamic hydraulic conditions and lacks higher aquatic plants due to the highly mobile stream bed (D. Watkinson, pers. comm. 2006). Rainfall in the Milk River basin averages only 333 mm annually, 72% of which falls during the growing season (Natural Regions Committee 2006). Periods of high runoff occur briefly in late March and April due to snowmelt and in June and July due to intensive, localized rain storms (McLean and Beckstead 1980).

The Milk River has been severely impacted by changes in its seasonal flow regimes. Water diverted from the St. Mary River in Montana augments flows in the Alberta portion of the Milk River from late March or early April through late September or mid-October (ISMMRAMTF 2006). Under natural pre-diversion conditions summer flows in Canada ranged from 1 to 2 m^3/s in the North Milk River to between 2 and 10 m^3/s at the Milk River's eastern crossing of the international border (McLean and Beckstead 1980). Since the diversion, flows in the Milk River at the Town of Milk River have ranged from 10 to 20 m^3/s from May to September, and have averaged 15 m^3/s between June and August. The effects of flow augmentation are much greater in the North Milk River, which has a relatively small drainage area (238 km^2 at the North Milk River gauge 11AA001), than they are downstream at the eastern crossing of the international border, where the river receives runoff from a much larger area (6,800 km^2 at gauge 11AA031) (McLean and Beckstead 1980). As the Milk River flows through Alberta the concentration of suspended sediment in the water increases, and with it the turbidity (Spitzer 1988). These levels tend to decline over the augmentation period despite flows that remain fairly constant.

When the diversion of water from the St. Mary River is terminated in late September to mid-October, the river reverts to natural flows for the remainder of the winter season (ISMMRAMTF 2006), albeit within a somewhat modified river channel (McLean and Beckstead 1980; Milk River Watershed Council Canada 2008). Ramping down of the diverted flow occurs over about a week, and flows in the river decline over the next several weeks. The decline is most rapid in upstream reaches of the river. Under severe drought conditions, such as those of 2001-2002, there may be little or no surface flow and the lower Milk River can be reduced to a series of isolated pools until spring, although subsurface flows may continue (K. Miller, pers. comm. 2006). At the Town of Milk River, the average flow rate over the period 1912 to 2006 was <2 m^3/s in November and February, and <1 m^3/s in December and January (WSC 2008b).

Some areas of the Milk River experience protracted periods with little or no surface flow during the non-irrigation period (K. Miller, pers. comm.). Upstream from its confluence with the North Milk River to the Montana Border, surface flow in the Milk River occasionally dries up from July or August until March. The Milk River mainstem east of Aden Bridge dries up less frequently, perhaps on the order of every 15 or 20 years; most recently in 1988 and 2001.

3.2 Species Description

The Rocky Mountain Sculpin is a bottom-dwelling fish characterized by a large head, heavy body that tapers towards the tail, and no air bladder (Figure 2). Fish with a total length **(**TL from tip of snout to tip of tail) of up to 114 mm have been caught in the North Milk River (R.L.&L. Environmental Services Ltd. 2002).

Figure 2. Rocky Mountain Sculpin (photo credit D. Watkinson, DFO, Winnipeg).

The taxonomic identity of the Rocky Mountain Sculpin is becoming clearer. Sculpins in the St. Mary and Milk river watersheds belong to an undescribed species of the genus *Cottus* that is widespread in the upper Missouri River system (Taylor and Gow 2008; D. Neely, pers. comm. 2008). Recent morphological and molecular genetic analyses by Taylor and Gow (2008) and Neely (pers. comm.) have demonstrated that a separate population of the same species occupies portions of the Flathead River system in British Columbia, and that these fish are not *Cottus bairdi punctulatus* as suggested by Troffe (1999) and in the Alberta status report (ASRD 2004). These analyses also support the distinction of the Rocky Mountain Sculpin from Shorthead Sculpin (*C. confusus*), Columbia Mottled Sculpin (*C. bairdi hubbsi*), and other sculpin species in western North America (COSEWIC 2005; Taylor and Gow 2008; see also Peden *et al*. 1989). Efforts are underway to resolve the taxonomy of the western sculpin complex by analyzing samples from Alberta, British Columbia, and Montana (D. Neely, pers. comm.).

3.3 Population and Distribution Context

3.3.1 Distribution

The Rocky Mountain Sculpin is only found in North America. It occurs in the upper Missouri system from Alberta (i.e., the Milk River) south to southern Montana (in the mainstem to at least Great Falls), and probably the Bighorn system of Wyoming (D. Neely, pers. comm.). It also occurs in Alberta's St. Mary River, which is a headwater tributary of the Nelson River watershed, and in the lower 24 km of British Columbia's Flathead River and associated tributaries, which are part of the Columbia River watershed (Peden and Hughes 1984; D. Neely, pers. comm.).

Within Alberta, the Rocky Mountain Sculpin distribution appears to be limited to the St. Mary River system above the St. Mary Reservoir, and the upper Milk and North Milk rivers. It is the only sculpin that occurs in these waters (ASRD 2004). The species' current distribution has likely been determined by postglacial dispersal and preference for cooler upstream waters (ASRD 2004; Fullerton *et al*. 2004). Its distribution may have expanded when the St. Mary Canal was constructed in 1917, as the canal enabled fish to move downstream from the St. Mary River into the Alberta portion of the North Milk and Milk rivers (Willock 1969).

The sculpin's Alberta distribution in the St. Mary River watershed appears to be limited to the lower 35 km of Lee Creek, the lower 500 m of Aetna Creek, and the St. Mary River upstream of the St. Mary Reservoir (Paetz 1993; R.L.&L. Environmental Services Ltd. 2002; COSEWIC 2005; D. Watkinson, unpubl. data). Whether the species inhabited lower reaches of the St. Mary River prior to construction of the reservoir is unknown. However, the abrupt decline in the species' abundance beginning at the reservoir, suggests that it may have been extirpated from the reservoir, and possibly from areas downstream. As such the St. Mary Reservoir likely represents a major obstacle to downstream dispersal of sculpins in the St. Mary River. The reservoir has very steep banks and almost no littoral zone (English 1977).

Rocky Mountain Sculpin occur in the North Milk River from the Alberta/Montana border downstream to its confluence with the Milk River, and within the Milk River downstream to within 85 km of the border (Willock 1969; Clayton and Ash 1980; R.L.&L. Environmental Services Ltd. 1987, 2002; Paetz 1993; ASRD 2004; COSEWIC 2005; T. Clayton and D. Watkinson, unpubl. data). Tributary use has not been observed as most tributaries of the North Milk and Milk rivers are ephemeral (T. Clayton, pers. comm. 2007). Since the species was first reported in the Milk River in the 1960s (Willock 1969), records of its occurrence have been extended downstream at least 130 km from the North Milk River well into the mainstem Milk River and past the Town of Milk river (Clayton and Ash 1980). Whether this a real change in distribution or a sampling artifact is unknown.

3.3.2 Population Size and Trends

An overall population estimate is not available for the Rocky Mountain Sculpin in Alberta, but the species is abundant in the St. Mary River upstream from the St. Mary Reservoir; in the lower 13 km of Lee Creek; in the North Milk River; and in the Milk River from Deer Creek upstream to the North Milk River confluence (Paetz 1993; R.L.&L. Environmental Services Ltd. 1987, 2002; P.&E. Environmental Consultants Ltd. 2002; D. Watkinson, unpubl. data).

The sculpin's abundance is fairly even throughout its Alberta range in the St. Mary River and in the lower reaches of Lee Creek (R.L.&L. Environmental Services Ltd. 2002; D. Watkinson, unpubl. data). From 2006 to 2009, electrofishing of 2,787 habitat quadrates in the St. Mary River found an average abundance of 0.62 fish/m^2 in habitats shallower than 1 m (D. Watkinson, unpubl. data). Prorating these values over the area of suitable habitat from the U.S. border to the St. Mary Reservoir suggests that this reach of river supports a population of 750,000 Rocky Mountain Sculpins.

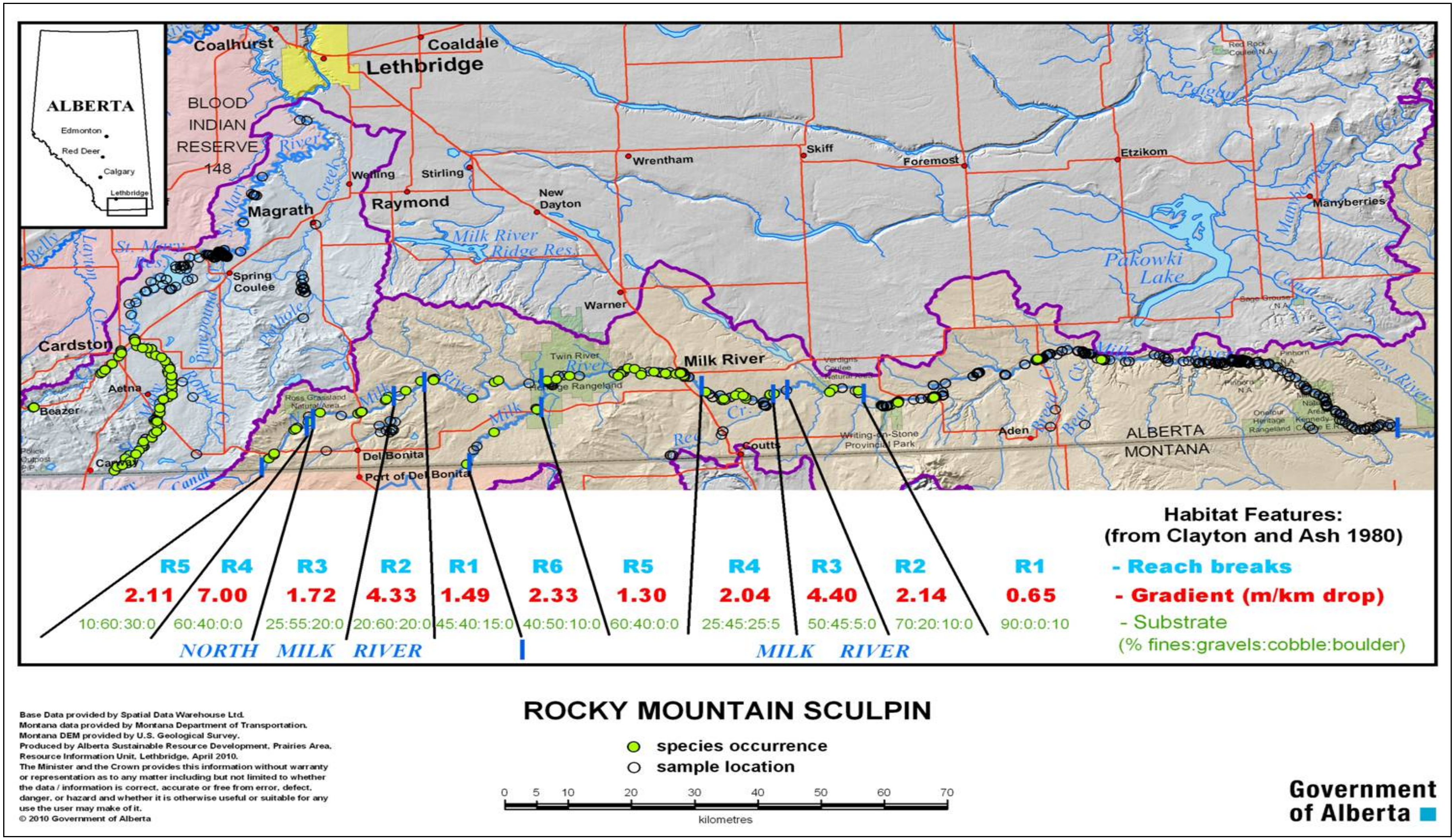

Figure 3. Alberta distribution of the Rocky Mountain Sculpin showing key habitat features. Distribution records are from the ASRD Fisheries and Wildlife Management Information System as of May 2010.

Within the Milk River the abundance of Rocky Mountain Sculpin appears to decline progressively downstream from the North Milk River until it is absent near the Pinhorn Ranch. Despite severe drought conditions in 2001, this sculpin remained one of the most abundant fish species in some sections of the Milk River in 2002 (P.&E. Environmental Consultants Ltd. 2002). The species is typically more numerous in samples taken during October and November than July and August, but this is likely an artifact of the higher flow and turbidity encountered during the summer (T. Clayton, pers. comm. 2008). Rocky Mountain Sculpin are present in the Milk River upstream from the confluence with the North Milk River (D. Watkinson, unpubl. data), but the species' abundance there is likely limited by low flow conditions that occur periodically and can extend from late summer through to spring. The potential for fish from the St. Mary River to move downstream via the canal into the Milk River watershed is a complicating factor in determining population sizes and trends in abundance for both populations. Elsewhere, the Flathead River in British Columbia may support a substantial population of Rocky Mountain Sculpin (Peden and Hughes 1984). No information is available on the sizes or trends of populations in the United States.

