

Recovery Strategy for the Bert's Predaceous Diving Beetle (*Sanfilippodytes bertae*) in Canada

Bert's Predaceous Diving Beetle



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For copies of the recovery strategy, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the [Species at Risk \(SAR\) Public Registry](http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1)¹.

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¹ <http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)² agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of recovery strategies for listed Extirpated, Endangered, and Threatened species and are required to report on progress within five years after the publication of the final document on the SAR Public Registry.

The Minister of the Environment and Climate Change is the competent minister under SARA for the Bert's Predaceous Diving Beetle and has prepared this recovery strategy, as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with the Province of Alberta, as per section 39(1) of SARA.

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 Environment and Climate Change Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Bert's Predaceous Diving Beetle and Canadian society as a whole.

This recovery strategy will be followed by one or more action plans that will provide information on recovery measures to be taken by Environment and Climate Change Canada and other jurisdictions and/or organizations involved in the conservation of the species. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

The recovery strategy sets the strategic direction to arrest or reverse the decline of the species, including identification of critical habitat to the extent possible. It provides all Canadians with information to help take action on species conservation. When critical habitat is identified, either in a recovery strategy or an action plan, SARA requires that critical habitat then be protected.

In the case of critical habitat identified for terrestrial species including migratory birds SARA requires that critical habitat identified in a federally protected area³ be described in the *Canada Gazette* within 90 days after the recovery strategy or action plan that identified the critical habitat is included in the public registry. A prohibition against destruction of critical habitat under ss. 58(1) will apply 90 days after the description of the critical habitat is published in the *Canada Gazette*.

² <http://registrelep-sararegistry.gc.ca/default.asp?lang=en&n=6B319869-1#2>

³ These federally protected areas are: a national park of Canada named and described in Schedule 1 to the *Canada National Parks Act*, The Rouge National Park established by the *Rouge National Urban Park Act*, a marine protected area under the *Oceans Act*, a migratory bird sanctuary under the *Migratory Bird Convention Act, 1994* or a national wildlife area under the *Canada Wildlife Act* see ss. 58(2) of SARA.

For critical habitat located on other federal lands, the competent minister must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies.

If the critical habitat for a migratory bird is not within a federal protected area and is not on federal land, within the exclusive economic zone or on the continental shelf of Canada, the prohibition against destruction can only apply to those portions of the critical habitat that are habitat to which the *Migratory Birds Convention Act, 1994* applies as per SARA ss. 58(5.1) and ss. 58(5.2).

For any part of critical habitat located on non-federal lands, if the competent minister forms the opinion that any portion of critical habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, or the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to prohibit destruction of critical habitat. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

Acknowledgments

This strategy was written by Jennie Pearce with edits and revisions by Lea Craig-Moore and Victoria Snable, Environment and Climate Change Canada – Canadian Wildlife Service. This strategy benefited from the surveys conducted by Robert E Roughley (deceased). Larry Stevens (Springs Stewardship Institute), Stewart Rood (University of Lethbridge) and Karen Gill (University of Lethbridge) provided valuable information on the threats and management of springs and seeps, and on spring surveys in Alberta. Kelly B. Miller (University of New Mexico) is thanked for the identification of *Sanfilippodytes* specimens.

Executive Summary

The Bert's Predaceous Diving Beetle (*Sanfilippodytes berate*) is a predatory insect endemic to Alberta, Canada. Adults are small (< 3 mm), broadly oval in shape, and dark brown with yellowish-brown elytra (wing covering). Habitat characteristics for this species are not available for all locations where it has been observed. However, at some locations, adults occupy natural and relatively pristine spring and seep habitat along steep slopes or river banks. These areas have a fine-grained substrate of sand and other fine particulates and an undisturbed area with mosses over fine particulate soil. Bert's Predaceous Diving Beetle was first described in 2000 from 42 individuals collected at two locations near Fort MacLeod, Alberta, in the 1980's. In 2007, four individuals were collected at two additional locations; north of Fort McLeod in proximity to the original locations and south of Head-Smashed-In Buffalo Jump. These are the only known occurrences of the species in Canada. All four locations were revisited in August 2015 by Environment Canada's Canadian Wildlife Service and springs were found at only one location and no individuals were seen at this location.

