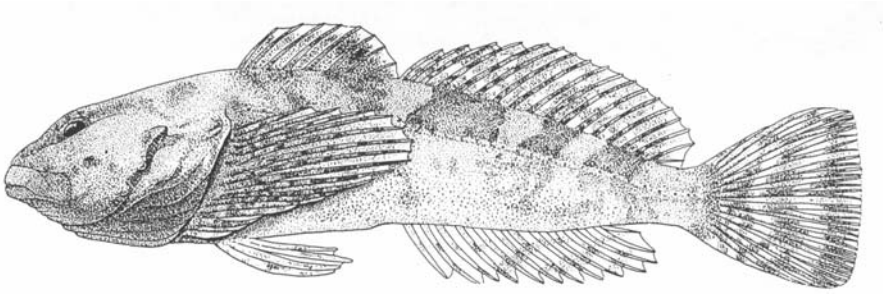
COSEWIC
Assessment and Status Report

on the

"Eastslope" Sculpin
Cottus sp.

in Canada

St. Mary and Milk River populations



THREATENED
2005

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur le chabot du versant est (populations des rivières St. Mary et Milk) (*Cottus* sp.) au Canada.

Cover illustration:
"Eastslope" sculpin — Illustration of *cottus bairdii* (after Bailey and Dimick, 1949 from Peden 2000 by permission).

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COSEWIC
Assessment Summary

Assessment Summary – May 2005

Common name
"Eastslope" sculpin (St. Mary and Milk river populations)

Scientific name
Cottus sp.

Status
Threatened

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.

Occurrence
Alberta

Status history
Designated Threatened in May 2005. Assessment based on a new status report.

COSEWIC
Executive Summary

"Eastslope" Sculpin

St. Mary and Milk River populations
Cottus sp.

Species Information

The “Eastslope” sculpin is a small freshwater sculpin found in Canada only in the St. Mary and Milk River systems of Alberta, and perhaps the Flathead River of British Columbia. The taxonomy of this fish has been in dispute, but efforts to resolve the situation are underway. The most recent genetic and morphological findings suggest that the “Eastslope” sculpin is a new species, which is in the process of being formally described. The St. Mary and Milk River populations comprise a designatable unit and the Flathead population may comprise another, though the latter is not assessed in this report.

Distribution

“Eastslope” sculpin are found in the Milk and St. Mary rivers in Alberta and Montana, as well as in the Flathead River in B.C. Regardless of taxonomy, the “Eastslope” sculpin has an extremely limited distribution in Alberta. Its presence in the St. Mary River above the St. Mary Reservoir and in the Milk River appears to be limited in part by its preference for cooler water temperatures and clean rocky substrates, and within these systems, it is the only sculpin species present.

Habitat

“Eastslope” sculpins are found in moderately cool streams with riffle habitat, rocky or gravel substrate and slow to fast currents, and were usually absent from pools where bottoms were entirely sand or clay. The greatest alterations to sculpin habitat in the St. Mary and Milk rivers are related to water diversions, reservoirs and water removal for irrigation. These factors, in combination with the frequent droughts experienced in southern Alberta, seriously affect the availability of sculpin habitat. Little of the area occupied is under public control, and protection measures would depend on legislation and regulation designed for habitat protection.

Biology

Life history information for the “Eastslope” sculpin is extremely limited, and much of the information available is based on a limited number of studies of *Cottus* populations

from other western systems. The only study to specifically describe the life history of this sculpin in Alberta noted that all *Cottus* species in Alberta, including the “Eastslope” sculpin, spawned during the late spring. The fecundity of sculpin specimens collected from the Milk and St. Mary rivers generally ranged from 100 to 250 eggs; eggs likely hatch within 2 to 3 weeks, and young of the year reach 30-40 mm in total length by the end of their first summer. Both sexes are believed to be sexually mature at the age of 23 months. Aquatic insect larvae appear to make up the majority of the diet, but molluscs, fish, and even sculpin eggs may also contribute. Neither juvenile nor adult “Eastslope” sculpin appear to undergo extensive migrations.

Population Sizes and Trends

The “Eastslope” sculpin appears to be locally abundant where it is present, but its distribution has changed in the Milk River system since it was first observed in the 1960s. It appears to have expanded downstream in the Milk River over time, although it remains absent in the furthest downstream sections. It has apparently been extirpated in the upper Milk River since it was documented there in the mid-1980s. No changes have been observed in its distribution in the St. Mary River, where it is currently found only above the St. Mary Reservoir.

Limiting Factors and Threats

Water removal, diversions and reservoirs associated with irrigation, in combination with the frequent droughts of southern Alberta, have likely had the greatest impact on population size and distribution over time and will continue to be the greatest threats to the existence of the species in Alberta.

Special Significance of the Species

This genetically distinct sculpin represents an important component of the genetic diversity found in the western sculpin complex and deserves a high level of protection.

Existing Protection and Other Status Designations

The “Eastslope” sculpin has been approved for listing as threatened (as of June 2004) under the *Alberta Wildlife Act*. In view of its extremely limited distribution in Alberta, a provincial management plan was developed in the 1990s to aid in protecting existing populations. More recently, the Fish and Wildlife Division of Alberta Sustainable Resource Development commissioned surveys in the Milk River (2000 to 2002) to help determine the status of several non-game fish species, including the “Eastslope” sculpin, and to provide recommendations with regards to protection.

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government members and the co-chairs of the species specialist and the Aboriginal Traditional Knowledge subcommittees. The Committee meets to consider status reports on candidate species.

DEFINITIONS (NOVEMBER 2004)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and it is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.
** Formerly described as “Not In Any Category”, or “No Designation Required.”
*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

COSEWIC Status Report

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2005

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SPECIES INFORMATION

Name and classification

Class:	Actinopterygii
Order:	Scorpaeniformes
Family:	Cottidae
Genus:	*Cottus*
Species:	*Cottus* sp.
Scientific name:	*Cottus* sp.
Common names:	
English	"Eastslope" sculpin (provisional; the quotations are used to indicate the provisional nature of the name.)
French	chabot du versant est

Description

The morphology of sculpins is distinct, reflecting the bottom-dwelling nature of species of this family. They are large-headed and heavy-bodied fish (Figure 1) with a body that tapers from the head to the tail, and lack an air bladder (Peden 2000, 2001). The dorsal and pelvic fins have protective spines (Scott and Crossman 1973). The maximum fork length (FL – straight-line distance from the tip of the snout laterally to the central margin of the tail fin) recorded for the sculpin in Alberta is 114 mm from the Milk River (R.L. & L. 2002).

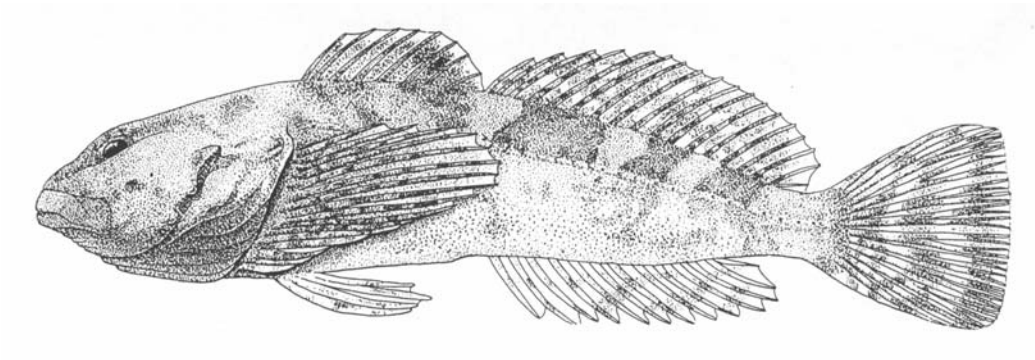

Figure 1. Illustration of *Cottus bairdii* (after Bailey and Dimick, 1949 from Peden 2000 by permission).

The mottled sculpin (*C. bairdii*) and the shorthead sculpin (*C. confusus*) are morphologically distinct from other sculpins in Canada based on several features (summarized in Peden 2001). These features include the following: (1) no prickles covering the entire body (i.e., only found behind the pectoral fin); (2) well-developed pelvic fin rays; (3) vomerine and palatine teeth; (4) 11-15 anal fin rays and 13-16 pectoral fin rays; and (5) an upper preopercular spine not strongly hooked. However, the two species are very difficult to differentiate from one another visually, and a

combination of several morphological features is required to distinguish them in western Canada. Large shorthead sculpins do not have papillae on the top of their heads. In general, they have fewer pectoral fin rays (13 versus 15), reduced preopercular spines (2 versus 3), and fewer lateral line pores (average of 23-25 versus 27-29) than mottled sculpins. A live specimen of the shorthead sculpin is noticeably more slender, often uniformly dark and appears smooth in texture with a shorter head (Peden 2001). In addition, the lateral line of the shorthead sculpin does not extend into the base of the tail fin (i.e., does not usually reach the fin rays). In comparison, the mottled sculpin is broader across the gill area and mottled in pigment with more visible papillae on the top of the head of larger specimens (Peden 2001).