3.3.3 Nationally Significant Populations

The Rocky Mountain Sculpin has no direct commercial economic importance but it does have intrinsic value as a contributor to Canada's biodiversity. Because of its preference for cool waters and clean substrates this fish may serve as a bio-monitor of environmental conditions in the rivers it inhabits (ASRD 2004).

3.4 Needs of the Rocky Mountain Sculpin

3.4.1 Biology and Life History

Information on the biology and life history of the Rocky Mountain Sculpin in Alberta is available from studies of the St. Mary River by Roberts (1988) and the North Milk and Milk rivers by R.L.&L. Environmental Services Ltd. (2002), and from ongoing work on both watersheds by T. Clayton, Alberta Sustainable Resource Development (ASRD) and D. Watkinson, Fisheries and Oceans Canada (DFO). Where gaps remain, information from other sculpin populations that inhabit similar habitats has been cited. This includes, in particular, work on Rocky Mountain Sculpins that inhabit the West Gallatin River tributary of the Missouri River in southwestern Montana (Bailey 1952) and the Flathead River of British Columbia (Hughes and Peden 1984; Peden *et al.* 1989). It may also include information from closely related Shorthead Sculpin (*Cottus confusus*) and Mottled sculpin (*Cottus bairdii*).

Growth

Rocky Mountain Sculpins in the North Milk River can grow to at least 114 mm TL (R.L.&L. Environmental Services Ltd. 2002). Newly hatched young in Montana ranged from 5.8 to 8.1 mm TL, and began feeding at about 9 mm (Bailey 1952). Sculpins in the Flathead River of BC averaged 19.2 mm total length (TL) by mid-September of their first summer (young-of-the-year, age 0+) and ranged from 36 to 43 mm TL by the end of their second summer (age 1+)(McPhail 2007). Most males were sexually mature by their third summer (age 2+), and most females by their fourth summer (age 3+). Young-of-the-year in the St. Mary and Milk river watersheds appear to grow faster, attaining lengths of 30 to 40 mm TL by the end of their first summer (age 0+) (Hughes and Peden 1984; Roberts 1988; D. Watkinson, unpubl. data). This difference does not appear to be the result of mistaking age 1+ fish for young-of-the-year as suggested by McPhail (2007). The smallest mature female examined from the St. Mary or Milk river watersheds was 52.3 mm TL (Roberts 1988).

Reproduction

Gravid female Rocky Mountain Sculpin have been observed in the St. Mary River of Alberta in mid-May at a water temperature of 7.5 °C (Roberts 1988). At the same time, males in the Lee Creek tributary were guarding eggs in 15°C water. Spawning by sculpins in southwest Montana has been documented in June at water temperatures ranging from 7.8 to 12.8°C (Bailey 1952).

Fecundity is directly related to size, and ranges from 100 to about 750 eggs per female in the St. Mary and Milk river watershed populations (Roberts 1988; D. Watkinson, unpubl. data). Rocky Mountain Sculpin in the St. Mary River seldom exceed 87 mm TL, so their egg counts are typically less than 400. Little else is known about the reproduction of these fish in Alberta.

Based on studies in southwestern Montana, some male sculpins are likely polygamous**,** having multiple mates (Bailey 1952). They construct nests under rocks or sometimes on aquatic vegetation, wood, or debris. Breeding males are dark with a yellow-orange margin on the first dorsal fin (McPhail 2007). More than one female may be attracted to lay a cluster of adhesive eggs on the underside of the nest rock, and a single nest was found to have 1,884 eggs (Bailey 1952). In the nest, the pale yellow to orange-yellow eggs are about 2.5 mm in diameter. After spawning, the male fans the developing eggs for several weeks to keep them silt-free. The incubation period is temperature dependent. Based on observations of spawning and hatching dates the incubation in the West Gallatin River was 21 to 28 days, at afternoon water temperatures that ranged from 7.8 to 17.2°C. Eggs taken artificially and held at temperatures between 8.9 and 10.0°C, began hatching 30 days after fertilization and continued for another 10 days. Absorption of the egg sac takes about two weeks (Bailey 1952). Longevity and spawning periodicity are unknown, but a male sculpin collected in Howell Creek, BC was in its seventh growing season (age 6+) (McPhail 2007), and Shorthead Sculpins in Idaho (Gasser *et al*. 1981) spawn annually following maturity. Genetic studies of Mottled Sculpin suggest that only a small proportion of the potential breeders in a sculpin population may breed successfully in a given year (Fiumera *et al.* 2002).

Hybridization can occur between Rocky Mountain Sculpin and Slimy Sculpin (*Cottus cognatus*). It has been documented in an area of the Flathead River below a hydroelectric dam where the release of hypolimnetic water has altered thermal regimes and habitat structure (Zimmerman and Wooten 1981; see also Taylor and Gow 2008).

Ecological Role

Sculpins forage at night and eat mostly bottom-dwelling invertebrates. Young-of-the-year sculpins in southwestern Montana feed mainly on midge larvae (Bailey 1952). As the fry grow, the larvae of other bottom dwelling aquatic insects are added to their diet. During the open water period adult Rocky Mountain Sculpins in the St. Mary and Milk river watersheds eat primarily midge larvae (Order Diptera, Family Chironomidae) and caddisfly nymphs (O. Trichoptera) (D. Watkinson, unpubl. data). They also eat mayfly nymphs (O. Ephemeroptera), nematodes (Phylum Nematoda), invertebrate eggs, Trout-perch (*Percopsis omiscomaycus*), molluscs (Ph. Mollusca), amphipods (O. Amphipoda), water mites (Sub-Order Hydracarina), beetles (O. Coleoptera), and crane fly larvae (F. Tipulidae). Other taxa that have been reported from the adult diet include the molluscs *Physa* sp. and *Pisidium* sp., and two fish species, Longnose Dace (*Rhinichthys cataractae*) and Rainbow Trout (*Oncorhynchus mykiss*) (Bailey 1952; Paetz 1993; Hughes and Peden 1984; ASRD 2004). Adults will eat fry and eggs of their own species (Bailey 1952).

Rocky Mountain Sculpins in Alberta may be quite sedentary. The estimated home range of sculpins in a small Montana stream was less than 46 m of longitudinal stream channel, with maximum observed dispersal upstream of 180 m and downstream of 153 m (McCleave 1964; see also Bailey 1952). During 1 hour observation periods both small (<50 mm TL) and large (≥ 55 mm TL) Mottled Sculpins in a small Appalachian stream moved within an area less than 0.50 m^2 (Freeman and Stouder 1989). Movement data from both studies should be interpreted with caution as the studies were limited in both geographical scope and methodology.

Eighteen fish species, including the Rocky Mountain Sculpin, have been documented in Canadian reaches of the St. Mary River watershed upstream of the St. Mary Dam (T. Clayton, pers. comm. 2007). The dam is a barrier to upstream fish movement. All of these fish species have distributions that overlap that of the Rocky Mountain Sculpin. Walleye (*Sander vitreus*) that were introduced to the St. Mary Reservoir have become established (Clements 1973). There may be introduced species in the U.S. reaches of the St. Mary River, upstream, that have not been found in Canadian reaches of the river.

Twenty-three fish species, including the Rocky Mountain Sculpin, have been documented in the Milk River mainstem and tributaries in Canada. Nineteen of these species occur within this sculpin's range in the Milk River.

The recent identification of Trout-perch, Yellow Perch (*Perca flavescens*), Walleye, and Lake Whitefish (*Coregonus clupeaformis*) in the Milk River watershed by the MULTISAR (Multi-Species at Risk) Program, a basin-wide terrestrial and aquatic species identification and stewardship program, suggests that fish may be immigrating from Montana or that introductions may be occurring (T. Clayton, pers. comm. 2007). Bull Trout (*Salvelinus confluentus*) and Pearl Dace (*Margariscus margarita*) have been entrained in the St. Mary Canal (Mogen and Kaeding 2002), but have not been reported from the Milk River in Canada. [Note: the Lake Chub (*Couesius plumbeus*), which is common in both rivers but was not identified among the entrained species, is sometimes misidentified as Pearl Dace.] Slimy Sculpin reported by Wells (1977) from the Milk River were probably misidentified Rocky Mountain Sculpin (Roberts 1988).

Competition of the Rocky Mountain Sculpin with other fish species has not been documented in Alberta. Rocky Mountain Sculpin in the Flathead River of British Columbia occupy habitats downstream from those occupied by Slimy Sculpin, with little overlap in their distributions

(Hughes and Peden 1984). Likewise, there is no distributional overlap of Rocky Mountain Sculpin with the Spoonhead Sculpin (*Cottus ricei*), which occurs in the Belly, Waterton, Oldman and Castle rivers, in Willow Creek, and in the St. Mary River below the St. Mary Reservoir (T. Clayton, pers. comm. 2007).

Predation of Rocky Mountain Sculpin in the Milk and St. Mary river watersheds by other fish species has not been documented. Sauger, Walleye, Northern Pike (*Esox lucius*), and Burbot (*Lota lo*ta) likely predate various life stages of Rocky Mountain Sculpin, while eggs and larvae may be consumed opportunistically by other fish species. Garter snakes (*Thamnophis sp.*) have been observed eating Rocky Mountain Sculpin (D. Watkinson, pers. comm.).

Table 1. Fish species that occur in Canada in the St. Mary River upstream of the St. Mary Dam and/or in the North Milk and Milk rivers, with ranges that overlap (Y) or do not overlap (N) with the Rocky Mountain Sculpin (Nelson and Paetz 1992; T. Clayton and D. Watkinson, unpubl. data). Dashes indicate species that have not been reported.

Common Name	Scientific Name	St. Mary River/Lee Creek	Milk River Watershed
Brassy Minnow	*Hybognathus hankinsoni*	-----	Y
Brook Stickleback	*Culaea inconstans*	Y	Y
Bull Trout	*Salvelinus confluentus*	Y	-----
Burbot	*Lota lota*	Y	Y
Cutthroat Trout	*Oncorhynchus clarkii*	-----[1]	Y
Cutthroat Trout x Rainbow Trout hybrid	*Oncorhynchus clarkii x Oncorhynchus mykiss*	Y	-----
Rocky Mountain Sculpin	*Cottus* sp.	NA	NA
Fathead Minnow	*Pimephales promelas*	Y	Y
Flathead Chub	*Platygobio gracilis*	-----	Y
Iowa Darter	*Etheostoma exile*	-----	N
Lake Chub	*Couesius plumbeus*	Y	Y
Lake Whitefish	*Coregonus clupeaformis*	Y	Y
Longnose Dace	*Rhinichthys cataractae*	Y	Y
Longnose Sucker	*Catostomus catostomus*	Y	Y
Mountain Sucker	*Catostomus platyrhynchus*	Y	Y
Mountain Whitefish	*Prosopium williamsoni*	Y	Y
Northern Pike	*Esox lucius*	Y	Y
Northern Redbelly Dace	*Chrosomus eos*	-----	N
Rainbow Trout	*Oncorhynchus mykiss*	Y	-----
Sauger	*Sander canadensis*	-----	Y
Spottail Shiner	*Notropis hudsonius*	Y	-----
Stonecat	*Noturus flavus*	-----	Y
Trout-perch	*Percopsis omiscomaycus*	Y	Y
Walleye	*Sander vitreus*	Y	Y
White Sucker	*Catostomus commersonii*	Y	Y
Western Silvery Minnow	*Hybognathus argyritis*	-----	Y
Yellow Perch	*Perca flavescens*	-----	N

[1] Genetically pure cutthroat trout may no longer exist in the St. Mary River.

3.4.2 Habitat

Habitat Preferences

In Alberta, Rocky Mountain Sculpin are associated with cool, clear headwaters (Willock 1969). They tend to be more common in silt-free rocky substrates near stream margins with low to moderate water velocities than in mid-stream areas where velocities are higher (Paetz 1993) (Figure 4). However, as their presence in both the St. Mary and Milk river watersheds suggests, the Rocky Mountain Sculpin is tolerant of periods of suspended sediments during high flows. In rivers or creeks where rocky cover is absent, such as near the Cardston (Lee creek), these fish may use emergent or riparian vegetation for cover.

Figure 4. Rocky Mountain Sculpin on gravel substrate (photo credit T. Clayton, Alberta Sustainable Resource Development, Lethbridge).

The distribution of Rocky Mountain Sculpin in the St. Mary and Milk river watersheds is strongly correlated with stream gradient and substrate type (Clayton and Ash 1980; R.L.&L. Environmental Services Ltd. 2002; D. Watkinson, unpubl. data). During June through October these fish frequented shallow runs and riffles that contained gravel, cobble, or boulders. Areas with moderate to high velocities (0.1-1.8 m/s), shallow water (0.1-1.0 m), and mainly gravel and cobble substrates with thin silt cover (0.0-0.02 m) were preferred (R.L.&L. Environmental Services Ltd. 2002; D. Watkinson, unpubl. data). Young-of-the-year and adults occupied habitat with similar ranges in flow velocity (<1.5 m/s), depth, and substrate but proportionately more young-of-the-year occupied shallower areas with lower water velocities, and silt substrates (D. Watkinson, unpubl. data). The larger fish showed a slight preference for substrates with more interstitial spaces (i.e., less embeddedness).