Bert's Predaceous Diving Beetle was assessed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2009, and listed as Endangered under Schedule 1 of the *Species at Risk Act* (SARA) in 2012, due to the small area of occupancy and pressures on its habitat. Threats to the species include agriculture and aquaculture, transportation and service corridors, human intrusions and disturbance, natural systems modification, pollution, and climate change and severe weather.

There are several unknowns regarding the recovery feasibility of Bert's Predaceous Diving Beetle. Approaches to address these unknowns are presented in this recovery strategy. The population and distribution objective is to maintain the occupancy for the two recent, extant occurrences (should they be confirmed) and any newly-discovered occurrences. Broad strategies to be taken to address the threats to the survival and recovery of the species are presented in the section on Strategic Direction for Recovery.

Known Bert's Predaceous Diving Beetle occurrences in Alberta are located on non-federal land within the Oldman River watershed. There is currently insufficient information available on this species' distribution and specific habitat requirements to identify critical habitat. A schedule of studies has been developed to identify critical habitat for the Bert's Predaceous Diving Beetle.

One or more action plans will be completed for this species by 2022.

Recovery Feasibility Summary

Based on the following four criteria that Environment and Climate Change Canada uses to establish recovery feasibility, there are unknowns regarding the feasibility of recovery of the Bert's Predaceous Diving Beetle. Therefore, in keeping with the precautionary principle, this recovery strategy has been prepared as per section 41(1) of SARA, as would be done when recovery is determined to be technically and biologically feasible. This recovery strategy addresses the unknowns surrounding the feasibility of recovery.

1. Individuals of the wildlife species that are capable of reproduction are available now or in the foreseeable future to sustain the population or improve its abundance.

Unknown. Bert's Predaceous Diving Beetle is known from 42 adult beetles captured from two locations in 1980 and 1984 and from four adult beetles captured at two additional locations in 2007. The maximum distance between the 4 locations is 20 km. All locations were revisited in August 2015 by Environment Canada. Suitable habitat containing springs were only found at the location near Head-Smashed-In Buffalo Jump; however, no Bert's Predaceous Diving Beetles were found despite substantial search effort. In 2009, The Alberta Springs Ecology Project surveyed 11 springs in the Oldman River watershed, 6-32 km away from the previous 4 Bert's Predaceous Diving Beetle occurrences, and failed to find the species. It is possible that additional occurrences of Bert's Predaceous Diving Beetle will be identified with further search effort and improved understanding of its life history.

2. Sufficient suitable habitat is available to support the species or could be made available through habitat management or restoration.

Unknown. Although it is known that Bert's Predaceous Diving Beetles occupy natural and relatively pristine spring and seep habitat, no measurements of ecohydrology and biophysical attributes have been taken at locations with Bert's Predaceous Diving Beetles to determine exactly what suitable habitat is for the species. In 2015, of the 4 known locations, habitat containing springs was only found at the location near Head-Smashed-In Buffalo Jump. Additional springs and seeps containing suitable habitat are expected to occur within southern Alberta; however, extensive surveys of these habitats have not occurred. Therefore, it is unknown if sufficient suitable habitat is or could be made available to support the species. More information regarding specific habitat requirements and habitat availability are needed to guide habitat management practices.

3. The primary threats to the species or its habitat (including threats outside Canada) can be avoided or mitigated.

Yes. The most significant threats to the recovery and survival of Bert's Predaceous Diving Beetle are livestock farming and ranching, dams and water management/use and droughts. Threats due to livestock can be mitigated through habitat stewardship and conservation, grazing beneficial management practices, and protection of Bert's

Predaceous Diving Beetle spring and seep habitat. However, threats due to dams and water management/use would have to be mitigated through cooperative work with Alberta's water managers, regulators and policy developers to ensure the conservation and protection of ground water resources.

4. Recovery techniques exist to achieve the population and distribution objectives or can be expected to be developed within a reasonable timeframe.