Significant variation for these morphological features also exists within western mottled sculpins throughout their range, making the classification of specific populations of these sculpins even more difficult. Two forms of mottled sculpin had previously been described in western Canada, including the Columbia mottled sculpin [now recognized as the Columbia sculpin, *C. hubbsi*, Bailey and Dimick 1949 (Nelson *et al*. 2004)], which is endemic to the Columbia Basin, and a Rocky Mountain form most closely allied with the sculpin found in the St. Mary and Milk rivers, provisionally, *C. bairdii punctulatus* Gill (Troffe 1999; Peden 2000). A recent morphological study on western Canadian mottled sculpins described populations from the Flathead River in British Columbia and the St. Mary River as the Rocky Mountain form (Troffe 1999). The Rocky Mountain form is distinguished from the Columbia sculpin based on several morphological features (Troffe 1999; Peden 2000). The Columbia sculpin has a complete lateral line with an average of 29 ± 3 pores, and prickles are present behind the pectoral fin. In contrast, the lateral line of specimens from the Flathead and St. Mary rivers is not complete, with an average of 22 ± 3 pores, and prickles behind the pectoral fin are absent (Troffe 1999; Peden 2000).

Taxonomy

The taxonomy of sculpins in western Canada is complex and unresolved. This fish was first recognized as the mottled sculpin, *C. bairdii* Girard, in the late 1960s (summarized by Nelson and Paetz 1992), but later described as the shorthead sculpin, *C. confusus*, based on morphological studies (Roberts 1988). Peden *et al*. (1989) described two forms of *C. confusus* from British Columbia; one from the Flathead system and another from the Columbia and Kettle rivers. The form found in the Flathead system is similar to that of the St. Mary-Milk rivers, and the other resembling those described as shorthead sculpin by Bailey and Bond (1963) is now recognized as a new species, *Cottus hubbsi* (Nelson *et al*. 2004). Some researchers (Troffe 1999; Peden 2000; D. McPhail, Professor Emeritus, Department of Zoology, University of British Columbia, Vancouver, BC; personal communication 2003) suggested that this fish was an unrecognized taxon within the western *Cottus bairdii* complex and should not be confused with the shorthead sculpin (*C. confusus*) found elsewhere.

Recent morphological and genetic data suggested that the sculpin in the St. Mary and Milk rivers may be the same species as that found in the Flathead River in

British Columbia (Figures 2, 3), as well as the one found in the upper Missouri River system (Troffe 1999; Peden 2000; McPhail pers. comm.). More recently, Neely (D.A. Neely, Post Doctoral Research Associate, Department of Biology, Saint Louis University, St. Louis, MO; personal communication 2003) has suggested that this may be a new species that is closely allied with the Rocky Mountain sculpin, *C. bairdii punctulatus* recorded by Bajkov (1927) and Schultz (1941) based on specimens collected from both slopes of the Rocky Mountain region and from Glacier National Park in Montana, respectively. Troffe (1999), Peden (2000) and McPhail (pers. comm.) suggested that the sculpins in the St. Mary and Milk rivers, along with the Flathead populations, should provisionally be identified as *C. bairdii punctulatus*.

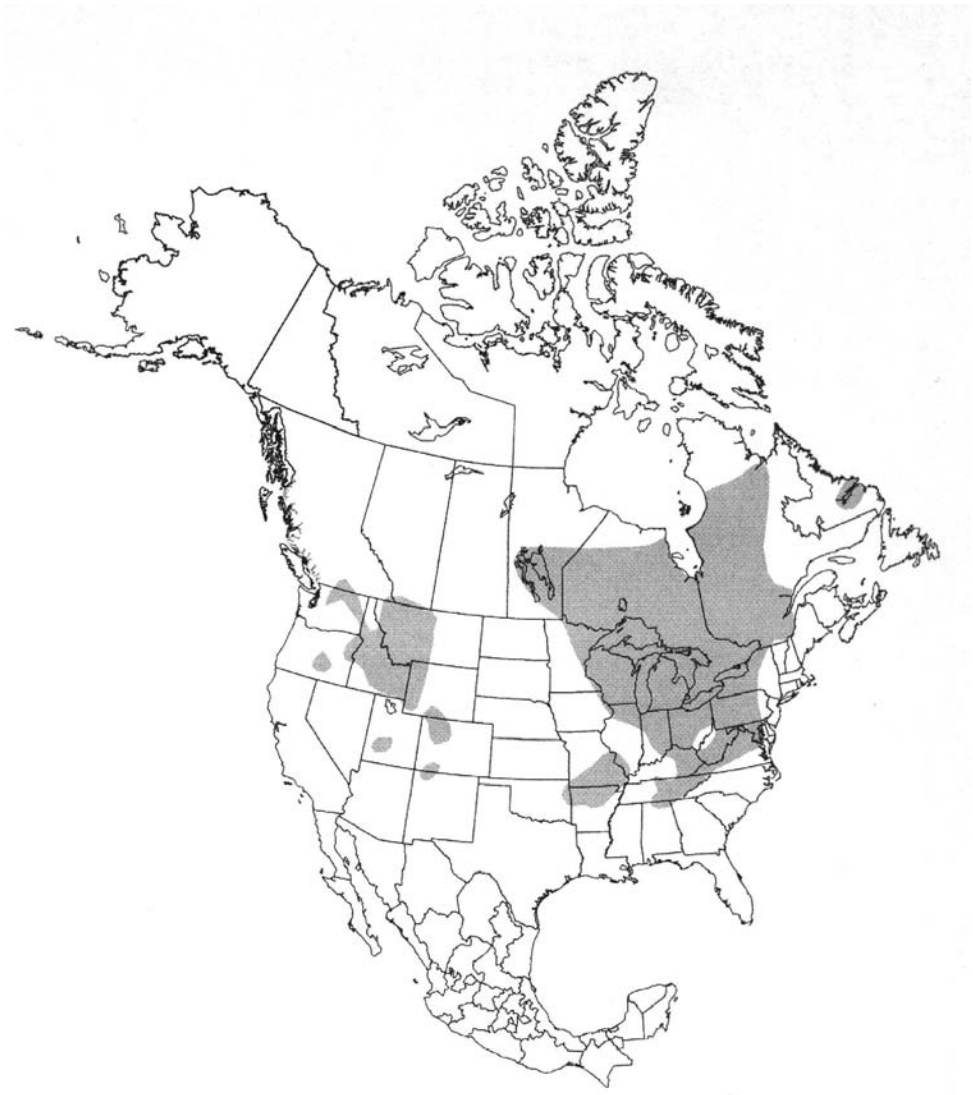

Figure 2. Distribution of mottled sculpins (*Cottus bairdii*) in North America (based on Lee 1980; Peden 2000). Note the disjunct distribution of the eastern subspecies, *C. b. bairdii*, from the western subspecies, *C. b. punctulatus* of the Missouri drainage, and the Columbia sculpin, *Cottus hubbsi*, which are separated by the Continental divide (roughly along the Montana/Idaho border). It now appears that there are no *bairdii* in western North America, and the Missouri form is also a distinct species, provisionally “Eastslope” sculpin, *Cottus* sp.

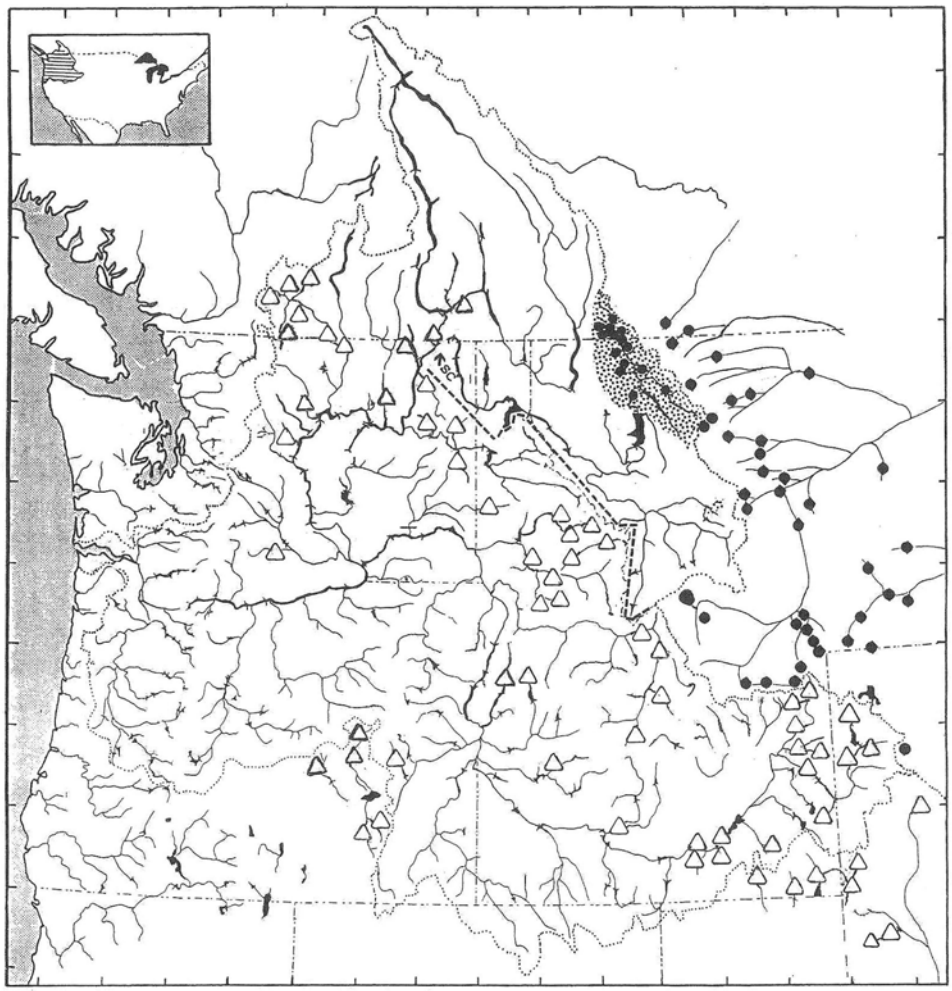

Figure 3. Distribution of mottled sculpins in western Canada. The dots represent collection sites for *C. b. punctulatus* (now provisionally “Eastslope” sculpin, *Cottus* sp.); the shaded area is the Flathead population. Diamonds represent *C. hubbsi* sites.