Rocky Mountain Sculpins occupy habitat with water temperatures up to 23.6°C, basic pH in the typical range of 8.0 to 8.6, conductivity of 100 to 920 (µS/cm), turbidity of 0.34 to 10.3 NTU—but typically less than 3.5 NTU, and dissolved oxygen levels of at least 7.4 mg/L (R.L.&L. Environmental Services Ltd. 2002). Turbidity was seldom sufficient to provide visual cover. In the Milk River, there is an abrupt change in gradient at the confluence with Deer Creek (Clayton and Ash 1980). Rocky Mountain Sculpins were common upstream of this confluence, where the stream gradient ranges from 1.3 to 7 m/km (0.13% to 0.70%), and absent downstream where the gradient is about 0.65 m/km (0.065%) (Clayton and Ash 1980). They were as common at creek mouths as in the river itself (Willock 1969).

Habitat use by specific life stages is not well known. Adults in the Flathead River were abundant in summer at similar water depths and velocities as those used by sculpins in the St. Mary and Milk river watersheds (McPhail 2007). During the day they sheltered in the substrate and at night emerged to forage along river edges in the shallows (<30 cm) where there was little surface current (<0.1 m/s). A September movement by larger males in the Flathead River to areas with faster surface velocities (>0.6 m/s), coupled with their association with large rocks and boulders, and spawning colouration suggest that breeding territories may be established in the autumn (McPhail 2007). During the winter, fish in the West Gallatin River of southwestern Montana lived in water with temperatures ranging from 0 to 2.2°C (Bailey 1952). In the spring, water depth at their nests was over 30 cm, and surface water velocities ranged from 0 to 1.4 m/s. The nests were typically located under rocks that were 12 to 38 cm in diameter.

Juveniles in the Flathead River occupy similar habitats to those used by the adults but are usually found closer to shore in shallower and quieter water (McPhail 2007). This distribution may be a response to predation by and competition with adults in the deeper, faster waters rather than a habitat preference, since both small and large fish prefer deep microhabitat (Freeman and Stouder 1989). Juvenile Rocky Mountain Sculpins can be abundant in silty, low gradient areas of the Milk River (D. Watkinson, unpubl. data) where they may stir up silt to provide cover (Bailey 1952; Willock 1969).

In autumn, young-of-the-year in the Flathead River were associated with sand and detritus substrates in quiet water areas such as pools, root-wads, back-channels, and shallow embayment's (McPhail 2007).

Habitat Availability

Limited information is available for specific habitat types in the Milk River watershed and their use by Rocky Mountain Sculpin. In November 1979, sculpins were found overwintering at most sites surveyed on the North Milk River from 14 to 80 km upstream of the confluence with the Milk River, and on the Milk River from near the Alberta/Montana border downstream to Verdigris Coulee (Clayton and Ash 1980). Sculpins were not found further downstream on the Milk River, at the Deer Creek Bridge or at a site 12 km upstream from the border. The highest numbers were generally caught at sites on the North Milk River. Overwintering habitat may not be limiting for Rocky Mountain Sculpin populations in the Milk River watershed under normal winter flow conditions (R.L.&L. Environmental Services Ltd. 2002). The availability of this habitat type during periods of drought is less certain. Droughts are not an infrequent occurrence in the Milk River watershed and species that occur there may be adapted to such conditions. Little is known about overwintering habitat in the St. Mary River. Low flow conditions also occur in the St. Mary River, but are not as pronounced, with surface flow occurring uninterrupted year-round.

Spawning and rearing habitat are not likely to be limiting for Rocky Mountain Sculpins in the Milk River watershed, since flow augmentation provides a continuous source of fresh, cool water (R.L.&L. Environmental Services Ltd. 2002). Changes to the current flow regime related to the St. Mary Diversion could affect the availability of these habitat types in the Milk River watershed but would be less likely to affect the St. Mary River. Lee Creek would not be affected by changes to the St. Mary diversion.

Ongoing habitat studies have found Rocky Mountain Sculpin to be common and widely distributed in the St. Mary River, from the International Border to the Highway 5 crossing (D. Watkinson, unpubl. data). Fish use of the various habitat types is currently being documented for specific life stages of the Rocky Mountain Sculpin.

Habitat Trends and Limitations

Completion of the St. Mary Canal in the United States in 1917 (ISMMRAMTF 2006), and of the St. Mary Dam and Reservoir in Alberta in 1951 (Gilpin 2000), significantly altered the hydraulic conditions of both the St. Mary and Milk river watersheds and thereby the availability of sculpin habitat. Flow diversion from the St. Mary River has increased seasonal flows in the North Milk and Milk rivers while reducing flows in the St. Mary River. Given the relative size of the systems, the effects have been more pronounced in the North Milk and Milk rivers, where flow has increased tenfold (McLean and Beckstead 1980). Construction of the St. Mary dam and reservoir replaced lotic (riverine) habitats with lentic (lake) habitats that are unsuitable for the Rocky Mountain Sculpin. Sculpin have not been reported from the impoundment or downstream, where they may have been extirpated by habitat degradation and fragmentation. The effects of flow diversion on upstream reaches of the St. Mary River are less pronounced and have not been for Rocky Mountain Sculpin habitat. Lee Creek is currently unaffected by flow regulation and any flow diversion is local.

Since 1917, the general character of the North Milk and Milk rivers has remained essentially unchanged although channel widening, increased cut-off activity and higher sediment yield have been documented (McLean and Beckstead 1980). The effects are most prominent in the smaller channel of the North Milk River, where the flood frequency has doubled and the magnitude of the flood flows has increased dramatically since diversion. Flow augmentation continues to erode river banks and reduce fine-sediment bottom habitats in the Milk River (McLean and Beckstead 1980).

Habitat availability in the North Milk and Milk rivers varies from year to year depending on flow, particularly when it is not being augmented during late summer, fall, and winter. There is the potential for Alberta to consider water storage in the Milk River in Canada and feasibility work has been completed (and would have to consulted with the U.S.). However, there are currently no plans to construct a reservoir on the Milk River in Canada and the impact of such a development has not been assessed. Given that reservoirs are not suitable habitat for the Rocky Mountain Sculpin, some adverse effects on the species should be anticipated if a reservoir is built on either system. In addition, should restoration to the St. Mary Canal occur and flows increase from 18.4 m^3/s to 24.1 m^3/s, changes to sculpin habitat in both the St. Mary and North Milk and Milk rivers are likely (Alberta Environment 2004; U.S. Bureau of Reclamation 2004).

Habitat Protection

The Rocky Mountain Sculpin, Eastslope populations, is afforded varying degrees of direct or indirect habitat protection through existing statutes and programs.

Federally, the *Fisheries Act* (R.S.C. 1985, c. F-14) prohibits any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat except as authorized by the Minister (S. 35). Subsection 36(3) of the *Fisheries Act* protects aquatic health by prohibiting the deposit of deleterious substances into waters frequented by fish (i.e. fish habitat). The *Canadian Environmental Protection Act* (S.C. 1999, c. 33) contributes to sustainable development and protects people and the environment through pollution prevention. The *Canadian Environmental Assessment Act* (S.C. 1992, c.37) ensures that certain federal regulatory actions including proposed alterations, disruptions, or destruction of fish habitat are subjected to an environmental review process. The *Species at Risk Act* (S.C. 2002, c.29) prohibits the killing, harming, harassing, capturing or taking individuals of wildlife species listed as extirpated, endangered or threatened (s.32(1)). Section 58 ensures that the critical habitat of listed species at risk is legally protected either by way of a prohibition, under SARA, against the destruction of critical habitat, or by provisions in, or measures under, SARA or other Acts of Parliament.

At the provincial level, Alberta's *Wildlife Act* (R.S.A. 2000, c.W-10) requires that the Minister responsible for that Act establish an Endangered Species Conservation Committee that will advise the Minister on endangered species and make recommendations to the Minister with respect to (among other things) organisms that should be established as endangered species and the preparation and adoption of recovery plans under that legislation. The *Environmental Protection and Enhancement Act* (R.S.A. 2000, c.E-12) protects land, water, and air by requiring those operating or proposing developments to meet their environmental responsibilities. The Alberta *Public Lands Act* (R.S.A. 2000, c.P-40) enables the designation of different types of Crown land use including agricultural, oil and gas and other resource uses. The Alberta *Water Act* (Chapter/Regulation: R.S.A. 2000, c.W-3) focuses on managing and protecting the province's water, and regulates the allocation of water resources.

Under the "Water for Life" strategy, Alberta supports the formation of Watershed Planning and Advisory Councils and the development of Watershed Management Plans. These plans identify watershed strategies and may influence Government of Alberta policy regarding water use. The needs of fish can be considered in the development of these plans but aquatic protection is only part of their purpose. The Milk River Watershed Council of Canada completed a State of the Watershed Report and a basin Management Plan is underway. The Oldman Watershed Council provides advice on water management in the St. Mary River watershed (S. Petry, pers. comm. 2007).

At writing, 56% of the land bordering the North Milk and Milk rivers was publicly owned; the rest was held privately (T. Clayton, pers. comm. 2006). Only 11% of the public and 14% of the private lands had conservation plans (plans created in part by landowners/users to protect the agricultural way of life and the environment) associated with them that included riparian protection. The remaining land was used mainly for grazing, or for small areas of municipal development (e.g., Town of Milk River). Six percent of the public land along the river was designated as park land, for public use and access during the summer but with restrictions on development. Much of the lands bordering Lee Creek (79%) and the St. Mary River (75%) were held privately (T. Clayton, pers. comm. 2007). The rest was publicly owned or part of the Blood Reserve. The proportion of these lands with conservation plans that include riparian protection is unknown.

Municipal approval is required for shoreline development on any municipal environmental easements. Some other initiatives or agencies that make recommendations affecting water quality and/or water flows, management of shorelines, and other aspects of watershed conservation include: Agriculture Canada, Alberta Agriculture, Alberta Environment, Alberta Health and Wellness, Alberta Riparian Habitat Management Society (Cows and Fish), Ducks Unlimited, Environment Canada, Environmental Farm Planning, Fisheries and Oceans Canada, Health Canada, MULTISAR, Nature Conservancy, and Operation Grassland Community.

3.4.3 Residence of the Rocky Mountain Sculpin

In southern Alberta, Rocky Mountain Sculpin generally spawn between May and June when water temperatures reach 7-13°C (Bailey 1952; Watkinson, Unpubl. data). Male sculpin construct nests on the underside of rocks, aquatic vegetation, wood or debris in which a female(s) may deposit clusters of adhesive pale yellow to orange eggs (see Sec. 3.4.1). When a male constructs a nest it will remain at the nest for up to several weeks, beginning prior to egg deposition by a female, and continuing during incubation and early embryo life stages (Peden 2000; Bailey 1952). The male will actively fan the nest post egg deposition to keep the eggs free of silt and may protect the eggs and fry from predators. It is possible that the male stays at the nest until the yolk sac is reabsorbed.

The *Species at Risk Act* defines a residence 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*".

The nests created and used by Rocky Mountain Sculpin for spawning demonstrate that there is significant investment in creating and maintaining the nest by sculpin. Thus, nests are considered to be the residence of this fish. The residence is limited to the nest itself and the spawning time period during which the male sculpin maintains the nest structure. This time frame also corresponds to the period of time when eggs, alevins or fry are present in the nest.

Sculpin are largely sedentary and relatively uniform in distribution in Alberta streams where they exist, so nests can likely occur at any location in a stream channel where appropriate structure exists. It is thought that much of the spawning that occurs in the St Mary and Milk river watersheds occurs on the underside of rocks, boulders or debris since usable riparian and instream vegetation is largely absent due to the dynamic and erosive nature of the watersheds. There is likely more opportunity for sculpin spawning to occur on riparian or instream vegetation or woody debris in Lee Creek.

3.4.4 Limiting Factors

Too little is known of the Rocky Mountain Sculpin's physiology or ability to adapt to different conditions to identify all factors that might limit population survival and maintenance. However, because it is a riverine species that has adapted to survive in cool, clear, running waters changing these conditions will likely have an adverse affect on survival of the species. Flow regulation or increased sedimentation might, for example, cause them to lose their advantage to competitors or increase their vulnerability to predators. Many sculpin species do not survive the transition to lake habitats when their streams are impounded, although the reasons are unclear (Peden 2000).

Although it is somewhat uncertain, Rocky Mountain Sculpin from Montana may have colonized the North Milk and Milk rivers via the St. Mary Canal, and may continue to do so in the future in the event that the Alberta population in the North Milk and Milk rivers was to become extirpated. However, the sedentary habits of closely related sculpin species (Bailey 1952; McCleave 1964; Peden 2000) suggests limited potential for re-colonization of upstream habitats such as Lee Creek or the Milk River upstream of its confluence with the North Milk River. Re-colonization of the St. Mary River from the North Milk River is not feasible given five drop structures (30 m long with 30° slopes) and two inverted siphons that create an impassable barrier to upstream migration (K. Miller, pers. comm. 2007). The apparent absence of this species in the Missouri River system downstream from the Milk River precludes re-colonization from within that watershed (Stash 2001).