Unknown. As there is a lack of information regarding Bert's Predaceous Diving Beetle, its specific habitat requirements, threats, as well as difficulty demonstrating occupancy of this species, it is not known at this time if recovery techniques are available in order to achieve the population and distribution objectives.

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1. COSEWIC* Species Assessment Information

Date of Assessment: November 2009

Common Name (population): Bert's Predaceous Diving Beetle

Scientific Name: *Sanfilippodytes bertae*

COSEWIC Status: Endangered

Reason for Designation: Despite extensive searches, this Canadian endemic species is known from only two locations in southern Alberta, one of which has been destroyed. It is limited to springs and seepage areas along steep cliff edges or river bends. Its habitat is declining due to trampling by livestock and lowering of the water table due to withdrawals for irrigation.

Canadian Occurrence: Alberta

COSEWIC Status History: Designated Endangered in November 2009

* COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

2. Species Status Information

Bert's Predaceous Diving Beetle is a Canadian endemic species, found only in Alberta. It has a global conservation status of G1, national status of N1, and subnational status of S1 in Alberta, ranking the species Critically Imperiled at all three geographic scales (NatureServe 2015).

The species was listed as Endangered on Schedule 1 of the *Species At Risk Act* (SARA) in 2012. The status of predaceous diving beetle species in Alberta was assessed in 2010 and Bert's Predaceous Diving Beetle was assessed as 'May Be at Risk' in Alberta (Alberta Sustainable Resource Development 2012). The species is not listed under Alberta's *Wildlife Act*.

3. Species Information

3.1 Species Description

Bert's Predaceous Diving Beetle is a small beetle within the family Dytiscidae (predaceous diving beetles), and is 1 of 8 species in the genus *Sanfilippodytes* found in Canada. Adults are 2.3-2.8 mm in length and broadly oval in shape (length:width = 1.84 to 1.94). As with most *Sanfilippodytes* species, adults have a dark head and pronotum, but are unusual in that their elytra (wing covering) lack markings or spots, and are yellowish brown in colour (Figure 1, Larson et al. 2000). Larvae of this species have not

been observed. Assuming they are similar to other species of *Sanfilippodytes*, there are likely three instars, with the first instar being distinct in appearance from later instar larvae (COSEWIC 2009; Alarie and Michat 2014).



Figure 1. Adult Bert's Predaceous Diving Beetle (© Robert Roughley)

No information exists on Bert's Predaceous Diving Beetle reproduction, egg laying (and associated habitat requirements), incubation (length of time or habitat requirements), larval development, overwintering (life stage or habitat requirements) or longevity of adults. Based on the biology of other predaceous diving beetles, it is likely that Bert's Predaceous Diving Beetle has one generation per year with mating and egg-laying in the spring, larval development over the summer, a short pupation period, and overwintering as adults (COSEWIC 2009). Egg, larvae and adult stages are likely all aquatic and the pupal stage terrestrial (Larson et al. 2000). All adults have been collected in the spring.

Both the larvae and adult stages of all predaceous diving beetles are predatory, mainly feeding on various species of invertebrates (e.g. enchytraeid worms and fly larvae) (Alarie and Michat 2014). The exact diet and prey species of Bert's Predaceous Diving Beetle is unknown (Larson et al. 2000).

Although Bert's Predaceous Diving Beetle has flight wings, no flight records exist for any members of the *Sanfilippodytes* genus. It is suspected that dispersal occurs via movement within water during the aquatic life stages (COSEWIC 2009).

3.2 Species Population and Distribution

Bert's Predaceous Diving Beetle is known from a total of four occurrences: one each in 1980 and 1984 along the Oldman River near Fort McLeod, Alberta, and two from 2007 COSEWIC surveys for the species (Figure 2, Table 1). The maximum distance between the 4 locations is 20 km. One of the 2007 occurrences was in close proximity (<2 km) to

those from the 1980's, while the other is along a creek, 20 km west of Fort McLeod. The 1980's occurrences are considered historical, as the spring habitat was not relocated during COSEWIC surveys in 2007 (COSEWIC 2009) and 2015 surveys (Craig-Moore Unpublished data).