In terms of genetic characterization, a large geographic (separated by the Great Plains) and molecular genetic gap appeared to separate western and eastern groups of mottled sculpin *C. bairdii*, and the eastern groups appear to be monophyletic (i.e., evolved from one group) (Neely pers. comm.). However, the genetic relationships among western *C. bairdii* and *C. confusus* populations are still in the process of resolution. Peden (2000) used allozyme variation to demonstrate that the Flathead River population of sculpins was actually an unrecognized Canadian taxon, which he provisionally named *C. bairdii punctulatus*, distinct from those of the Columbia system, provisionally named *C. b. hubbsi* (Bailey and Dimick 1949; McAllister and Lindsey 1961; McPhail 2001) and is in agreement with the morphological results reported by Troffe (1999). Most recently, higher resolution molecular genetic results (based on variation in cytochrome *b* and the control region genes found in the mitochondrial DNA) demonstrated that the Flathead

population of sculpins appears to be genetically similar to the St. Mary River (Alberta) and upper Missouri River populations in Montana (McPhail pers. comm.). In addition, these results demonstrated that the Columbia sculpin was quite distinct from the sculpins from the Flathead and St. Mary systems (McPhail pers. comm.). Again, this work supports the morphological work by Troffe (1999). Subsequently, the form in the Columbia River basin has formarlly been recognized as a valid species (*see* Nelson *et al*. 2004), *Cottus hubbsi*, (Bailey and Dimick 1949) based on work by Markle and Hill (2000) supported by the ongoing study of D.A. Neely (pers. comm.).

In a parallel genetic study of western *Cottus* species in the United States, at least five taxa within the former *C. bairdii* complex are believed to occur (Neely 2002; Neely unpublished in preparation; J. Nelson, Professor Emeritus, Department of Biological Sciences, University of Alberta; personal communication 2005). As indicated above, the Columbia sculpin (*Cottus hubbsi*) has already been recognized (Nelson *et al*. 2004) as a new species. According to Neely (2002; Neely, pers. comm. 2005), the upper Missouri River population, and therefore most likely the St. Mary/Milk and Flathead populations, which were provisionally described as *Cottus bairdii punctulatus* (Peden 2000), is also a new taxon, not *Cottus punctulatus*, which is confined to the Colorado River, USA (Nelson, pers. comm. 2005). This new species is provisionally being referred to as the "Eastslope" sculpin, *Cottus* sp., until a formal description is available (Neely, unpublished data, in preparation). It will require a new name, as it has no synonyms (Nelson, pers. comm. 2005). It now appears that there may be no mottled sculpin in western Canada and *C. bairdii* exists only in the east (Nelson, pers. comm. 2005).

Unfortunately, the Canadian and American data sets have yet to be combined, but Neely is in the process of completing this task in his ongoing research. In addition, none of the recent morphological work by Troffe (1999) or genetics work has incorporated any Milk River or Flathead specimens. However, Neely's ongoing research will address these problems, but results are not as yet available. Therefore, it is assumed, based on the earlier morphological data (e.g., Roberts 1988), that the population in the Milk River is the same species as the St. Mary River population.

Designatable units

As discussed above, all researchers currently pursuing the taxonomic questions regarding these taxa concur that the St.Mary-Milk and upper Missouri sculpins represent an unrecognized taxon, provisionally called "Eastslope" sculpin, *Cottus* sp. (Neely 2002; Nelson, pers. comm. 2005). Since the St. Mary-Milk River populations are disjunct and biogeographically isolated [COSEWIC National Freshwater Ecological Areas 4, 7 COSEWIC (2004)] from those of the Flathead system (Area 11), they may be considered a Designatable Unit. The flathead population may comprise another designatable unit, but its status is not assessed in this report.

DISTRIBUTION

Global range

Previously, the mottled sculpin was thought to have a wide but discontinuous distribution in North America (Figures 2, 3), where it was represented by two geographically isolated groups separated by the Great Plains, where it is absent. The eastern group ranges from at least the Tennessee River system in Georgia and Alabama to Labrador on the north, west to the Great Lakes basin. In eastern Canada, the mottled sculpin is found in discontinuous locations in Labrador, Ungava Bay in Quebec west to the Hudson Bay drainages, through the St. Lawrence-Great Lake system and in the James and Hudson Bay drainages of most of Ontario to southern Manitoba (Scott and Crossman 1973; Lee 1980). However, it now appears that there are no "mottled" sculpin, i.e., *Cottus bairdii* in western North America (*see* species Information above).

The distribution of the western group from the Rocky Mountains to the Pacific coast is discontinuous and unclear, particularly in the United States (A. Peden, Liparis Consultants, Victoria, BC; personal communication 2003). In western Canada, two distinct forms of "mottled" sculpin have been identified: (1) the Columbia sculpin, *C. hubbsi*, originally described by Bailey and Dimick (1949); and (2) the Rocky Mountain form, *C. bairdii punctulatus,* found in southeastern British Columbia and southwestern Alberta (Peden 2000).

The Columbia sculpin, designated by COSEWIC as a species of Special Concern in 2000 (Peden 2000), is found only in the western Columbia River system (Figure 2). Specifically, it has been noted in a few systems in southern British Columbia, including the Similkameen River (above Similkameen Falls), Kettle River (below Cascade Falls), various streams tributary to the Columbia River, as well as the lower Kootenay River below Bonnington Dam (Peden 2000). South of the international border, the distribution of the Columbia sculpin is much less well known. It was originally described in the Columbia River system in Washington and Idaho (Bailey and Dimick 1949).

The Rocky Mountain sculpin, *Cottus bairdii punctulatus*, was originally noted in southwestern Alberta in 1925-26 (Bajkov 1927) [however, there is some doubt as to the authenticity of the Bajkov specimen (Nelson and Paetz 1992)] and in the Flathead and upper Missouri River systems in Montana in the late 1930s (Schultz 1941). According to Neely's research (Neely 2002, Neely unpublished*), Cottus punctulatus* is a valid species confined to the Colorado River. As discussed earlier in this report, recent genetic and molecular studies indicate that the form straddling the Continental Divide is also a separate taxon, provisionally named "Eastslope" sculpin, *Cottus* sp. In Canada, the only other known population that appears to share the same taxon as the "Eastslope" sculpin (Figure 4) occurs in the Flathead River in British Columbia (Troffe 1999; Peden 2000; McPhail pers. comm.). Other closely related populations in the United States are found in the upper Missouri River system in Montana and Wyoming (Neely pers. comm.). Interestingly, the Milk, St. Mary and Missouri populations of sculpins on the eastern slopes of the Rocky Mountains are separated from the Flathead population of sculpins