4. THREATS

A number of threats to the Rocky Mountain Sculpin have been identified throughout its range. The most significant threats may be those that alter the natural flow regime of a river causing habitat loss or impairment. Such threats may include water removal (e.g., for irrigation, municipal, recreational, industrial and domestic use), impoundment, bank stabilization, channelization, and changes in flow conditions. Other threats to the species' habitat and survival include pollution and degradation of riparian areas. Some of the above threats may also act indirectly by altering faunal communities which in turn threaten the sculpin's existence.

COSEWIC (2005) identified water removal, diversions and reservoirs associated with irrigation, in combination with the frequent droughts as likely posing the greatest threat to the Rocky Mountain Sculpin in southern Alberta. Drought is a natural occurrence in prairie streams and one to which the sculpin is somewhat adapted. Man-made changes to flow can exacerbate the impacts of natural drought on sculpin habitat. The impacts of drought are difficult to mitigate, but habitat loss or degradation caused by man-made changes can be mitigated. The following sections summarize these and other sources of threats to the species and habitat.

4.1 Threat Classification

The Recovery Team undertook a detailed assessment of threats to the species based on both published information and local knowledge. Threats were identified under the following broad categories identified by Environment Canada (2007):

- habitat loss/degradation,
- changes in ecological dynamics or natural processes,
- exotic or invasive species,
- pollution,
- accidental mortality,
- climate and natural disasters, and
- natural processes or activities.

The methods and terminology used to assess threats to the Rocky Mountain Sculpin have been described by Environment Canada (2007). The results are discussed below and summarized in Tables 2 through 12.

4.2 Description of Threats

4.2.1 Habitat Loss/Degradation

Habitat loss or degradation is a threat to the survival of Rocky Mountain Sculpin in the Milk River watershed. A number of existing or potential activities may result in habitat loss or degradation, including: 1) dam construction and operation, 2) changes in flow associated with restoration of the St. Mary Canal in Montana (from 18.4 m^3/s to 24.1 m^3/s), 3) groundwater extraction, 4) surface water extraction, and 5) livestock use of the floodplain.

Dam Construction and Operation

Dam construction and operation could pose a threat to Rocky Mountain Sculpin in the St. Mary and Milk river watersheds (Table 2, Table 3). The apparent absence of this species from the St. Mary Reservoir and reaches of the river downstream suggests that Rocky Mountain Sculpin could be extirpated from within the impoundment and possibly for some distance downstream. While there is no proposal at this time, the feasibility of developing a dam on the Milk River upstream of the Town of Milk River has been completed by Alberta. The purposes of a dam would be to improve the security of the water supply for existing withdrawals, and to provide water for the irrigation of additional acres.

Table 2. Threat to the Rocky Mountain Sculpin from dam construction.

1	**Dam construction**	**Threat Information**		
Threat Category	Habitat loss or degradation	**Extent**	Unknown	
			Local	**Range-wide**
General Threat	Water impoundment (reservoir creation)	**Occurrence**	Unknown	
		Frequency	Continuous	
Specific Threat	Habitat loss and fragmentation	**Causal Certainty**	High	
		Severity	Unknown	
Stress	Reduced population size	**Level of Concern**	Low*	

Comments: Rocky Mountain Sculpin are not found in existing impoundments, such as the St. Mary Reservoir. There is currently no plan to build a dam on the Milk River in Canada at this time. *In the event that such a development were to occur the anticipated level of concern would be high as impoundment could lead to local or perhaps wider-ranging extirpation of the species.

Table 3. Threat to the Rocky Mountain Sculpin from dam operation.

2	**Dam operation**	**Threat Information**		
Threat Category	Habitat loss or degradation	**Extent**	Unknown	
			Local	**Range-wide**
General Threat	Downstream flow changes	**Occurrence**	Unknown	
		Frequency	Continuous	
Specific Threat	Changes in the seasonal flow regime	**Causal Certainty**	High	
		Severity	Unknown	
Stress	Reduced productivity and/or population size	**Level of Concern**	Low*	

Comments: The St. Mary Diversion exerts significant control over seasonal flow in the North Milk and Milk rivers. Dam construction on the Milk River would add another level of flow control. Flow changes could have positive or negative effects depending upon their timing and volume and the resultant effects on fish habitat. The effect would depend on how releases from a dam were controlled. The seasonality (e.g., during incubation) of any sediment addition may be an important consideration. *In the event that such a development were to occur the anticipated level of concern would be high as impoundment could lead to local or perhaps wider-ranging extirpation of the species.

A reservoir in this reach of the river would inundate Rocky Mountain Sculpin habitat and alter flow and water quality downstream. Until such time as a proposal is advanced any assessment of potential threats is highly speculative and intended only to flag areas where further study or investigation may be required in the future.

Impoundments alter habitat types, flow regimes, sediment loads, microbiota and water temperatures, and may also increase the risk of species' introductions (McAllister *et al*. 2000;

Quist *et al.* 2004). These changes often result in a narrowing of stream channels, less turbid water, less subject to fluctuations in temperature and flow, and less productive with less substrate movement (Cross *et al.* 1986; Pflieger and Grace 1987; Quist *et al.* 2004). Water released from storage reservoirs is often withdrawn from near the bottom of the reservoir (hypolimnetic withdrawals), creating significantly cooler water conditions in downstream areas.

The effect of impoundment on sculpin habitat downstream would depend on how water releases are managed. Downstream effects noted elsewhere include low water flows, high summer temperatures, and silted substrates; all unfavourable conditions for the Rocky Mountain Sculpin (ASRD 2004). The species may be absent downstream of the St. Mary Reservoir, although the Spoonhead Sculpin is present (T. Clayton, pers. comm. 2007). Low flow conditions below a dam on the Milk River would increase the potential for extirpation of sculpin populations downstream, and the barrier posed by the reservoir might limit subsequent re-colonization by the upstream population, thus dam construction and operation could affect Milk River populations by reducing their range (T. Clayton, pers. comm. 2007).

In reviewing any future dam proposal, the potential impacts on the Rocky Mountain Sculpin will need to be thoroughly considered. Such a review would benefit from more information on the species' ecology.

St. Mary Diversion

Diverting water in Montana from the St. Mary River to the North Milk River has reduced the effects of drought in the North Milk and Milk rivers (Willock 1969), and may have extended the availability of suitable summering habitat for the Rocky Mountain Sculpin further downstream than under natural flow conditions. The net effect of this change on the population is unknown, since downstream habitat gains may be offset by upstream losses, and other aspects of the species' life history that may be affected. Winter flows in the North Milk and Milk rivers, while low, are considered natural and taken alone are unlikely to threaten the Rocky Mountain Sculpin.

The St. Mary Diversion Canal in Montana is in need of maintenance and restoration. Due to its poor structural condition, the canal is not operating at its design capacity of 24.1 m^3/s but at a capacity of about 18.4 m^3/s (Alberta Environment 2004; U.S. Bureau of Reclamation 2004). Work has begun to bringing the structure up to design capacity which would increase flows by almost 27% and could lead to flow surges during periods of peak runoff in June. In either case, increased flows could alter channel morphology, particularly in the lower Milk River where banks are already highly susceptible to erosion during high flow periods.

Unexpected maintenance has led to temporary or premature closures of the canal in the past. Two such interruptions have occurred over that past 30 years (K. Miller, pers. comm. 2006). One of these interruptions occurred in 2001 when the canal was closed in mid-August to allow for emergency repairs. Due to extreme drought conditions, the lower Milk River was later reduced to a series of isolated pools until the spring freshet. Flow persisted in the upstream sections of the Milk and North Milk rivers that support sculpins. It is not uncommon during the winter for the Milk River upstream from its confluence with the North Milk River to have no surface flow.

Threats posed to Rocky Mountain Sculpin by changes in flow related to the St. Mary Diversion are mostly relevant to the North Milk and Milk rivers (Table 4). Increased flows related to improvements in the diversion could alter water clarity and substrate composition, impact feeding and reproductive success, and facilitate the transfer of biota from the St. Mary River into the North Milk and Milk rivers. Reduced flows related to canal maintenance could cause water temperature to increase and/or dissolved oxygen level to decrease beyond the species' preferred range. Changes to the flow regime that favour other species could be detrimental to sculpin populations. The rate at which flow is ramped down may alter the potential for stranding. The severity of these threats to Rocky Mountain Sculpin in the North Milk and Milk rivers is unknown. Anticipated changes to the flow regime of the North Milk and Milk rivers should be preceded by detailed studies to determine how the various options might affect river morphology and fish habitat, and Rocky Mountain Sculpin habitat in particular.

Table 4. Threat to the Rocky Mountain Sculpin from changes in flow.

3	**Changes in flow**	**Threat Information**		
Threat Category	Habitat loss or degradation	**Extent**	Widespread	
			Local	**Range-wide**
General Threat	St. Mary Diversion	**Occurrence**	Anticipated	
		Frequency	Seasonal	
Specific Threat	Habitat disruption	**Causal Certainty**	Low	
		Severity	Unknown	
Stress	Reduced productivity and/or reduced population size	**Level of Concern**	Low to Medium	

Comments: The existing flow regime has been regulated for most of the past century. Changes to this regime that alter seasonal flow patterns and volumes could alter the seasonal availability of suitable sculpin habitat. At the population level, the net effect of any change could be positive or negative. The effects of flow changes have historically been greatest on the North Milk River, which receives water diverted from the St. Mary River watershed and is small relative to the diverted flows and to St. Mary River and Milk River mainstem.

Surface Water Extraction - Irrigation

The threat to Rocky Mountain Sculpin in Alberta from the extraction of surface water for irrigation is considered low, since only a small proportion of the available flow is withdrawn and these withdrawals are regulated. Water is extracted from the Milk River for irrigation only while flows are augmented, from late-March or early April through to late September or mid-October. In 2008, Alberta irrigators were licensed to remove a total of up to 1.186×10^7 m^3 of water from the Milk River (D. Hunt, pers. comm. 2008). This constituted about 92% of the total licensed annual water withdrawal, but only about 5% of the average annual flow at the Town of Milk River from April through September (2.423×10^8 m^3; period of record 1909 to 2007 (WSC 2008b).

The total withdrawals allowable under water licenses are typically approached only during drought years (K. Miller, pers. comm.). When the St. Mary diversion in Montana is closed for maintenance, or during reduced flow conditions, withdrawals for irrigation are terminated, or suspended on a priority use basis. Alberta Environment has begun installing water meters on all irrigation pumps drawing water from the Milk River (K. Miller, pers. comm. 2006). These meters would measure water removal four times a day to provide an accurate and up-to-date measure of water withdrawals.

Sculpin populations in Lee Creek and the St. Mary River are unlikely to be affected by water withdrawals for irrigation at this time. There is little irrigation currently along these watercourses and further development that would require water diversions is unlikely due to the high elevation, topography, short growing season, and higher rainfall (Government of Alberta 2005). Very little water (27,140 m^3) is withdrawn from Lee Creek for irrigation (D. Hunt, pers. comm. 2008). In 2008, Alberta irrigators were licensed to remove a total of up to 1.104×10^6 m^3 of water from the St. Mary River (D. Hunt, pers. comm. 2008). This constituted about 80% of the total licensed annual water withdrawal, but only about 0.3% of the average annual flow at the Highway 501 Crossing during the irrigation period (i.e., 3.863×10^8 m^3) April through September of 1998 through 2007 (WSC 2008d). If water withdrawals were to increase significantly in the future relative to the available flow, the impact of this potential threat to Rocky Mountain Sculpins should be reassessed.

Surface Water Extraction - Non-irrigation

In contrast to water licenses for irrigation, Temporary Diversion Licenses (TDLs) for non-irrigation purposes are issued throughout the year by Alberta Environment, including during critical low flow periods. Oil and gas companies, for example, may be licensed to remove water from the river for activities related to well-drilling. Overwintering habitat for Rocky Mountain Sculpin may be particularly vulnerable to this type of extraction for reasons similar to those outlined under “Groundwater Extraction”. This kind of extraction also occurs during the augmented flow period, when it may not be an issue unless the St. Mary diversion is prematurely or temporarily closed down. The diversion of water during the non-augmented period is a concern and under such conditions, some TDLs may be revoked, as they were during the drought conditions in 2001 (S. Petry, pers. comm. 2006). TDLs are more prevalent for oil and gas development near the Milk River than they are near the St. Mary River and Lee Creek. Fish in the Milk River are most vulnerable during the non-augmented period. Restriction of TDLs in areas that would reduce sculpin habitat during critical low flows could be used to mitigate impacts.

During the flow augmentation period, the Town of Milk River diverts about 0.3% of the flow for domestic purposes (S. Petry, pers. comm.). The Town of Cardston draws its water from Lee Creek. In 2008, about 3.3% (1.500×10^6 m^3; D. Hunt, pers. comm. 2008) of the average annual flow in Lee Creek at Cardston (4.433×10^7 m^3; WSC 2008a) was licensed for municipal use. This constituted about 91% of the total licensed annual water withdrawal from Lee Creek. Water is not withdrawn for municipal use from reaches of the St. Mary River that are inhabited by Rocky Mountain Sculpin, unless flow in Lee Creek is insufficient to meet the needs of the Town of Cardston.