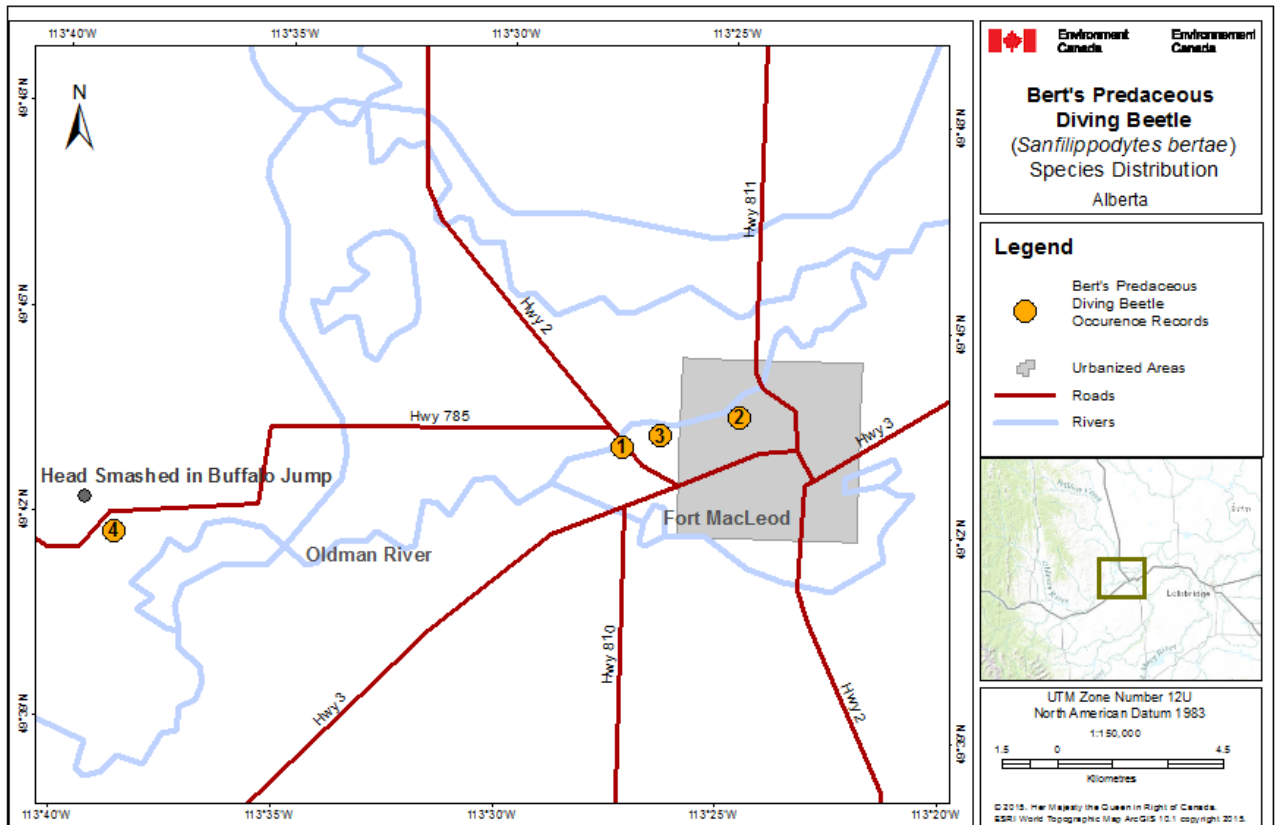


Figure 2. Occurrences of Bert's Predaceous Diving Beetle in Canada (numbered chronologically: oldest = 1).

Table 1. Summary of Bert's Predaceous Diving Beetle Occurrence Records in Canada

Map Label	Location ^a	Date	# Specimens ^b	Status ^c
1	northwest bank of the Oldman River upstream of the Hwy 2 crossing west of Fort MacLeod, Alberta	March 1980 and May 1984	30	Historic
2	south bank of the Oldman River, 3 km downstream of the Hwy 2 crossing west of Fort McLeod, Alberta	May 1984	12	Historic
3 ^d	south bank of the Oldman River, 0.7 km downstream of Hwy 2 crossing west of Fort McLeod, Alberta	April 2007	2	Extant
4 ^e	small creek south of Head-Smashed-In Buffalo Jump, Alberta, 20 km west of Fort McLeod Alberta	April 2007	2	Extant

^aThe locational information reported is the best information available to Environment Canada at the time this recovery strategy was written. Sources are Larson et al. (2000), COSEWIC (2009), Alberta Conservation Information Management System, and Wallis-Roughley Museum of Entomology at the University of Manitoba.