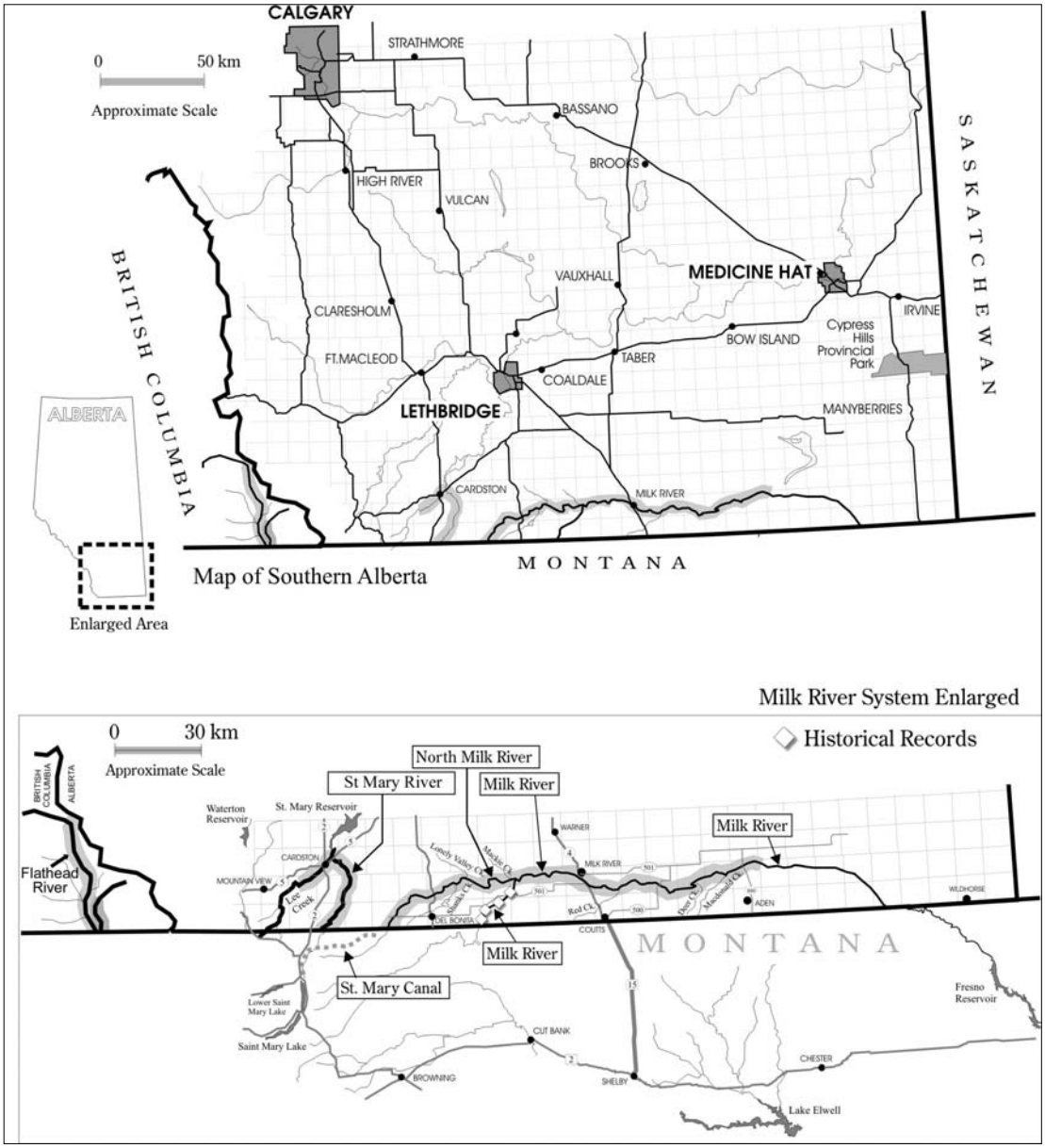

Figure 4. Distribution of the “Eastslope” sculpin in Alberta . Shaded grey line indicates distribution based on recent surveys in the St. Mary and Milk rivers (R.L. & L. 2002; P & E 2002), as well as on earlier studies (R.L. & L. 1987; Paetz 1993) where they agree with the most recent work. Open diamonds indicate sites on the upper Milk River where sculpins were found by Willock (1969), Clayton and Ash (1980), and R.L. & L. (1987), but not in the more recent surveys. The inset illustrates the Flathead River population that appears to be the same taxon (distributional information for these sculpins in the upper Missouri system was not available).

on the western side by the Continental Divide (Peden 2000). This may not be surprising given that the geological evidence suggests that portions of the South Saskatchewan River, including the St. Mary River and portions of the Flathead River, shared post-glacial drainage connections with the upper Missouri River drainage during the retreat of the last glacier approximately 10 000-13 000 years ago (Troffe 1999).

In the western United States (Figure 2), proposed taxa within what was referred to as the the *C. bairdii* complex are found in the Snake River (upstream of Shoshone Falls), specifically the Bonneville Basins, the Malheur Basin in Oregon, and the Colorado River basin (Neely pers. comm.). In addition, disjunct populations are also found in Arizona, New Mexico, Nevada and Missouri (Lee 1980; Peden 2000).

The only likely source of gene flow between the “Eastslope” sculpin in Alberta and populations outside of the province is from the most upstream section of the St. Mary River mainstem that flows through Montana.

Canadian range

The zoogeography of the “Eastslope” sculpin is complex, and theories regarding glacial refugia and dispersal routes vary. The present distribution suggests that this species survived in two, possibly three, refugia (i.e., Missourian, Mississippian and Columbian) [Bailey and Allum 1962; Crossman and McAllister 1986]. The extent of ice coverage during the last glaciation period (which began approximately 18 000 years ago) of the Pleistocene epoch is somewhat uncertain, but it is believed that much of Alberta was covered, with possibly some ice-free areas occurring in southern Alberta (summarized in Nelson and Paetz 1992). Nelson and Paetz (1992) suggested that during that last deglaciation period various post-glacial connections between the Oldman (e.g., St. Mary River) and the Milk drainages may have permitted movement from the Missouri drainage to the Saskatchewan system. Movement of the “Eastslope” sculpin from the Missouri drainage could have occurred during this time. Willock (1969) proposed that the isolated occurrence of the “Eastslope” sculpin outside of the Missouri system in the St. Mary River reflects a post-glacial arrival here, probably occurring fairly recently. An alternative view is that the “Eastslope” sculpin may have entered the Milk River system from the St. Mary River through the irrigation canal system in Montana (Nelson and Paetz 1992, Paetz 1993; W. Roberts, Zoology Museum, University of Alberta, Edmonton, Alberta; personal communication 2003). This movement may happen annually and could stimulate the apparent downstream expansion of sculpins observed in the Milk River over a recent 20-year span (Paetz 1993). Several other upper Milk River fish species are also found in the St. Mary River (T.B. Clayton, Sustainable Resource Development, Lethbridge, Alberta; personal communication 2003). Given this observation, and the unresolved taxonomy of the “Eastslope” sculpin, it is impossible to determine whether the sculpin expanded from the St. Mary River to the Milk River or from the Milk River into the St. Mary River. Crossman and McAllister (1986) proposed that the present-day occurrence of species such as the “mottled” sculpin might depend on the availability of deeper, colder water habitat rather than be explained just based on refugia. Therefore, the current distribution of the “Eastslope” sculpin may be explained by its preference for colder waters upstream, in addition to movement by way of irrigation canals and reservoirs and post-glacial dispersal.

Extensive fish sampling since the 1960s has delineated a fairly well defined distribution range for the “Eastslope” sculpin in Alberta. The “Eastslope” sculpin was first identified (as *C. bairdii*) in the Milk River in 1966 (University of Alberta Zoology Museum

record 3771). Its presence in Alberta appears to be limited to the St. Mary River above the reservoir and to the North Milk River and Milk River mainstem, except for the furthest downstream section (i.e., the lowermost 85 km in Alberta) (Roberts 1988; Nelson and Paetz 1992; Paetz 1993; *see* Figure 4). This distribution is primarily within the Dry Mixedgrass, as well as the Mixedgrass and Foothills Fescue subregions of Alberta (ANHIC 2002a). The Dry Mixedgrass Subregion is considered the driest area in the province, with the warmest summers, cold winters and extreme variability in the amount of annual precipitation (ANHIC 2002a).

The earliest published study within the Milk River found the "Eastslope" sculpin only in the upper reaches of the North Milk River and at the international border in the upper Milk River above the confluence with the North Milk River (Willock 1969). A later study also documented the presence of sculpins at three locations in the upper Milk River (Clayton and Ash 1980). In 1986, a survey documented the sculpin throughout the North Milk River as far downstream as a site approximately 100 km upstream of the international border and at one upstream site in the upper Milk River (R.L. & L. 1987). Paetz (1993) confirmed the sculpin's presence in the North Milk River and mainstem, but for the first time noted an absence in the upper Milk River. He believed that the sculpins in the Alberta portion of the upper Milk River had been extirpated as a result of the depletion of water flows south of the international border in Montana. Water withdrawal for irrigation is unregulated there (Clayton pers. comm.). Furthermore, comparisons of the earliest work (Willock 1969) with work conducted in 1979 (Clayton and Ash 1980) suggest that sculpins occurred some 130 km further downstream in the later study.

Most recent assessments have found that the "Eastslope" sculpin is widely distributed throughout most of the North Milk River and Milk River mainstem, except for the lowermost section (0-85 km upstream of the international border) where it is absent (R.L. & L. 2002) (Figure 4). This is consistent with earlier studies (Clayton and Ash 1980, R.L. & L. 1987; Paetz 1993), suggesting that the distribution in these sections has not changed in recent years, with the exception of the upper Milk River above the confluence with the North Milk River. Studies in 2000-2001 found this section of the Milk River dry as a result of severe drought conditions and the operation of the St. Mary Canal (R.L. & L. 2002), reflecting findings similar to Paetz (1993).

With regards to the St. Mary River, provincial fisheries' catch records prior to 1980 did not document any "Eastslope" sculpins downstream of the St. Mary Reservoir (summarized in Paetz 1993). Paetz (1993) confirmed the sculpin's presence in the St. Mary River above the reservoir and in the lower 10 km of Lee Creek. He also noted its absence in the St. Mary River downstream of the reservoir and in upper Lee Creek, as well as the Belly, Waterton and Oldman rivers. Similarly, the "Eastslope" sculpin has not been observed in the reservoir (Clayton pers. comm.; Roberts pers. comm.). The St. Mary Reservoir is likely a major obstacle to downstream dispersal of sculpins in the St. Mary River (Paetz 1993). Paetz (1993) suggested that the absence of sculpins downstream of the reservoir reflected a relatively recent movement of the "Eastslope" sculpin into Alberta waters. However, it has also been suggested that the "Eastslope"

sculpin likely did occur downstream of the reservoir before its construction and that current habitat conditions (e.g., silty substrate) have resulted in its extirpation here (Roberts pers. comm.). Unfortunately, no historical records are available to support either hypothesis. The recent studies conducted in 2000 also found the “Eastslope” sculpin to be common throughout the entire section of the St. Mary River above the St. Mary Reservoir to the international border (R.L. & L. 2002) (Figure 4). However, in Lee Creek, a major tributary of the St. Mary River, distribution was limited to the lower sections, with the uppermost extent found 6 km upstream of the settlement of Cardston (R.L. & L. 2002).

Overall, the “Eastslope” sculpin occupies approximately 80 km of stream in the St. Mary system and 220 km of stream (with a probable maximum width of 0.02 km) in the Milk River in Alberta (Paetz 1993). However, habitat availability within these lengths can vary significantly depending on water flow, particularly in the Milk River, where availability becomes significantly reduced during periods of extreme drought when certain sections are completely dry. Some changes in distribution appear to have occurred in the Milk River since the 1960s, with significant downstream expansion in the mainstem, and extirpation in the upper Milk River as a result of the consistent lack of adequate water flow. In contrast, no changes in distribution are apparent in the St. Mary River, but the possibility exists that sculpins were present downstream of the reservoir before its construction.