The threat to Rocky Mountain Sculpin in Alberta from surface water extraction for purposes other than irrigation is considered low, since only a small proportion of the available flow is withdrawn (D. Hunt, pers. comm.), and these withdrawals are regulated. If water withdrawals were to increase significantly in future relative to the available flow, the impact of this potential threat to Rocky Mountain Sculpins should be reassessed.

Livestock Use of Flood Plain

The Alberta Riparian Habitat Management Society ("Cows and Fish") has been working to improve livestock management practices in the North Milk and Milk rivers floodplain. Several riparian and grazing management workshops have been held, involving many ranchers along the North Milk and Milk rivers. There is a growing understanding of the value and vulnerability of the riparian area to degradation, and a greater understanding and adoption of management solutions by ranchers, including off-stream water development (L. Fitch, pers. comm. 2006). Several riparian benchmark inventories have been completed, but there has not been any follow-up monitoring to date. Demonstration sites have been established to show the positive effects of utilizing off-stream watering sites and have shown riparian vegetation recovery, especially with woody vegetation. Riparian recovery is usually evident within three to five years after the first management changes are made, but it may be ten years before significant physical changes can be measured. The Society has also conducted some work on Lee Creek and its tributary, Tough Creek. An aerial reconnaissance of the upper St. Mary River has been conducted, but nothing on the ground (T. Clayton, pers. comm. 2008).

Most Rocky Mountain Sculpin habitat is situated upstream of areas with cattle crossings (T. Clayton and M. Bryski, pers. comm. 2008). These crossings are more prevalent in the North Milk and Milk rivers and Lee Creek downstream of Beazer than in the St. Mary River. Outside the canyon sections (~4 km) much of the St. Mary River valley (~42 km) is relatively broad and accessible to cattle. Ranching is a primary agricultural activity and access to the St. Mary River by cattle is generally unrestricted. Balanced against this access is the natural resilience of the bed and shores of the river, where the gravel and cobble bed and underlying bedrock provide natural armour. While much of the shoreline is in good condition, some areas have been overused, resulting in shoreline degradation and man-made armouring may reduce the habitat value for sculpins and other fish if appropriate mitigation measures are not applied before, during and after construction. The threat to Rocky Mountain Sculpin and their habitat from livestock use of the floodplain can be largely mitigated through improving land management practices and is considered low.

4.2.2 Changes in Ecological Dynamics of Natural Processes

Blooms of the diatom *Didymosphenia geminata* (Bacillariophyceae) are an emerging threat to headwater rivers in Alberta with high water quality (i.e., low turbidity and nutrient levels) (Kirkwood *et al*. 2007) (Table 5). These blooms can create dense algal mats that cover kilometers of river bottom, impacting ecosystem structure and function and negatively affecting other trophic levels. The environmental factors and conditions that promote bloom events are not well understood. However, studies on the Bow and Red Deer rivers have found a negative relationship between the mean flow regime and diatom biomass. Flow regulation by dams may create the stable flow environment preferred by *D. geminata*. Together with other environmental factors such as water clarity, temperature, pH, conductivity, and total phosphorus this may promote diatom blooms.

If these algal blooms occur in river habitat occupied by the Rocky Mountain Sculpin they could alter the cover, food, and spawning habitats available to these fish and might displace them from these habitats. The likelihood of blooms occurring and negatively affecting Rocky Mountain Sculpin is unknown. Any impacts are likely to be periodic and to affect local areas, so the population as a whole is not likely at risk. The ability to prevent or mitigate the blooms themselves may depend upon altering the flow regime (Kirkwood *et al*. 2007).

Table 5. Threat to the Rocky Mountain Sculpin from *Didymosphenia geminata*.

4	***Didymosphenia geminata***	**Threat Information**		
Threat Category	Changes in ecological dynamics or natural processes	**Extent**	Localized	
			Local	**Range-wide**
General Threat	Algal bloom	**Occurrence**	current	unknown
		Frequency	Recurrent	
Specific Threat	Habitat impairment	**Causal Certainty**	Low	
		Severity	Unknown	
Stress	Reduced productivity, displacement, reduced fitness	**Level of Concern**	Low	

Comments: Blooms are typically restricted to an area of a river.

4.2.3 Exotic or Invasive Species

Exotic or invasive species may be introduced into waters occupied by the Rocky Mountain Sculpin either intentionally by stocking (Table 6), or unintentionally in bilge water, on boat hulls, as bait, or by other means (Table 7). Introduced species can threaten native fish fauna through various mechanisms including: predation, hybridization, competition for resources, the introduction of exotic diseases or parasites, and habitat degradation (Taylor *et al*. 1984; Lassuy 1995; Courtenay 2007). The degree to which this threat is likely to occur depends on the suitability of sculpin habitats to potential invading species.

In Montana, authorized stocking of non-native fishes into the St. Mary River watershed began early in the 20th century and continued in Glacier National Park until mid-century (Marnell 1988; Mogen and Kaeding 2005a). It continues today in some waters of the Blackfeet Reservation, mainly isolated ponds and lakes. Non-native fishes that have established self-sustaining populations in the St. Mary River watershed in Montana include Brook Trout, Rainbow Trout, Yellowstone Cutthroat Trout, and their hybrids. Brook Trout have not been reported from Canadian reaches of the St. Mary River.

In Alberta, Kokanee, Rainbow Trout, and Walleye have been stocked into the St. Mary Reservoir but only Walleye have established a self-sustaining population (Clements 1973). The Milk River and its tributaries have not been stocked for at least 10 years, although Goldsprings Park Pond, an old oxbow of the river with no connection to the mainstem is stocked annually with Rainbow Trout (T. Clayton, pers. comm. 2006). The Alberta Fish and Wildlife Division does not plan to introduce sportfish species into the Milk River or St. Mary River watersheds, and is unlikely to do so in the future (T. Clayton, pers. comm. 2008). Unauthorized introductions have not been documented in these rivers. Such introductions are difficult to control and might increase the severity of this threat if a new species were introduced.

Table 6. Threat to the Rocky Mountain Sculpin from intentional fish stocking.

5	Intentional fish stocking	Threat Information		
Threat Category	Exotic or invasive species	**Extent**	Widespread	
			Local	**Range-wide**
General Threat	Freshwater fish	**Occurrence**	Historic, current, anticipated	
		Frequency	Recurrent	
Specific Threat	Resource competition, predation	**Causal Certainty**	Low	
		Severity	Unknown	
Stress	Altered productivity and/or reduced population size	**Level of Concern**	Low	

Comments: Various fish species, typically those of interest to harvesters, have been introduced to both the Milk and St. Mary watersheds. Their effects on Rocky Mountain Sculpin are unknown and likely ongoing. Further stocking of already introduced species is unlikely to change the severity of this threat, however, new introductions could have a higher threat potential. The severity of this ongoing threat may be somewhat mitigated by the environment in which the Rocky Mountain Sculpins exist. Introductions to the Fresno Reservoir only affect the Milk River, whereas introductions to Lower St. Mary Lake in Montana can affect Rocky Mountain Sculpins in both the Milk and St. Mary watersheds. Illegal introductions are difficult to prevent and once established are difficult to eradicate. Education and regulation offer the best potential for mitigating this threat.

Table 7. Threat to the Rocky Mountain Sculpin from unintentional species introductions.

6	Unintentional species introductions	Threat Information		
Threat Category	Exotic or invasive species	**Extent**	Widespread	
			Local	**Range-wide**
General Threat	Introduction of aquatic biota	**Occurrence**	Historic, current, anticipated	
		Frequency	One-time, seasonal, recurrent	
Specific Threat	Resource competition, predation	**Causal Certainty**	Low	
		Severity	Unknown	
Stress	Altered productivity and/or reduced population size	**Level of Concern**	Low	

Comments: This threat has been ongoing in the North Milk and Milk rivers through inter-basin water transfers since the diversion began operation. Future introduction may also be of concern. Two organisms of concern are the New Zealand Mud Snail (*Potamopyrgus antipodarum*) and Northern or Virile Crayfish (*Orconectes virilis*). These species do not currently inhabit Canadian portions of the St. Mary or Milk river watersheds. Unintentional species introductions are most likely to occur during the open water period. Their occurrence may be sporadic, but the impacts will persist if an introduced species becomes established. The ability to prevent this threat is moderate but the potential to mitigate it once established is low. The overall level of concern for this watershed at this time is considered low. The focus should be on prevention through education and regulation (e.g., do not use crayfish as bait).

The effects of historical species introductions from the St. Mary River into the Milk River watershed via the diversion are unknown. Increasing the annual flow in the St. Mary diversion canal might further facilitate movement of biota from the St. Mary River into the Milk River. The potential impacts on Rocky Mountain Sculpins in the Milk River of controlling the entrainment of biota by the St. Mary Diversion are unknown.

To date, Trout-perch and Walleye are the only introduced fish species that have been observed in the lower Milk River where the Rocky Mountain Sculpin occurs (T. Clayton and D. Watkinson, unpubl. data). Further downstream, the Fresno Reservoir contains a number of introduced predatory species, including: Rainbow Trout, Walleye, Yellow Perch, Northern Pike, and Black Crappie (*Pomoxis nigromaculatus*), as well as other introduced species such as Lake Whitefish and Spottail Shiner (*Notropis hudsonius*) (Stash 2001; http://www.ifished.com/montana/fresno-reservoir). Spottail Shiners have also been observed in the river section between the international border and the reservoir (Stash 2001). While some species listed here have specific habitat requirements that may not be met in the lower Milk River of Alberta, others are generalists that might expand into Alberta.

There are no physical barriers to fish migration between the Fresno Reservoir in Montana, and areas of the North Milk and Milk rivers in Alberta that support Rocky Mountain Sculpin. Therefore, introduction of fish species to the Fresno Reservoir in Montana has allowed introduced fish species to migrate upstream into the North Milk and Milk rivers in Canada. At this time few introduced fish have been collected and the impacts to sculpin are likely low.

Introductions of species to Lower St. Mary Lake in Montana have the potential to affect Rocky Mountain Sculpin in both the Milk and St. Mary watersheds.

The significance of species introductions would depend upon the species introduced. Introduction of the New Zealand snail (*Potamopyrgus antipodarum*), for example, can disrupt indigenous invertebrate populations and may cause a marked dietary shift in both sculpin and trout (Cada 2004). The potential impact of such an introduction into the Saskatchewan River watershed was assessed as unknown (Golder Associates Ltd. 2003). Crayfish have not been reported from the St. Mary River watershed above the St. Mary Reservoir or from the Milk River watershed in Canada (T. Clayton, pers. comm. 2008). Introduction of a crayfish into these areas could modify the aquatic macrophyte, macroinvertebrate and, ultimately, fish communities (Chambers *et al*. 1990; Hanson *et al*. 1990; McCarthy *et al*. 2006). These effects would likely be greatest in detritus-based littoral food webs (Usio and Townsend 2002, 2004).

4.2.4 Pollution

The likelihood of point source and non-point source pollution entering the St. Mary or Milk river watersheds at levels that would threaten Rocky Mountain Sculpin survival is considered low (Table 8). Point sources of pollution include any stormwater and sewage releases, as well as accidental spills and gas leaks particularly at river and tributary crossings. Over the past 12 years, fewer than 20 pollution incidents have been reported from the St. Mary River watershed, and some of these were in Lee Creek, Pothole Creek, or downstream of the reservoir (M. Bryski, pers. comm. 2008). These incidents included sewage discharges, feedlot run-off, sediment releases, small oil/gas spills and small chemical spills. Municipal sewage and industrial sediment were released into Lee Creek in the past at Cardston, affecting the lower four kilometres of the creek. The Town of Milk River has not released sewage into the Milk River for 20 years, and stormwater is surface run-off (K. Miller, pers. comm. 2006) making both of these a minimal risk.

Table 8. Threat to the Rocky Mountain Sculpin from point source pollution.

7	**Point source pollution**	**Threat Information**		
Threat Category	Pollution	**Extent**	Local	
			Local	**Range-wide**
General Threat	Accidental spills	**Occurrence**	Anticipated	
		Frequency	Unknown	
Specific Threat	Release of contaminants from natural gas or oil pipeline leaks, at highway crossings and/or from sewage treatment plants	**Causal Certainty**	Medium	
		Severity	Unknown	
Stress	Toxic effects, reduced productivity, increased mortality	**Level of Concern**	Low	

The accidental release of a toxic substance at any one of the river crossings including bridges or pipelines could have serious consequences. The extent and severity of any damage to the aquatic community including Rocky Mountain Sculpin would depend on the substance released, the location of spill, the time of year (flow augmentation or not), and the potential to mitigate the impacts. To date, no such spills have been documented for the Milk River. However, the possibility, although quite low, exists because traffic flow is significant at some crossings (e.g., average of 2,700 crossings per day on the Highway 4 Bridge in 2003, 25% by trucks). A number of gas leaks have also occurred in recent years (S. Petry, pers. comm. 2006). The risk to the sculpin population from point-source pollution seems low based on both the low frequency and limited potential for a large-scale event that would affect a substantial length of river.