No genetic or movement data are available to describe population substructure or the number of genetically discrete populations that may exist in Alberta. However, some postulations can be made based on other studies and knowledge of the river systems. Peden (2000) noted fairly small-scale differences among populations for both “mottled” and shorthead sculpins in British Columbia, suggesting little gene flow even among small tributaries within drainage. In addition, Bailey (1952) noted very little movement for tagged *C. bairdii punctulatus* in Montana over a period of one year. It is now generally agreed that the Bailey (1952) reference is to the same taxon (S. Pollard, BC Ministry of Water, Land and Air Protection, personal communication 2005). Conservatively, there may be at least two genetically distinct populations of “Eastslope” sculpin: one in the St. Mary River immediately upstream of the St. Mary reservoir, and one in the Milk River system that is similar to the St. Mary River in Montana upstream of the St. Mary Canal intake. Some movement of larvae from the upper St. Mary River in Montana to the furthest downstream section immediately above the reservoir is possible but probably limited, allowing for some genetic isolation. The St. Mary Canal becomes operational during the spring high flows and it is at this time that some sculpin larvae are likely drawn downstream through the canal into the North Milk River, resulting in an annual influx of genetic material (Paetz 1993; Clayton pers. comm.).

Based on genetic and movement studies of this and closely related sculpins (Bailey 1952; Peden 2000, 2001), it is likely that some sub-structuring within the St, Mary and Milk rivers occurs. Lee Creek, St. Mary River and North Milk River (below the confluence with the North Milk) all contain some water year-around and thus can sustain sculpin populations.

HABITAT

Habitat requirements

Sculpins are nocturnal and tend to remain under cover (usually rocks) during daylight hours (McPhail 2001). “Mottled” sculpins are found in moderately cool streams with riffle habitat, rocky or gravel substrate and weak to fast currents (Peden 2000). An older study by Bailey (1952) on the Rocky Mountain sculpin (*C. bairdii punctulatus*), which may be the same taxon as the “Eastslope” sculpin (*see* Taxonomy above), in southwestern Montana also found these fish to be most abundant in riffle habitat where rubble and boulders were predominant and provided refuge. They were usually absent from pools where bottoms were entirely sand or clay (Bailey 1952). Little information is available regarding temperature preferences for western “mottled” sculpins, but shorthead sculpin populations were found to inhabit streams with spring and summer temperatures averaging 15^{o}C (range 8^{o}C-21^{o}C) in Oregon (Bond 1963), and in streams with summer temperatures of 12^{o}C to 18^{o}C and winter temperatures of 0^{o}C to 4^{o}C in British Columbia (Peden 2000).

The only study describing spawning habitat was for the Rocky Mountain sculpin in southwestern Montana (Bailey 1952). Nests consisted of holes under rocks that ranged from 0.12 m to 0.38 m in diameter. Eggs were usually attached to rocks, but other substrates including aquatic vegetation, wood and other debris were also utilized (Bailey 1952). Water depth of nests was over 0.3 m, and surface water velocities ranged from 0 m/s to 1.6 m/s.

Since the 1960s, a number of studies on the St. Mary and Milk rivers have described the habitat features preferred by the “Eastslope” sculpin. Willock (1969) stated that the colder temperatures and increased water clarity in the upper Milk River accounted for the presence of species such as the “Eastslope” sculpin. These characteristics are associated with higher rainfall, higher elevation and gradient, more vegetation and less erosion because of the presence of more resistant sandstone substrate in the upstream reaches of the Milk River compared to further downstream reaches (Willock 1969). In particular, Willock (1969) stated that water temperature was the single most important factor affecting sculpin distribution in the Milk River. In addition, he found that sculpins were most numerous in sections of the Milk River with little or no current, and were at least as common at creek mouths as in the mainstem proper. Similarly, Paetz (1993) noted that sculpins in the North Milk River and the St. Mary River were most common in silt-free rocky substrate near the stream margin where currents were slower, whereas no sculpins were found in the main river current. In Lee Creek (a tributary of the St. Mary River), sculpins appeared to prefer the slightly silty stream margins where currents were slower, compared to the mid-creek section, which was silt-free but had higher velocity (Paetz 1993). Paetz (1993) also noted that sculpins used areas where instream sedges and bankside shrubs trailed in the slower current in the middle Milk River if rocky substrates and cobbles were absent, particularly near the Town of Milk River. Other habitats utilized consisted of debris anchored by an obstruction such as a root in the streambed. Clayton and Ash (1980) noted that the “Eastslope” sculpin appeared to prefer clean substrates, but lower numbers were also found in quiet pools with silty substrate.

A detailed habitat evaluation for the “Eastslope” sculpin was conducted in 2000-2001 in the St. Mary and Milk river systems (R.L. & L. 2002). Some variability in habitat selection appeared to be drainage-specific and dependent on habitat type availability, as well as water levels. In general, sculpins were present predominantly in shallow runs and riffles, as well as run/boulder gardens (larger boulders providing in-stream cover). A statistical analysis of microhabitat characters found that rather than being associated with a particular type or range of character values, the “Eastslope” sculpin appeared to be more of a generalist (R.L. & L. 2002). However, water depths in capture locations tended to be shallow (range 0.05-0.42 m, mean of 0.19 m), and velocities were low (range 0-0.6 m/s, mean of 0.22 m/s). Silt depths tended to be low (range 0.0-0.02 m deep), rock was the predominant cover type (10%-40%), turbidity was low (range 0-5%), and substrate consisted mainly of gravel and cobble (R.L. & L. 2002).

Little information is available regarding habitat features associated with any life history stage for the “Eastslope” sculpin. Spawning, rearing and feeding habitats are not believed to be limited throughout the St. Mary River or the upstream sections of the Milk River where sculpins are found (R.L. & L. 2002). Interestingly, Willock (1969) noted a disproportionately large number of young sculpins in muddy areas with little gradient in the Milk River, suggesting that these areas might be used for rearing. A similar observation was made by Bailey (1952), who noted that some small specimens of Rocky Mountain sculpin were found in quiet waters near the shore. He proposed that these small sculpins could stir up clouds of silt for cover. Overwintering habitat is also believed to be well represented in both river systems, provided that adequate water flow is available (R.L. & L. 2002).

Trends

The greatest alterations to sculpin habitat in the St. Mary and Milk rivers are related to water diversions, reservoirs and water removal for irrigation. These factors, in combination with the frequent droughts experienced in southern Alberta, seriously affect the availability of sculpin habitat. The construction of the St. Mary Reservoir, completed in 1951 (Clayton pers. comm.), significantly altered the type of habitat available to fish species in the St. Mary River (*see* Figure 4 in Distribution section for dam location). Currently, “Eastslope” sculpins are not known to be present in the reservoir or downstream of the reservoir (Roberts pers. comm.; Clayton pers. comm.). Although it is not known whether they once inhabited these sections, future expansion into downstream habitats is not possible because of the presence of the dam. Furthermore, the absence of sculpins in the reservoir suggests that conditions (i.e., temperature regimes and bottom type) here are unfavourable.

The biggest alteration to habitat in the Milk River occurred after 1917 when the St. Mary Canal was constructed in Montana to divert water from the St. Mary River to the North Milk River for irrigation purposes. In most years, the canal diverts water from April to September, increasing the water volume in the North Milk River and the Milk River proper. Before construction of the canal the Milk River was probably a typical small prairie stream, possibly intermittent in times of drought, and generally less turbid

(Willock 1969). Although the volume of water may have increased downstream of the canal outflow in the North Milk River, this has become a highly managed flow, which may be turned off temporarily or prematurely during the open water months if canal repairs are required. This occurrence, in combination with the drought conditions common to this region, can result in the severe reduction in the availability of sculpin habitat in the Milk River. In addition, the ongoing removal of water in Montana from the upper Milk River, which is above the confluence with the North Milk River, may be partly responsible for the disappearance of sculpins in this upstream section of the mainstem (Paetz 1993). In 2000-2001, the upper Milk River was dry during the summer and fall sampling seasons (R.L. & L. 2002). In fact, this section is often dry during the summer months (Clayton pers. comm.). Any use of this section of river by sculpins is at most temporary. Similarly, the tributaries of the North Milk River are considered ephemeral, and are dry to damp most of the year under average conditions (Clayton pers. comm.).

No other major changes to habitat have been observed since the construction of the St. Mary Reservoir. Instead, the availability of habitat, particularly overwintering habitat in the Milk River, is highly variable from year to year and dependent on adequate water flows. The combination of severe drought conditions and water flow management associated with the St. Mary Canal can lead to extremely low flow conditions, as observed in the late summer and fall of 2000 and 2001 (R.L. & L. 2002). A potential threat to existing sculpin habitat in the Milk River is the recurring (still under consideration) proposal to construct a dam on the Milk River upstream of the Town of Milk River for irrigation purposes. Such a dam would flood approximately 19 km of the North Milk River and 11 km of the Milk River mainstem (R.L.& L. 1987), resulting in approximately 10.5% of existing habitat being lost above the dam, as well as possible effects downstream of the dam (Paetz 1993), such as altered flow, turbidity and temperature levels.

In terms of re-colonization potential, the St. Mary irrigation canal is a probable source of migrants from the upper St. Mary River in Montana to the North Milk River on an annual basis. The suspected eastward expansion of sculpins in the Milk River since the species was first documented in the 1960s (*see* Distribution section) suggests that the “Eastslope” sculpin is capable of expanding into new habitat, particularly into downstream areas. In contrast, Peden (2000) claimed that genetic differences between “mottled” sculpin populations in British Columbia, in combination with a relatively sedentary lifestyle, suggest that dispersal is slow and movement among streams is limited. Given this information, re-colonization of an extirpated population in the North Milk River by annual immigration through the canal from the St. Mary River is probable and could happen relatively quickly (i.e., within an estimated 10 years); however, given recent drought conditions and other factors it is doubtful that this would happen under recent conditions. Re-colonization of the Milk River mainstem from the North Milk River would likely be a slower process (i.e., 10 or more years), based on previous reports documenting changes in distribution (Willock 1969; Clayton and Ash 1980). Natural re-colonization of the Milk River from the upper Missouri system in Montana is not possible given the absence of sculpins in the Milk River downstream of the international border and the presence of six or more impassable dams (Stash 2001). Similarly, natural re-

colonization of the St. Mary River from the North Milk River would likely be impossible given the design of the St. Mary Canal (Clayton pers. comm.).

Habitat protection/ownership

The St. Mary and Milk river habitat is largely under private ownership and none is legally protected. The Crown owns the river-bed, and shores up to 6 ft from the high water mark. Lands bordering the Milk and North Milk rivers are only under 38% private ownership — the remainder is public land, although a good portion of that is under grazing lease. Within the basin itself, probably most of the land is deeded (Clayton. pers. comm. 2005).

Although protection could be available under Fish Habitat sections of the Federal Fisheries Act of 1867 or the provincial Wildlife Act no provisions have been made as yet. A provincial management plan was developed by Paetz (1993) to aid in protecting existing populations. More recently, surveys have been commissioned in the Milk River (2000 to 2002) to help determine the status of several non-game fish species, including the “Eastslope” sculpin, and to provide recommendations with regards to protection (*see* R.L. & L. 2002; P& E 2002).

BIOLOGY

General

Life history information for the “Eastslope” sculpin is somewhat limited, and much of the information available is based on a limited number of studies of *C. bairdii* populations from other western systems. It appears that Bailey (1952) may refer to the same taxon. The only study to specifically describe the life history of the “Eastslope” sculpin in Alberta was conducted by Roberts (1988).

Roberts (1988) noted that all *Cottus* species in Alberta, including the “Eastslope” sculpin, spawned during the late spring. Specifically, he observed male sculpins protecting eggs in Lee Creek, a tributary of the St. Mary River, during mid-May when the water temperature was 15^{o}C (Roberts 1988). He noted that only gravid females (no males were observed protecting nests) were observed in the St. Mary River mainstem when the water temperature was 7.5^{o}C, suggesting a threshold temperature triggering spawning somewhere between 7.5^{o}C and 15^{o}C.

Reproduction

The spawning season for *Cottus* species is highly variable and may range from February to August, depending on location (summarized by Bailey 1952). A fairly detailed study on spawning ecology was conducted for Rocky Mountain sculpin in southwestern Montana by Bailey (1952). In general, males arrived earlier than females at the breeding sites, and were ripe earlier. In addition, these males were considered highly polygamous, usually spawning with 1.5 to 4 females, but sometimes up to

12 females. Single egg clusters are deposited by the female *C. bairdii* on or under rocks, and the single male remains near the nest site for up to several weeks during oviposition, incubation and early embryo stages (Peden 2000; Bailey 1952). Rather than behaving as guardians of these nest sites, Bailey (1952) believed that these males kept the nests clean of silt and other debris. Finally, the study of Rocky Mountain sculpin in southwestern Montana found that more than one female might use a particular nest site (Bailey 1952).

The fecundity of sculpin specimens collected from the Milk and St. Mary rivers generally ranged from 100 to 250 eggs, although one large female of 80.7 mm total length (TL – straight-line distance from the tip of the snout to the end of the tail fin), contained 354 eggs (Roberts 1988). Peden and Hughes (1984) noted a female of 53 mm standard length (SL – straight-line distance from the tip of the snout to the end of the tail spine) with 128 eggs and a female of 99 mm (standard length) with 690 eggs from the Flathead River. Eggs of the "Eastslope" sculpin likely hatch within 2 to 3 weeks, depending on temperature (Roberts 1988). Young of the year were 30-40 mm TL by the end of their first summer, and yearlings achieved a length of at least 50 mm (Roberts 1988). These data are similar to data from the Flathead River, where young-of-the-year were on average 37.0 mm SL by late summer (Hughes and Peden 1984). In the Flathead River, one-year-old males were on average 64.4 mm SL and one-year-old females were 48.6 mm SL by October (Hughes and Peden 1984). Growth of shorthead sculpins in Big Lost River in Idaho was approximately 10 to 20 mm per year (Gasser *et al*. 1981).

For the "Eastslope" sculpin, both sexes are believed to be sexually mature at the age of 23 months, although no specimens have been aged (Roberts 1988). The only mature two-year-old female collected from the Flathead River was 71.4 mm SL (Hughes and Peden 1984). The smallest mature female examined from the Milk or St. Mary rivers was 52.3 mm in TL, but age was not estimated (Roberts 1988). These observations are consistent with data collected for *C. confusus* and *C. bairdii* elsewhere. The youngest age of first maturation for *C. confusus* in British Columbia is probably 2 years, with the smallest standard length recorded at 42 mm for a mature female (Peden 2001). Similarly, all specimens of Rocky Mountain sculpin in southwestern Montana found to be sexually mature were at least 2 years old and 57 mm TL (Bailey 1952).

Survival

No longevity information is available for this species, but shorthead sculpins in British Columbia are not thought to live beyond 5 years of age and probably breed annually (Peden 2001). Shorthead sculpin females from Big Lost Creek, Idaho were also observed to breed annually (Gasser *et al*. 1981).

Physiology

There is very little information available on the physiology of the "Eastslope" sculpin. In the Milk River, they are found only in the upper, and middle reaches, which

suggests that they have a preference for colder temperatures and clearer water as was indicated for the Columbia sculpin (Peden 2000). Willock (1969) postulated that water temperature was the single most important factor affecting sculpin distribution. Temperature may also play a role in spawning with a threshold between 7.5 and 15°C (Roberts 1988).

Movement

It is unlikely that "mottled" or shorthead sculpins migrate extensively throughout the year, as surveys found specimens of both species at the same sites in British Columbia during spring, summer, fall and winter sampling (Peden 2001). Similarly, Peden and Hughes (1984) did not find either juvenile or adult shorthead sculpin to undergo extensive migrations. Furthermore, Peden (2000) noted that the home range was less than 5 m^2 for "mottled" sculpins in British Columbia. An older study by Bailey (1952) found that, over a one-year period, the maximum dispersal by tagged *C. bairdii punctulatus* in Montana was only approximately 143 m. Finally, genetic differences among small tributaries within streams (based on allozyme electrophoresis) suggested virtually no movement (or at least gene flow) among *C. confusus* populations in tributaries 10 km or more apart in British Columbia, and similar small-scale differences were noted for *C. bairdii* (Peden 2000). Although no information for the "Eastslope" sculpin exists regarding movement, in all likelihood these fish would demonstrate similar behaviour patterns to those observed in the above studies.

Nutrition and interspecific interactions

Sculpins are mainly nocturnal foragers, but foraging behaviour is somewhat dependent on the species. A recent study found that shorthead sculpins in the Columbia River system tended to remain in the fast water areas during the night, where they foraged on drifting insects on the upstream side of rocks (McPhail 2001). In general, food habits appear to be similar for *C. bairdii* and *C. confusus* (Peden 2000, 2001). Aquatic insect larvae appear to make up the majority of the diet, but molluscs, fish, and even sculpin eggs may also contribute (Bailey 1952, Peden 2000, 2001; Paetz 1993). Similarly, Bailey (1952) found that the diet of *C. bairdii punctulatus* in Montana was made up almost exclusively (99.7%) of bottom-dwelling aquatic insects, with snails, clams, water mites, sculpin eggs and fish making up the remaining 0.3%.

Sculpins may forage on eggs of other fishes and may form part of the diet of other fishes such as brook trout (*Salvelinus fontinalis*) and smallmouth bass (*Micropterus dolomieu*) or even snakes (Deason 1939, Scott and Crossman 1973). Parasitic interactions are not known for the "Eastslope" sculpin, but larval cestode (*Proteocephalus ambloplitis, P*. sp.), and trematode (*Tetracotyle* sp., *Diplostomum* sp.) infestations have been noted in *C. bairdii* from eastern Canada (Bangham and Hunter 1939; Bangham 1955), and it is a carrier of *Aeromonas salmonicida,* the bacterium responsible for furunculosis in fishes (Rabb and McDermott 1962). In addition to trematodes and cestodes, Hoffman (1967) lists several protozoans, nematodes, acanthocephalans, molluscs and crustaceans as associated parasites.

Behaviour/adaptability

As indicated above, water temperature is an important factor in the distribution of the “Eastslope” sculpin; however, water level also seems to be an important factor (R.L. & L. 2002). Given the restricted area of occupancy (<300 km^2) and the periodic episodes of extreme drought that can, and do occur in the prairies, the survival of “Eastslope” sculpins is susceptible to such stochastic events. For example, changes in distribution have certainly occurred since the 1960s as a result of inadequate water flow resulting from drought conditions and impoundments, diversions and water removal (Paetz 1993; R.L. & L. 2002). Populations in the upper Milk River have been extirpated as a result of inadequate water flow, although Clayton (pers. comm. 2004) views this as an unsuccessful range extension; i.e., when the mainstream Milk River dries up some fish are trapped and die. When it does have water some fish may swim up from the North Milk River and if it has sufficient water for a few years, they move further up, and then in dry years the cycle reverses. Therefore, he (Clayton) sees this as habitat limitation through water availability.