Contamination of water from seismic or drilling activities is also a possibility in the Milk River. Uncapped groundwater wells may also pose a problem although licensing and well capping programs help to minimize this threat (Alberta Environment 2001).

Non-point sources of pollution with the potential to affect Rocky Mountain Sculpin habitats are limited mainly to the runoff of agricultural pesticides and fertilizers (Table 9). Overall, this threat is considered low. The intensity of agricultural cultivation beside Lee Creek and the St. Mary River is low, lower than along the North Milk and Milk rivers (Government of Alberta 2005), and no feedlots are currently located on either the Milk or St. Mary rivers. Most of the approximately 8,000 acres of cropland that is irrigated in the Milk River watershed is located within 50 km of the Town of Milk River, but there is another small section located upstream on the North Milk River near Del Bonita (K. Miller, pers. comm. 2006). The rough terrain near the river channel prevents crops in most areas from being grown within about 400 m of the river (K. Miller, pers. comm. 2006) and acts as a buffer, reducing the potential for direct contamination of the river. The growth period for most crops also coincides with the diversion period, when flows are usually at their highest, creating a significant dilution effect. Leaching of fertilizer residues has declined significantly in recent years due to the high costs of fertilizing and pumping of water (K. Miller, pers. comm. 2006), but nutrient concentrations can become elevated at downstream sites such as the Highway 880 crossing (W. Koning, pers. comm. 2006).

Table 9. Threat to the Rocky Mountain Sculpin from non-point source pollution.

8	**Non-point source pollution**	**Threat Information**		
Threat Category	Pollution	**Extent**	Unknown	
			Local	**Range-wide**
General Threat	Agricultural fertilizers and pesticides	**Occurrence**	Unknown	
		Frequency	Seasonal	
Specific Threat	Contaminant and nutrient loading	**Causal Certainty**	Low	
		Severity	Unknown	
Stress	Toxic effects, increased mortality	**Level of Concern**	Low	

Water quality in the mainstem also changes seasonally in response to flow augmentation, with increases in the total dissolved solids, conductivity and salt (sodium) concentrations when the diversion is shut off in the winter months (Milk River Watershed Council Canada 2008; W. Koning, pers. comm. 2006).

4.2.5 Accidental Mortality

Scientific sampling may pose a threat to the Rocky Mountain Sculpin (Table 10). Sampling occurs range-wide, but only affects a small area of habitat in any given year. Most fish caught are released alive but some are killed intentionally or accidentally. The severity and level of concern attached to this threat are low because scientific sampling is regulated through the issuance of permits under section 73 of SARA and, consequently, the potential for mitigation is high. The extent of mortality is generally prescribed within any approvals granted so as to ensure that the survival or recovery of affected populations is not compromised.

4.2.6 Climate Change

Climate change has the potential to impact water availability, temperature, and a broad range of other issues (Schindler 2001), thereby affecting the availability and quality of Rocky Mountain Sculpin habitat (Table 11). The extent to which this might affect the species is unknown.

Table 10. Threat to the Rocky Mountain Sculpin from scientific sampling.

9	**Scientific sampling**	**Threat Information**		
Threat Category	Disturbance or persecution	**Extent**	Localized	
			Local	**Range-wide**
General Threat	Scientific sampling	**Occurrence**	Historic, current, anticipated	
		Frequency	Recurrent	
Specific Threat	Fish sacrifice, accidental mortality	**Causal Certainty**	High	
		Severity	Low	
Stress	Increased mortality	**Level of Concern**	Low	
Comments: The threat from scientific sampling, while range-wide, only occurs periodically and only affects small areas of sculpin habitat in any year. It is regulated by permit.				

Table 11. Threat to the Rocky Mountain Sculpin from climate change.

10	**Climate Change**	**Threat Information**		
Threat Category	Climate Change	**Extent**	Widespread	
			Local	**Range-wide**
General Threat	Climate change	**Occurrence**	Anticipated	
		Frequency	Recurrent	
Specific Threat	Altered flow and temperature regimes	**Causal Certainty**	Low	
		Severity	Unknown	
Stress	Increased mortality, reduced fitness	**Level of Concern**	Low	

Comments: None.

4.2.7 Natural Processes or Activities

Recurring conditions such as droughts and anoxia also have the potential to significantly impact Rocky Mountain Sculpin.

Drought

Southern Alberta is susceptible to extreme drought conditions, particularly during the summer and early fall. The impact of this threat to Rocky Mountain Sculpin will depend on the severity and duration of the drought. Overwintering habitat is the habitat most likely to be threatened (Table 12). Drought conditions in combination with water regulation and water extraction practices have the potential to reduce the amount and quality of sculpin habitat. The severity of the combined effect could be significant. In 1988 and 2001, for example, the surface flow of the Milk River east of Aden Bridge and upstream of the confluence with the North Milk River was virtually eliminated in the fall and winter due to severe drought conditions with the lower reaches of the Milk River reduced to a series of standing pools (WSC 2008b).

Table 12. Threat to the Rocky Mountain Sculpin from drought.

11	Drought	Threat Information		
Threat Category	Natural processes or activities	**Extent**	Widespread	
			Local	**Range-wide**
General Threat	Drought	**Occurrence**	Historic, anticipated	
		Frequency	Recurrent	
Specific Threat	Low water, anoxia	**Causal Certainty**	Medium	
		Severity	Moderate	Low
Stress	Increased mortality	**Level of Concern**	Low	

Comments: Natural drought is an ongoing, intermittent threat to Rocky Mountain Sculpins in Alberta. Fish in the North Milk and Milk rivers are most vulnerable, as the St. Mary River has higher seasonal flows and more water is withdrawn for irrigation from the Milk River. Water withdrawals or regulation could increase or decrease the severity of impacts from future droughts.

Anoxia

Low dissolved oxygen levels during the winter could seriously impact the survival of Rocky Mountain Sculpin and other fish species in the lower Milk River. In January, oxygen concentrations under the ice in the lower Milk River can decline to 1.6 mg/L, perhaps due to oxidization by organic debris or inflow of anoxic ground water (Noton 1980; R.L.&L. Environmental Services Ltd. 2002). The sculpin population as a whole is unlikely to be threatened by anoxia as similar declines have not been observed further upstream in the North Milk River, where measured winter levels are at or above 8.4 mg/L (Noton 1980), or at a number of isolated pools in the lower Milk River, where March levels are at or above 10.2 mg/L (R.L.&L. Environmental Services Ltd. 2002b). This suggests that oxygen exchange in these reaches, where there is continuous flow and possibly open water, is adequate to support sculpin. Anoxia is unlikely in the St. Mary River and Lee Creek for the same reasons. This parameter should be evaluated in future winter habitat surveys to confirm this conclusion.

5. POPULATION AND DISTRIBUTION OBJECTIVES

No evidence to date suggests that populations of Rocky Mountain Sculpin in the St. Mary and Milk river watersheds have suffered a serious decline or that the range has been reduced significantly since it was first identified. These populations appear to persist naturally in these two watersheds. Nevertheless, simply because of its limited distribution, the species may always be at some level of risk. The focus of recovery planning should be to ensure a self-sustaining population by reducing, eliminating or managing existing or potential threats. Given that population numbers and habitat do not appear to require recovery or restoration, a conservation approach based on protecting and maintaining existing populations and their habitats is recommended. As such, the population and distribution objective for the Rocky Mountain Sculpin is:

"To protect and maintain self-sustaining populations of the Rocky Mountain Sculpin within its current range in the St. Mary and Milk river watersheds in Canada."

A number of approaches are proposed to meet the population and distribution objective. The approaches or objectives, take into consideration the uncertainty associated with our knowledge of the species' taxonomy, biology, life history, abundance, and habitat requirements as well as the impact of identified threats to its survival in the St. Mary and Milk river watersheds. The recovery approaches are to:

1. **to quantify and maintain current population levels of Rocky Mountain Sculpin in the St. Mary and Milk river watersheds (within the population's range of natural variation), as determined from a standardized survey program;**
2. **to increase knowledge of the taxonomy, life history, basic biology and habitat requirements of the Rocky Mountain Sculpin, with a view towards refining the identification of and protecting critical habitat; and**
3. **to increase our understanding of how human activities affect Rocky Mountain Sculpin survival, so that potential threats to the species can be avoided, eliminated, or mitigated.**

6. BROAD STRATEGIES AND GENERAL APPROACHES TO MEET OBJECTIVES

Strategies proposed to address identified or potential threats, and to guide appropriate research and management activities to meet the population and distribution objectives, are discussed under the broader approaches of:

1. **Research,**
2. **Monitoring,**
3. **Management and regulatory actions, and**
4. **Education and outreach.**

Each strategy has been designed to assess, mitigate or eliminate specific threats to the species; to address information deficiencies that might otherwise inhibit species recovery; or to contribute to the species recovery in general. These strategies are summarized by approach in Table 13, which indicates their priority and relates them to specific recovery objectives.

6.1 Planning Table

Table 13. Recovery objectives, the strategies to address them, and their anticipated effects.

Strategy	Priority*	Anticipated Effect
Objective 1: *To quantify and maintain current population levels of Rocky Mountain Sculpin in the St. Mary and Milk river watersheds (within the population's range of natural variation), as determined from a standardized survey program.*		
R4. Develop population models	Necessary	Provide trend through time data. Improve knowledge of natural variability and population viability. Improve ability to identify anthropogenic impacts.
M1. Population monitoring	Necessary	
Objective 2: *To increase knowledge of the taxonomy, life history, basic biology and habitat requirements of the Rocky Mountain Sculpin, with a view towards refining the identification and protecting critical habitat.*		
R1. Confirm distribution and abundance	Necessary	Clarify the extent of the species' distribution and relative abundance in Lee Creek and the North Milk and Milk rivers.
R2. Clarify life history requirements	Necessary	Better knowledge of life history parameters will help determine population targets and refine critical habitat identification.
R3. Clarify habitat requirements	Necessary	Better knowledge of habitat use will help focus impact mitigation and recovery efforts and refine critical habitat identification.
R4. Develop population models	Necessary	Establish reliable population models including population viability estimates, as well as appropriate surrogate measures relying on relative abundance, presence/absence, inter-basin movements, and population structure data.
Objective 3: *To increase our understanding of how human activities affect Rocky Mountain Sculpin survival, so that potential threats to the species can be avoided, eliminated, or mitigated.*		
MR1. Water management and conservation	Necessary	Avoid unnecessary degradation of Rocky Mountain Sculpin habitat and mortality of Rocky Mountain Sculpin.
MR2. Development impact mitigation		
MR3. Stocking program rationalization	Beneficial	
MR4. International cooperation		
MR5. Data conservation	Necessary	Ensure data and samples can be revisited if necessary. Avoid loss of important information and unnecessary duplication of effort.
E1. Improve awareness of the species	Beneficial	Improve awareness of the Rocky Mountain Sculpin and its habitat Encourage understanding and communication with respect to the species. Reduce inadvertent harvesting and habitat destruction.
E2. Encourage stakeholder participation	Beneficial	Improve awareness of this species and its habitat and local support for species recovery initiatives.
E3. Facilitate information exchange	Necessary	Improve accessibility and security of data.
E4. Discourage species introductions	Beneficial	Reduce potential for damage to Rocky Mountain Sculpin populations by introduced predators and competitors.
R5. Assess stressors	Necessary	Enable the assessment and mitigation of threats to the species or its habitat from anthropogenic activities.
M2. Habitat monitoring	Necessary	Provide trend through time data. Improve knowledge of natural variability in habitat parameters. Improve ability to identify anthropogenic impacts.

Urgent = High priority for immediate species conservation, initiate as soon as possible. **Necessary** = Medium priority for long term species conservation. **Beneficial** = Lower priority, primarily directed at potential future activities.

6.2 Narrative to Support the Recovery Planning Table

6.2.1 Research

Sound scientific knowledge must form the basis of any recovery efforts for the Rocky Mountain Sculpin. Currently, many of the conclusions drawn for Rocky Mountain Sculpin in the St. Mary and Milk river watersheds are speculative and rely on very limited and often inferred information. Gaps exist in knowledge of the taxonomy, basic life history, biology, habitat requirements, population structure and abundance, and threats. These gaps need to be addressed to refine the recovery strategy and ensure that the species is adequately protected in Canada. To address the need for scientific research the following strategies are recommended:

R1. **Confirm distribution and abundance:** Conduct scientific studies to clarify the extent of the species' distribution and relative abundance in Lee Creek and the North Milk and Milk rivers in association with habitat use.

R2. **Clarify life history requirements:** Conduct scientific studies to understand the life history, ecology, population dynamics, and population structure.

R3. **Clarify habitat requirements:** Conduct scientific studies to determine biophysical attributes of habitat required seasonally by each life stage of the Rocky Mountain Sculpin so as to better understand the relationship between specific habitats and population viability.