It is also possible that those downstream of the reservoir on the St. Mary River were extirpated. There may have been “Eastslope” sculpin in the St. Mary River downstream of the dam prior to construction of the reservoir, but they would have been intolerant of the resultant higher water temperatures (Clayton, pers. comm. 2004). There is evidence that fragmentation within the river systems is possible (*see* Distribution – Alberta), so local extirpations may affect gene flow and lead to further fragmentation. Genes/sculpins from St. Mary sculpin in Montana, above the St. Mary canal, can end up in the Milk River or in the St. Mary River in Canada. But sculpins cannot go from the Milk River to the St. Mary River, and sculpins from the St. Mary River in Canada can not go to the Milk River (Clayton, pers. comm. 2004). In a catastrophic situation the “Eastslope” sculpin might well be eradicated from Alberta.

POPULATION SIZE AND TRENDS

To date, no studies have provided a quantitative estimate of population size for the “Eastslope” sculpin. However, various studies have measured relative abundance. The “Eastslope” sculpin is considered locally abundant where it is found in Alberta (R.L. & L. 1987; 2002). Surveys in 2000 and 2001 found that the “Eastslope” sculpin had the highest or second highest relative abundance of all fish species encountered in the Milk and St. Mary rivers where they were found (Table 1), although abundance was dependent on season sampled (R.L.& L. 2002). In these surveys of the Milk River, the highest abundance values for sculpins were observed in the North Milk River and decreased downstream to where they were absent in the lowest section of the Milk River mainstem (R.L. & L 2002). A similar pattern was observed in earlier surveys (R.L. & L. 1987), and is likely due to higher abundance of suitable spawning and rearing habitat in the upper reaches (R.L. & L. 1987). In contrast, sculpins were evenly distributed throughout the St. Mary River. In Lee Creek, they were present in the lower section as far upstream as 6 km above Cardston. These assessments of abundance

were conducted before the extreme drought conditions experienced, particularly for the Milk River, in fall 2001. However, limited surveys in October 2002 did not indicate a noticeable change in abundance (P&E 2002). These latter surveys were conducted to evaluate fish populations in the Milk River and were concentrated mainly in the furthest downstream section of the Milk River (i.e., from the international border to 57 km upstream), as well as in the lower North Milk River and at the confluence of the Milk River and North Milk River. Similar to previous studies, the results of these surveys found sculpins to be absent in the furthest downstream section of the Milk River to the international border (P&E 2002). However, in the upstream section, the "Eastslope" sculpin was the most abundant fish species encountered.

Table 1. Percent composition of St. Mary sculpin relative to other fishes encountered in the Milk River and St. Mary River systems over time.

Year	Season	System	Sample Size	% Total Composition	Reference
1966-67	May-Oct	Milk River	155	1.1	Willock 1969
1979-80	Nov	Milk River	214	43,7	Clayton & Ash 1980
1986	Jul-Oct	Milk River	1009	4.8	R.L. & L. 1987
2000	Aug	Milk River	38	4.2	"
2000	Oct	Milk River	276	11.8	"
2001	Jul	Milk River	0	0	"
2001	Oct	Milk River	118	1.8	"
2002	Oct	N. Milk River	59	37.1	P&E 2002
2000	Aug	St. Mary	89	21.4	R.L. & L. 2002
2000	Oct	St. Mary	57	51.8	"
2001	Oct	St. Mary	85	73.9	"
2000	Aug	Lee Creek	33	2.9	"
2001	Oct	Lee Creek	17	22.4	"

Trends in population size are difficult to evaluate given the limited information available and the variability in season and location of sampling. Some variation in relative abundance over time is evident, but these changes do not appear to be consistent (Table 2). For example, fall relative abundance values based on catch-per-unit-effort (CPUE) appear to have increased in the upper North Milk River when comparing the results of a survey conducted in 1986 to those of 2000-2001 (R.L. & L. 2002). The most recent fall CPUEs collected in 2002 suggest a slight increase in abundance near the confluence of the North Milk River and in the lower North Milk River (0.5-2.44 fish/min.) compared to sites near the confluence sampled in 1986 (0-0.59 fish/min.) (R.L. & L. 1987; P&E 2002). However, summer 2000 values in the North Milk River are much lower than summer values collected in 1989 by Paetz (1993). Similarly, summer values for the Milk River near the town of Milk River were considerably lower in 2000 compared to 1989 (R.L. & L. 2002). Fall values were similar and low for the lower Milk River in 1986 and 2000 (R.L. & L. 2002). Unfortunately, the most recent surveys in October 2002 did not include sites immediately downstream of the Town of Milk River, where sculpins have been noted previously. In the St. Mary River, summer CPUE values appear to have remained relatively

stable from 1989 to 2001 (Table 2). In comparison, summer CPUE values in Lee Creek increased considerably from 1989 to 2001 (Table 2).

Table 2. Comparison of catch-per-unit-effort (CPUE) values (fish/minute) for "Eastslope" sculpins encountered in the Milk River and St. Mary River systems over time. (Method of capture – backpack electrofishing).

Season	System	Location	CPUE	Reference
Oct 1986	N. Milk River	Overall	0.02-1.86	R.L. & L. 1987
Oct 2000-01	"	"	3.7-10.75	R.L. & L. 2002
Summer 1989	"	Upper Site[1]	4.56	Paetz 1993
Aug 2000	"	Upper Site[1]	0.83	R.L. & L. 2002
Oct 1986	"	Confluence	0-0.59	R.L. & L. 1987
Oct 2002	N. Milk /Milk rivers	Confluence Area[2]	0.50-2.44	P&E 2002
Summer 1989	Milk River	Town of Milk R.	3.00	Paetz 1993
Summer 2000	"	"	0.32	Stantec 2000
Aug 2000	"	"	0.26	R.L. & L. 2002
Oct 1986	"	Lower Section[3]	0-2.05	R.L. & L. 1987
Oct 2000-01	"	Lower Section[3]	0-1.90	R.L. & L. 2002
Summer 1989	St. Mary River	Overall	5.76	Paetz 1993
Aug 2000	St. Mary River	Overall	2.77-8.02	R.L. & L. 2002
Summer 1989	Lee Creek	Cardston	3.60	Paetz 1993
Aug 2000	Lee Creek	Cardston	16.62	R.L. & L. 2002

[1]Approximately 5 km downstream of the international border.
[2]Includes four sites collected in the lower north Milk River and one site immediately downstream of the confluence.
[3]Sites between the town of Milk River and approximately 90 km upstream of the international border.

Estimates of abundance may be influenced by season, as well as water flow conditions and the ability of survey crews to capture fish. In addition, the population size may fluctuate slightly from year to year depending on migration rates through the St. Mary Canal into the Milk River. It is therefore impossible to determine whether the population in the Milk River is stable, declining or increasing. Given the recent drought conditions, the population may have experienced at least a slight decline in numbers even though the most recent catches in October 2002 (P&E 2002) suggest that the sculpins are still one of the most abundant species in the lower North Milk River. There is no evidence to suggest the population in the St. Mary River mainstem has experienced a significant change in numbers, although a significant increase in Lee Creek was observed (R.L. & L 2002).

LIMITING FACTORS

The "Eastslope" sculpin is considered locally abundant, but its range is extremely limited, being restricted to the St. Mary River, upper and mid-Milk River and North Milk River. A comparison of habitats occupied by the sculpin in these systems with habitats elsewhere in the Oldman River system (Paetz 1993) suggests that favourable habitat is

available elsewhere (e.g., Upper Belly River, Waterton River above the Waterton Reservoir and the Oldman River mainstem upstream of Fort McLeod). However, expansion into these habitats is blocked by the presence of the St. Mary Reservoir, Waterton Reservoir and dam, and unfavourable conditions downstream of the reservoirs (e.g., low water flows, high summer water temperatures and silted substrate) (Paetz 1993; Roberts pers. comm.).

Under adequate flow conditions, spawning, rearing, feeding and overwintering habitats do not appear to be limiting throughout the St. Mary River above the reservoir, or the Milk River, except in the lower section (R.L. & L. 2002). The main threat to the populations of the “Eastslope” sculpin in Alberta appears to be the potential loss of flowing water through impoundment diversions and water removal, in combination with the frequent drought conditions experienced in southern Alberta (Paetz 1993). Within the Milk River, the removal of water in Montana from the upper section, in combination with the natural low flows, is likely responsible for the lack of favourable habitat conditions (i.e., depleted water flows) and the disappearance of sculpins here. Reduced water flow affects the availability of physical habitat, and it also increases water temperatures during the warm summer months. Indeed, Willock (1969) stated that temperature was the most important factor affecting the distribution of the sculpin in the Milk River. He believed that this was one of the reasons that sculpins only occurred in the upper sections of the north and south branches where temperatures are lower because of increased rainfall and higher elevations.

Southern Alberta is susceptible to extreme drought conditions during the summer, and naturally low flows at this time of year may be exacerbated by the seasonal operation of the St. Mary Canal, and by water removal for irrigation (Pollard 2003). In 2001 the August, October and December discharge were 50%, 7% and 6% of historic values, and the October and December rates in 2002 were 11% and 20%. Such low flows could seriously limit overwintering habitat, and in fact, during the late fall and winter of 2001/2002 the lower Milk River dried up completely, except for a number of isolated pools (R.L. & L. 2002). This severity of drought conditions in southern Alberta is not uncommon (Pollard 2003) and may be more common given predicted changes in aquatic ecosystems associated with global climate change (Poff *et al*. 2002). This may prevent populations from expanding and what is more significant is the higher temperatures that accompany the summer drought; all fish species, including the sculpin are exposed to increased risk which may be exacerbated by ongoing maintenance of the St. Mary Canal that results in closures of the canal for extended periods.

In addition to the potential effects on sculpin habitat downstream of impoundments, the habitat alterations associated with an impounded area of a river, such as the St. Mary Reservoir or the proposed reservoir on the Milk River, may be significant. No sculpins have been collected from the St. Mary Reservoir, although sampling has been extremely limited (Clayton pers. comm.). The reservoir has a very limited littoral zone, and water levels fluctuate widely throughout the year (Paetz 1993; Clayton pers. comm.). Other alterations to habitat would likely include elevated summer temperatures in shallow littoral areas, increased silting of substrate and the loss of riffle habitat, none of which are

desirable for sculpin habitat (Peden pers. comm.). Finally, the aquatic insect community, which sculpins depend upon for food, would be altered from one suited to flowing water conditions to one suited to lake conditions (Clayton pers. comm.).

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

The “Eastslope” sculpin has not been previously assessed by COSEWIC (Committee on the Status of Endangered Wildlife in Canada), but was approved for listing as Threatened in June 2004 in Alberta. It is not currently listed under Alberta’s Wildlife Act; however, promulgation of the necessary regulation is underway (S. Cotterill, Alberta Sustainable Resource Development, Edmonton, AB, personal communication 2005). The “mottled” sculpin (*C. bairdii*) is provincially ranked as Not Assessed (Alberta Sustainable Resource Development 2001). The Alberta Natural Heritage Information Centre tracks provincial and global rankings. Provincially, the “Eastslope” sculpin is ranked as “S1” (as of April 2000) (ANHIC 2002b).

In view of its extremely limited distribution in Alberta, a provincial management plan was developed by Paetz (1993) to aid in protecting existing populations. More recently, the Fish and Wildlife Division of Alberta Sustainable Resource Development commissioned surveys in the Milk River (2000 to 2002) to help determine the status of several non-game fish species, including the “Eastslope” sculpin, and to provide recommendations with regards to protection (see R.L. & L. 2002; P&E 2002).

The Department of Fisheries and Oceans, along with representation from Alberta Sustainable Resource Development, Alberta Environment, an environmental NGO, two ranchers/irrigation associations, and one member from the regional counties/towns, has established a recovery team to develop a recovery strategy for the western silvery minnow (*Hybognathus argyritis*), which is on Schedule 1 of SARA. Due to provincial recommendations for listing, this recovery strategy has been expanded to incorporate a watershed-based approach, and includes “Eastslope” sculpin and stonecat (*Noturus flavus*) in the Milk River. This strategy will be expanded to the St. Mary River if required.

SPECIAL SIGNIFICANCE OF THE SPECIES

The “Eastslope” sculpin appears to be an unrecognized taxon within the western “mottled” sculpin complex. Regardless of taxonomy, it has a very limited distribution both within Alberta and nationally, apparently present in only three river systems including the St. Mary and Milk rivers in Alberta, and the Flathead River system in British Columbia. This genetically distinct sculpin represents an evolutionarily important component of species diversity for fish fauna in Canada and should therefore receive a high level of protection.

The life history and behaviour of the “Eastslope” sculpin suggest a relatively sedentary species with limited dispersal. Given this feature and the fact that these sculpins appear to prefer cooler waters and clean substrates, this fish would make an excellent biomonitor of environmental conditions for the rivers in which it resides.

TECHNICAL SUMMARY

***Cottus* sp.**	
"Eastslope" Sculpin	Chabot du versant est
St Mary and Milk River Populations	
Range of Occurrence in Canada: Alberta	

Extent and Area information	
• Extent of occurrence (EO)? [see text , calculated from Figure 4]	<2600 km^2
• Trend in EO?	Unknown
• Are there extreme fluctuations in EO?	Unknown
• Area of occupancy (AO)? (Stream lengths of 80 km (St. Mary River) and 220 km (Milk river), maximum stream width is 0.02 km and sculpins do not utilize all areas of either river, see Distribution section of report)	<6 km^2
• Trend in AO?	Decline
• Are there extreme fluctuations in AO)?	Minor but not extreme
• Number of known or inferred current locations? (see Tables 1,2)	3
• Trend in # locations?	Decline
• Are there extreme fluctuations in # locations?	Uncertain, but appears likely in response to wet/dry cycles
• Number of historic locations from which designatable units have been extirpated?	Possibly 2
• Trend in area, extent or quality or quality of habitat?	Decline
Population Information	
• Generation time (average age of parents in the population)?	2-3 yr.
• Number of mature individuals?	Unknown
• Total population trend?	Unknown
• % decline over the last/next 10 years or 3 generations?	Unknown
• Are there extreme fluctuations in number of mature individuals?	Unknown, but some indication that this has been the case in response to wet - dry cycles
• Is the total population severely fragmented?	Somewhat
• Trend in number of populations?	Decline
• Are there extreme fluctuations in number of populations?	Unknown
• List populations with number of mature individuals in each	Unknown
Threats (actual or imminent threats to populations or habitats)	
Restricted range, total area of occupancy constrained to an ≈ 80 km stretch of the St. Mary and 220 km of the Milk River systems of Alberta (but < I km wide at widest section). - Habitat loss and degradation resulting from loss of water flow due to impoundments, diversions and water removal, as well as frequent periods of drought which may become more pronounced due to global climate change	

Rescue Effect	Moderate (St. Mary River only)
• Status of the outside population(s)? USA (see below)	Secure
• Is immigration known or possible? (see sections on distribution and limiting factors)	Possible from upper St. Mary River in the US
• Would immigrants be adapted to survive in Canada?	Probably
• Is there sufficient habitat for immigrants here?	Unknown
Quantitative Analysis	Not Applicable

Existing Status
The entity 'Eastslope" sculpin is not listed separately by the Association for Biodiversity Information. The Columbia sculpin, *Cottus hubbsi* and the mottled sculpin, *Cottus bairdii*, are listed as follows:

Columbia sculpin, Cottus hubbsi

NatureServe Ranks (NatureServe 2004)
Global – G5T4Q
National
US – N? Canada - N?
Regional
US – Oregon S4 Canada – BC S3

Provincial Rank – blue (British Columbia Conservation Data Centre 2000)

Wild Species 2000 – not listed (Canadian Endangered Species Council 2001)

COSEWIC – Special Concern 2000 (COSEWIC 2004).

Mottled Sculpin, *Cottus bairdii*

NatureServe Ranks (NatureServe 2004)
Global – G5
National
US – N5 Canada – N5
Regional
US – Al – S2, AR – SE1, CO – S4, DE – S1, GA – S4, ID – S5, IL – S2, IA – S4, IA – S2, KY – S4, MD – S3S4, MI – S5, MN – S?, MS – S4?, MO – S4, MT – S5, NN – S1, NV – S?, NJ – SR, NM – S1?, NY – S4, NC – S5, OH – S?, OR – S4?, PA – S5, TN – S5, UT – S4, VT – S2, VA – S4, WA – S3, WV – S5, WI – S4, WY – S5

Canada – AB – S1, BC – S3, MB – S5, NF/LA – S3S4, ON – S5, QC – S5.

Provincial Ranks – BC blue (British Columbia Conservation Data Centre 2000)

Wild Species 2000 (Canadian Endangered Species Council 2001)

National – 4
Provincial – BC – 3, AB – 6, MB – 4, ON – 4, QC – 4

COSEWIC - Threatened (May 2005)

Status and Reasons for Designation

Status: Threatened	**Alpha-numeric Code**: D2

Reasons 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.

Applicability of Criteria

Criterion A (Declining Total Population) – Not Applicable - no evidence to support overall declining population trends. However, because of the limited distribution, loss of some habitat, existing and potential threats (e.g., drought, water removal, possible dam construction on the Milk River), the species might possibly qualify as threatened under A4c.

Criterion B (Small distribution, and Decline or Fluctuation) – Not applicable – the extent of occurrence (2600 km^2) is less than 5000 km^2, the area of occupancy (6 km^2) is less than 500 km^2, there are fewer than 5 locations, and there is evidence of decline in AO, quantity and quality of habitat and number of populations, but the rate is of decline is not known. There is some indication that populations may fluctuate in response to periodic drought conditions, however the magnitude of such fluctuations is unknown.

Criterion C (Small Total Population Size and Decline) – Not Applicable - Population size and trends not known, but no doubt exceed 1000 mature individuals (there is no quantitative estimate), however there is no evidence of overall decline although increases and decreases are known for various areas.

Criterion D (Very Small Population or Restricted Distribution – Meets the criterion for Threatened D2, i.e., restricted distribution, known only from 3 locations and the area of occupancy is less than 6 km^2. The species is prone to the effects of agricultural practices that alter stream flows for irrigation and to drought conditions resulting from global warming.

Criterion E (Quantitative Analysis) – Not Applicable – data not available.

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Susan M. Pollard completed a B.Sc. in Marine Biology and M.Sc. in fish population genetics at the University of Guelph in 1992. As the BC government's fisheries geneticist, she established and maintained the provincial fisheries genetics program under the Conservation Section for approximately 8 years until 2001. Major areas of focus during this time included steelhead stock identification to address mixed-stock fisheries issues, describing genetic population structure and conservation units for various freshwater fish species (including white sturgeon, bull trout and cutthroat trout), evaluating fish culture practices and assisting in the development of provincial policies surrounding conservation and management of native fishes in BC. Susan spent a year in Alberta, during which time she began the three AB species at risk status reports. In 2002, she returned to BC and currently works with the Freshwater Fisheries Society of BC and the Biodiversity Branch of the BC Ministry of Water, Land and Air Protection on a number of projects including policy development for conservation and management of fisheries, species at risk and exotic species issues. As well, Susan currently acts as secretariat for the Milk River Species At Risk Recovery Team.