R4. **Develop population models:** Conduct scientific studies to establish reliable population models including population viability estimates, as well as appropriate surrogate measures relying on relative abundance, presence/absence, inter-basin movements, and population structure data.

R5. **Assess stressors:** Conduct scientific studies to better understand the potential threats associated with human activities including water regulation (e.g., dam, canal operations and land use practices).

6.2.2 Monitoring

Regular monitoring is necessary to establish trends in abundance of Rocky Mountain Sculpin, as well as to describe the availability and permanency of habitats, including critical habitats. Furthermore, the physical and biological parameters of river water should be monitored regularly to track water quality. The following strategies are recommended to address monitoring needs:

M1. **Population monitoring:** Develop an appropriate monitoring protocol to track abundance, distribution and habitat use for the Rocky Mountain Sculpin.

M2. **Habitat monitoring:** Routinely monitor physical environmental parameters including flow conditions, turbidity, water temperature, dissolved oxygen, nutrient loading and salinity.

6.2.3 Management and Regulation

Some management and regulatory actions are necessary to protect the Rocky Mountain Sculpin and its habitat. Such actions will help to reduce or eliminate identified threats including habitat loss and degradation, pollution, and the introduction of exotic species. Because the recovery strategy is focused on maintenance, approaches should focus on ways to maintain and protect the species rather than rebuild the population or create new habitat. Recommended strategies include:

MR1. **Water management and conservation:** Reduce the effects of water extraction on the Rocky Mountain Sculpin through appropriate water use management and conservation measures.

MR2. **Development impact mitigation:** The development of any project proposals for the St. Mary and Milk river watersheds must consider the potential environmental effects on the Rocky Mountain Sculpin and its critical habitat as early as practical in the planning stages, and must focus on the elimination or mitigation of any potential adverse impacts on the species.

MR3. **Stocking program rationalization:** Reduce the potential for species introductions and stocking-related impacts to Rocky Mountain Sculpin.

MR4. **International cooperation:** Work with United States agencies to mitigate the effects of unscheduled flow interruptions in the North Milk and Milk rivers during flow augmentation.

MR5. **Data conservation:** To provide continuity and future reference, all samples and information (current and future) must be appropriately preserved and/or archived within known repositories.

6.2.4 Public Education and Outreach

Public education is essential to gain acceptance of, and compliance with, the overall recovery strategy. Public support can be gained through increased awareness of the Rocky Mountain Sculpin and involvement in stewardship programs. The following strategies are recommended:

E1. **Improve awareness of the species:** Develop and distribute information describing the species and its needs, as well as implications of the recovery strategy.

E2. **Encourage stakeholder participation:** Promote and support stakeholder involvement in stewardship initiatives.

E3. **Facilitate information exchange:** The exchange of information among researchers, stakeholders and fisheries agencies from Canada and the United

States, with regard to research, recovery and management activities related to the Rocky Mountain Sculpin should be facilitated.

E4. **Discourage species introductions:** To prevent species introductions – intentional or otherwise, education programs that heighten awareness on this issue should be supported.

6.3 Actions Already Completed or Currently Underway

A number of activities related to recovery of the Rocky Mountain Sculpin have already been completed. These include:

- In June 2004, an early summer habitat survey was conducted on the lower Milk River (Highway 880 bridge to Pinhorn Ranch) to identify possible spawning and early rearing habitat. Possible suitable habitat locations were described but fish sampling was not conducted to confirm sculpin presence.

- Fall fish and habitat surveys were conducted opportunistically at selected sites on the lower Milk River in October and November 2004 to sample for fish presence in potential overwintering habitat.

- A water conservation plan was developed by the Town of Milk River in 2004. The plan incorporates the economics of town planning while recognizing the need for water conservation in the Milk River watershed. Generally, water conservation is addressed through timing of operations and water storage.

- Aerial photography was completed in October and November 2004 to document key macro-habitat sections for the entire Milk and North Milk rivers. This survey geo-referenced and mapped key habitat features for evaluation. Limited habitat analysis has also been conducted. A similar but less detailed survey of the St. Mary River, and portions of the Milk River, was conducted by DFO and ASRD in the spring of 2008 to delineate fish habitat types.

- Signage at Writing-On-Stone Park was completed, identifying species at risk including the Rocky Mountain Sculpin.

- A comprehensive report on the state of the Milk River watershed has been prepared by Milk River Watershed Council Canada (2008). This watershed basin advisory committee is working with Alberta Environment and other agencies to monitor chemical water quality bi-weekly at ten locations in the Milk River watershed. A battery of water quality parameters are tested including: pH, conductivity, dissolved oxygen, temperature, dissolved and suspended nutrients, chlorophyll, ions, metals, pesticides, and bacteria (fecal coliforms and *Escherichia coli*) (W. Koning, pers. comm. 2007). These data are supplemented with temperature data collected at Aden Bridge by Alberta Environment (K. Miller, pers. comm. 2007).

- Environment Canada has resumed water quality monitoring at the international border, where the North Milk River enters Canada and the Milk River exits (W. Koning, pers. comm. 2006).

- Collaboration with the Milk River MULTISAR Program is ongoing.

- A fact sheet describing the Rocky Mountain Sculpin has been completed by Fisheries and Oceans Canada.

- Water Survey of Canada sites are well established and tracking flows in Lee Creek, the St. Mary River, and Milk River (via HYDAT).

- Fisheries and Oceans Canada sampled fish populations in the Milk River watershed in July 2005; May, August, and October 2006; June 2007; and May 2008. Populations in the St. Mary River watershed were sampled in late August to early October of 2006, July and August of 2007, May and August of 2008, and August of 2009 (D. Watkinson, unpubl. data). New data were collected on the diet, population structure and density, juvenile and adult habitat use, and distribution of the Rocky Mountain Sculpin.

- Dr. David Neely, in a collaborative effort initiated by the Province of British Columbia, is conducting a comprehensive taxonomic assessment (genetic and morphological comparisons) of sculpin populations in the St. Mary and Milk river watersheds in Alberta and Flathead River in British Columbia. This assessment will also incorporate representative populations believed to be from the same taxon, as well as closely related *Cottus bairdi* and *C. confusus* populations. Taylor and Gow (2008) have completed a similar, smaller-scale study to compare the genetics of Rocky Mountain Sculpin in Alberta with sculpins in the Flathead River for Fisheries and Oceans Canada.

7. CRITICAL HABITAT

7.1 General Identification of the Rocky Mountain Sculpin's Critical Habitat

Critical habitat is defined in the Species at Risk Act (2002) section 2(1) as:

> *"…the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in a recovery strategy or in an action plan for the species."* [s. 2(1)]

SARA defines habitat for aquatic species at risk as:

> *"… spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced."* [s. 2(1)]

Critical habitat for the Rocky Mountain Sculpin is identified to the extent possible, using the best information currently available. Section 58 ensures that the critical habitat of listed species at risk is legally protected either by way of a prohibition, under SARA, against the destruction of critical habitat, or by provisions in, or measures under, SARA or other Acts of Parliament

Critical habitat identified in this recovery strategy describes the geospatial area and the biophysical features which support functions necessary to support the survival and or recovery of the species. The schedule of studies outlines the activities required to refine areas of critical habitat and further describe the features, functions and attributes of those habitats to support its protection.

7.1.1 Information and Methods Used to Identify Critical Habitat

Using the best available information, critical habitat has been identified in Lee Creek as well as in the St. Mary, North Milk, and Milk rivers using a slightly modified 'bounding box' approach. This approach assumes that there is a thorough understanding of the features functions and attributes of the habitats associated with all life stages of the sculpin but the actual locations of these habitats are not known. In the case of the Rocky Mountain Sculpin there is fairly uniform distribution of individuals at different life stages in certain habitats, particularly in the North Milk and St Mary rivers. The features functions and attributes of those habitats in which Rocky Mountain Sculpin generally occur may be described in detail; essentially, most if not all life stages of Rocky Mountain Sculpin occur in riffle and run type habitats as defined in Table 14. Considering the above, the approach to identifying critical habitat for the sculpin was further modified by catch per unit effort (CPUE) as well as ecological classification. CPUE was used to help identify critical habitat limitations in the St. Mary River and Lee Creek. In the North Milk and Milk rivers, critical habitat was identified using CPUE and ecological features and attributes. Life stage habitat information is described in Sections 3.4.1 (Biology and Life History) and 3.4.2 (Habitat). The bounding box approach was the most appropriate, given the limited information available for the species and the lack of detailed habitat mapping for these areas.

The areas identified can be refined and/or additional areas could be also identified if new information comes to light regarding the life history needs of the Rocky Mountain Sculpin. Areas of critical habitat identified at some locations may overlap with critical habitat identified for other co-occurring species at risk; however, the specific habitat requirements within these areas may vary by species.

St. Mary River:

Comparable backpack electrofishing CPUE data was collected for the St. Mary River from the U.S. Border to the Highway 5 crossing on the St. Mary River. The species is common and abundant throughout this stretch of the St. Mary River with an average density of 0.75 fish/m² at flows <20 m^3/s (D. Watkinson, unpubl. data).

Lee Creek:

CPUE declines quickly moving upstream from the confluence of Lee Creek with the St. Mary River. The CPUE is highest in the lower 13 km of the creek (>0.01 fish/sec of backpack electrofishing). Limited sampling has been conducted upstream and CPUE was <0.01 fish/sec of backpack electrofishing.

North Milk and Milk Rivers:

Boat electrofishing has provided CPUE data from Canadian reaches of the Milk River downstream from its confluence with the North Milk River. While the number of sites sampled by backpack electrofishing on the North Milk River is low, the CPUE at these sites has been high from the U.S. Border to the confluence with the Milk River (river km 238). In the Milk River, the area of occurrence extends from the U.S. Border downstream into R1. The CPUE is low in the Milk River upstream of its confluence with the North Milk River. This habitat is considered marginal as surface flow often stops during the summer. While the species has been caught downstream of the R3/R2 reach break (river km 162), it was absent from the boat electrofishing catches in these reaches which provides standardized sampling for comparisons. This abrupt decline in CPUE corresponds with a change in habitat to predominately silt and sand substrates (≥70%). The habitat in reaches R2 and R1 is not preferred for sculpin, although pockets of suitable habitat may exist.

The approach used to identify critical habitat for the Rocky Mountain Sculpin is independent of a specific population recovery target. Population numbers and habitat do no appear to require recovery or restoration. Recovery planning should focus on protecting and maintaining existing Rocky Mountain Sculpin populations and their habitats.

7.1.2 Identification of Critical Habitat: Geospatial

Critical habitat for Rocky Mountain Sculpin in Alberta is defined as all of the St. Mary River from the U.S. Border to the St. Mary Reservoir (upstream 49.0000 degrees North – 113.32870 degrees West to 49.24966 degrees West – 113.25595 degrees West), the lower 13 km of Lee Creek (upstream 49.16847 degrees North to confluence of St Mary River). Further sampling is needed to refine the upstream extent of critical habitat in Lee Creek. The North Milk and Milk rivers from the U.S. Border to the confluence of mainstem Milk River, and the mainstem Milk River from the confluence with the North Milk River downstream to the R3/R2 reach boundary are also considered critical habitat for Rocky Mountain Sculpin (upstream 49.00000 degrees North – 112.99867 degrees West to 49.10961 degrees North – 111.85008 degrees West). The Milk River upstream of the confluence with the North Milk River was not considered critical habitat as surface flows are periodically absent; likewise, the predominance of fine substrates downstream from the R2/R3 reach break makes those habitats marginal for Rocky Mountain Sculpin. To provide a buffer zone, the bankfull channel is considered part of the critical habitat. The locations of critical habitat are shown in Figure 5. These are areas that the Minister of Fisheries and Oceans considers necessary to support the species’ survival or recovery objectives.

Critical habitat is not comprised of all the area within the identified geographic boundaries but only those areas where the specified biophysical features occur. Permanent anthropogenic features such as marinas, road crossings, infiltration galleries, outfalls, canals etc. that require routine maintenance and are within the areas delineated as critical habitat are excluded and not considered to be critical habitat for the Rocky Mountain Sculpin .

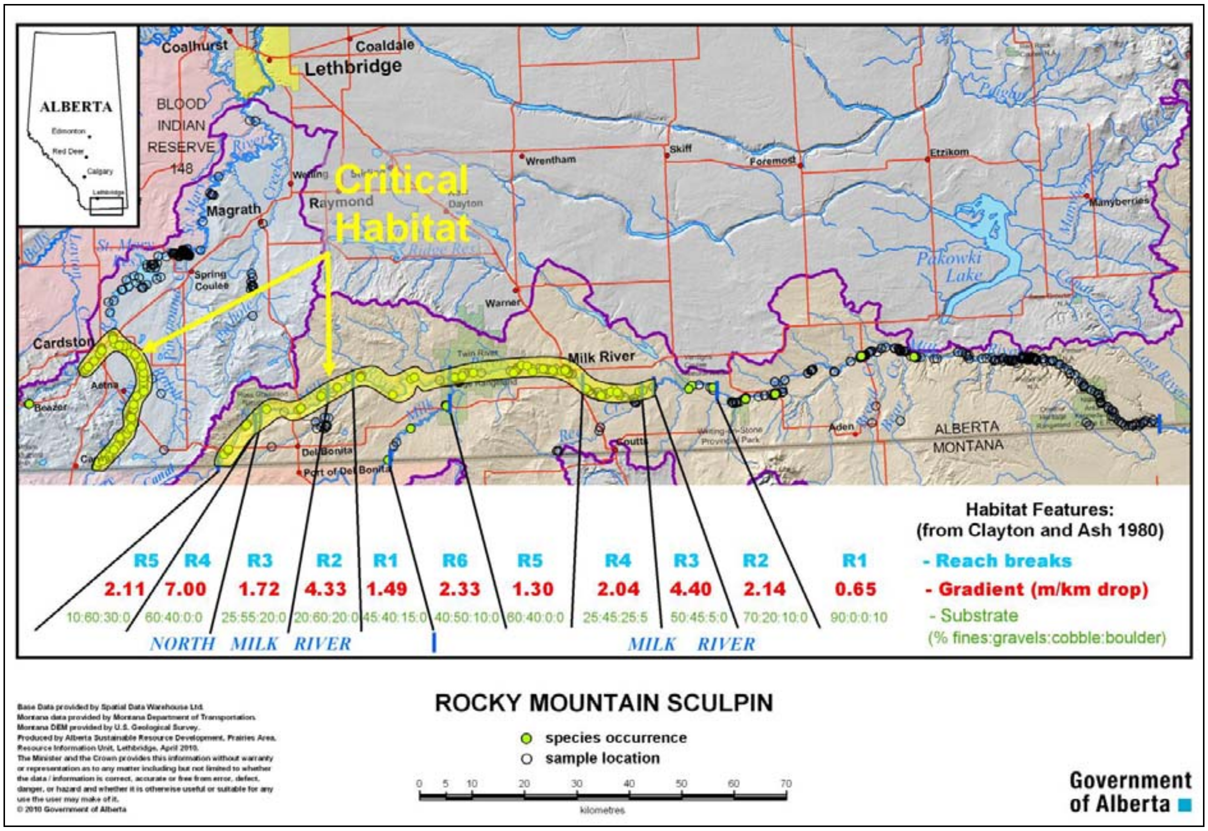

Figure 5. Critical habitat for the Rocky Mountain Sculpin in Alberta.

7.1.3 Identification of Critical Habitat: Biophysical Functions Features and Their Attributes

Information on some key aspects of the life history and biology of the Rocky Mountain Sculpin is limited. Table 14 summarizes available knowledge on the essential functions, features and attributes for each life-stage. Refer to Section 4.3.1 (Biology and Life History) for full references. Areas identified as critical habitat must support these features.

Table 14 General description of essential functions, features and attributes of critical habitat for each life stage of the Rocky Mountain Sculpin

Life Stage	Habitat Requirement (Function)	Feature(s)	Attribute(s)
Larvae to Young of the Year (Age 0+)	• Rearing/Nursery	• Riffle and runs	• Depth 10-75 cm • Velocity 0.1-0.5 m/s • Substrate, gravel • Temperature ranging 7.8-17.2°C.
Juvenile (Age 1-3)	• Feeding and cover	• Riffles and runs	• Depth 20-80 cm • Velocity 0.5-1.1 m/s • Substrate, gravel, and cobble
Adult (Age 3+)	• Spawning (mid May to June) • Feeding and cover	• Riffle and runs	• Temperatures between 7.5 and 12.8 °C. • Substrate cobble to boulder • Aquatic vegetation, large woody debris) • Depth 25-80 cm • Velocity 0.6-1.1 m/s • Substrate, gravel, and cobble

Habitat that falls outside the definition above may also be recommended as critical in subsequent action plans if it is known to provide a critical function as per the description of habitat in SARA. The ranges of attributes in table 14. are optimal for the Rocky Mountain Sculpin. The species is not limited to these areas and may and are known to occur outside of these areas throughout their distribution.

Studies to further refine knowledge on the essential functions, features and attributes for various life-stages of the Rocky Mountain Sculpin are described in section 7.2 (Schedule of studies to identify critical habitat).

7.2 Schedule of Studies to Identify Critical Habitat

This recovery strategy includes an identification of critical habitat to the extent possible, based on the best available information. Further studies are required to identify and/or refine additional critical habitat necessary to support the population and distribution objectives for the species as per Table 15 below.

Table 15 Schedule of Studies to identify or refine Critical Habitat

Description of Study	Rationale	Timeline
Conduct studies to identify and characterize habitat use by life stage of Rocky Mountain Sculpin.	There is limited information known about the reproductive strategy of adults or specific habitat needs for early life-stages. This work will help refine critical habitat and will specifically link habitat use to life stage.	2012-2015
Movement studies	The seasonal movements and area required by individual fish are unknown. These studies will determine the extent of movement for this species, particularly for spawning and overwintering purposes and the potential to re-colonize habitat. They may also help refine areas of critical habitat by clearly identifying distribution	2012-2015

These studies are designed to provide a more complete picture of the critical habitat requirements of the Rocky Mountain Sculpin. A precautionary approach to the identification of critical habitats was utilized to help meet the population and distribution objective until a more comprehensive analysis has been completed. The prescribed schedule of studies is, of necessity, a long term planning document and will be revised periodically or refined on an ongoing basis as further information warrants.

7.3 Examples of Activities Likely to Result in the Destruction of Critical Habitat

The definition of destruction is interpreted in the following manner:

> "*Destruction of critical habitat would result if any part of the critical habitat were degraded, either permanently or temporarily, such that it would not serve its function when needed by the species. Destruction may result from single or multiple activities at one point in time or from cumulative effects of one or more activities over time*."

Under SARA, critical habitat must be legally protected from destruction once it is identified. This will be accomplished through a s.58 Order, which will prohibit the destruction of the identified critical habitat.

The activities described in the table below are neither exhaustive nor exclusive and have been guided by the General Threats described in section 4.1 of the recovery strategy for the species. The absence of a specific human activity does not preclude, or fetter the department's ability to regulate potential impacts pursuant to SARA. Furthermore, the inclusion of an activity does not result in its automatic prohibition since it is destruction of critical habitat that is prohibited not the activity. Since habitat use is often temporal in nature, particularly in fluvial systems like southern Alberta, the potential of destruction of critical habitat is assessed on a case-by-case basis and site-specific mitigation is applied. In every case where projects are proposed in areas of critical habitat, sufficient lead time and baseline information will be necessary to better inform management and regulatory decision-making.

Table 16 Examples of activities likely to result in the destruction of critical habitat for the Rocky Mountain Sculpin

Threat	Activity	Affect – Pathway	Function Affected	Feature Affected	Attribute Affected
Habitat Loss or Degradation	Dam Construction (water impoundment or reservoir creation)	Large-scale loss of habitat (change from riverine to reservoir)	• Spawning • Rearing/nursery • Feeding and cover	Riffles and runs	• Depth • Velocity • Substrate • Temperature
Habitat Loss or Degradation	Dam Operation (flow modification)	Reduction in available habitats	• Spawning • Rearing/nursery • Feeding and cover	Riffle and runs	• Depth • Velocity • Substrate • Temperature
Habitat Loss or Degradation	Water withdrawal	Reduction in available habitats	• Spawning • Rearing/nursery • Feeding and cover	Riffles and runs	• Depth • Velocity • Temperature
Point Source Pollution	Release of harmful substances	Reduction in available habitat (e.g. loss of interstitial spaces)	• Rearing/nursery • Feeding and cover	Rifles and runs	• Substrate • Temperature

8. MEASURING PROGRESS

Upon completion of this recovery strategy, the Rocky Mountain Sculpin Recovery Team may meet periodically or at such as time when new information is available. At that time, the performance and implementation of the recovery strategy and the development of any associated action plans for achieving the stated population and distribution objective will be considered and or reviewed. During the fifth year, the overall recovery strategy will be re-visited to determine whether:

- the population and distribution objective is still valid or need to be amended or;
- a fundamental change in approach to addressing the population and distribution objective may be warranted.

Any recommendations by the Recovery Team will be forwarded to DFO and ASRD through the respective chairs. Evaluations shall be based on the comparison of specific performance measures to the stated recovery objectives. Whenever possible, scientific studies will also be peer reviewed.

9. STATEMENT ON ACTION PLANS

The recovery strategy for the Rocky Mountain Sculpin shall be complemented by subsequent development of an action plan or action plans which will detail actions to be done, and shall be completed in 2013. To ensure continuity and efficiency, the current recovery team will provide advice towards the development of an action plan by Alberta and DFO. The action plan will be reviewed on a five-year basis or as needed to respond to new information.

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12. GLOSSARY

Anoxia is the absence of oxygen, which is necessary to sustain most life. In aquatic ecosystems, this refers to the absence of dissolved oxygen in water.

Bankfull channel is the maximum width the stream attains and is typically marked by a change in vegetation, topography, or texture of sediment.

Benthic organisms live in, on, or near the bottom of a waterbody.

Biota is the animal and plant life of an area.

Ephemeral streams flow when there is runoff from snowmelt or precipitation but otherwise remain dry.

Fish habitat, as it is defined under the *Fisheries Act*, includes “the spawning grounds and nursery, rearing, food supply and migration areas on which fish depend directly or indirectly in order to carry out their life processes.”

Habitat deterioration occurs when fish habitat is altered and fish health or production is adversely affected.

Habitat loss occurs when fish habitat is altered until it can no longer support fish.

Lentic habitats are those with still water such as lakes, ponds, swamps, and reservoirs.

Lotic habitats are those with flowing water such as rivers and streams.

Polygamous males mate with more than one female at a time.

Riparian zone the vegetated corridor along the banks of streams and rivers.

A subpopulation consists of individuals that are isolated from the rest of the population. A population can consist of many subpopulations.

A Threatened species is likely to become endangered (i.e. at imminent risk of extinction or extirpation) if limiting factors are not reversed; or is, because of low or declining numbers, particularly at risk if the factors affecting its vulnerability are not reversed.

Total length (**TL**) is the distance from the tip of the snout to the tip of the tail.

Unit conversions:
1 km = 1000 m = 0.6214 miles
1 km^2 = 100 hectares = 247.1 acres
1 m^3 = 0.001 dam^3 = 35.31 ft^3 = 0.000810713 acre-ft
1 m^3/s = 35.31 cfs

APPENDIX A: EFFECTS ON THE ENVIRONMENT AND OTHER SPECIES

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that strategies may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

The recovery strategy will likely have positive impacts on other fish species. In the Milk River this would include the Western Silvery Minnow (*Hybognathus argyritis*) and the Stonecat (*Noturus flavus*), which are both considered “Threatened” in Alberta. The Western Silvery Minnow was listed as “Threatened” under SARA in 2003 with a recovery strategy completed in 2007 (Milk River Fish Species at Risk Recovery Team 2007). The recovery strategies for these species complement each other and provide for efficiencies in implementing many of the required recovery actions. In the St. Mary River, Bull Trout (*Salvelinus confluentus*) is considered “Sensitive” in Alberta and may benefit from any strategies designed to protect the Rocky Mountain Sculpin. Measures directed at maintaining stream flows, preventing habitat destruction and avoiding species introductions should benefit these and other species in both river systems.

APPENDIX B: RECORD OF COOPERATION AND CONSULTATION

The Rocky Mountain Sculpin, Eastslope populations, Recovery Team was formed in 2006. It continued the work begun by the Milk River Fish Species Recovery Team, which was organized in 2004 to develop a recovery strategy for the Western Silvery Minnow (*Hybognathus argyritis*) and to initiate recovery efforts for other potential "species at risk", including the Rocky Mountain Sculpin, Eastslope populations. The Rocky Mountain Sculpin, Eastslope populations, Recovery Team was tasked with developing a recovery strategy that would consider both the St. Mary and Milk river watershed populations, and satisfy both federal and provincial requirements. The team represented a broad range of conservation, regulatory and stakeholder interests, with membership from Fisheries and Oceans Canada; Alberta Sustainable Resource Development; Alberta Environment; the Milk River Watershed Council of Canada (MRWCC); the Southern Alberta Environmental Group; the Milk River Ranchers' Association; the Counties of Cardston, Forty Mile and Warner; the Villages of Coutts and Warner; and the Town of Milk River. All recovery team meetings were held in Lethbridge, Alberta. The Recovery Team also benefited from the participation of Annabelle Crop Eared Wolf of the Blood Tribe at the first meeting.

Previously, letters and plain language summaries of the proposed recovery strategy and factsheets were sent to two offices of the Métis Nation of Alberta. To date no comments have been received.

Concurrent with posting of the proposed recovery strategy on the SARA Public Registry, announcements will be placed in local newspapers inviting public comment. In addition, information packages will be forwarded to specific stakeholders with an identified interest in the recovery strategy including resource users, non-government organizations, local Aboriginal groups and local government inviting their comment. All comments received will be considered prior to posting of the final recovery strategy.