^b All specimens collected were adults.

^c Extant means the occurrence is recent and habitat still exists at the time of writing the recovery strategy.

^d This location was not mentioned in the text of the COSEWIC (2009) status report. The Wallis-Roughley Museum of Entomology at the University of Manitoba has confirmed that these specimens were collected on 28 April 2007 by R. E. Roughley and J. A. Knopp. Surveys in 2015 failed to find this location. Precision of the location coordinates is uncertain as habitat described was not found.

^e The coordinates provided by the Wallis-Roughley Museum of Entomology at the University of Manitoba for this location were investigated in August 2015, but did not match the written and photographic descriptions in the COSEWIC status report. The correct location was found in closer proximity to Head-Smashed-In Buffalo Jump.

Surveys specifically looking for Bert's Predaceous Diving Beetles have been conducted twice. First, an extensive survey in search of the species, based on the 1980's locations in Southern Alberta, was done in 2007 during the spring, summer and fall. A total of 50 potential springs identified from maps and aerial photos were visited in and around Fort McLeod (COSEWIC 2009). Only seven of these sites visited had water present and one spring was located along the banks of the Oldman River. In August 2015, Environment Canada conducted surveys at the four known locations of Bert's Predaceous Diving Beetles to better understand habitat conditions and investigate occurrence of the species.

Among the sites surveyed in 2007 were those corresponding to Locations 1 and 2 (Figure 2, Table 1) where Bert's Predaceous Diving Beetle was collected in 1980 and 1984. The spring seepage at Location 1 was thought to have been destroyed by road and bridge construction and no specimens were captured at this location in 2007 (COSEWIC 2009). The site for Location 2 was also visited, but the habitat from which the type specimens were collected could not be found and surveys could not be conducted at this location (COSEWIC 2009). Locations 1 and 2 are thus considered to be historical. Two of the new sites surveyed in 2007, Locations 3 and 4 (Figure 2, Table 1), were found to contain Bert's Predaceous Diving Beetle. At Location 3, two adult

specimens were collected on the southern bank of the Oldman River, approximately 0.7 km downstream of the Highway 2 crossing. This location was not mentioned in the COSEWIC status report (2009), but has since been confirmed with the specimens at the Wallis-Roughley Museum of Entomology, University of Manitoba (S. Oghiakhe, pers. comm. 2015). At Location 4, two specimens were collected at a creek 2.5 km south of Head-Smashed-in Buffalo Jump (a UNESCO World Heritage site), within the Oldman River watershed. In addition, suitable springs in Waterton Springs Campground 3 km north of Waterton Lakes National Park on Highway 6 were searched in fall, 2007. Nine sites had water and were sampled; however, no Bert's Predaceous Diving Beetles were captured at any of these sites (COSEWIC 2009).

All four known locations were investigated in August 2015 by Environment Canada. Suitable spring habitat was not found at Locations 1-3. Location 1, as suggested in the COSEWIC status report (2009) has been destroyed by modifications to the Highway 2 bridge across the Oldman River. Spring habitat was not found at Locations 2 or 3, indicating one or more of the following possibilities, 1) the springs were dry and undetectable, 2) the habitat no longer exists at those locations, or, 3) the accuracy of the coordinates is uncertain. A visit to Location 3 in the spring, when water levels are high is necessary to determine the status of the spring habitat. The coordinates provided for Location 4 were investigated, but appeared to be of a creek west of Head-Smashed-In Buffalo Jump that did not match the photographic descriptions in the COSEWIC status report (2009). Location 4 is a very distinctive site, with a rock outcrop in a deep crevice in grassland. Using some written descriptions of the site from status report as a guide, the correct site of Location 4 was found in closer proximity to and south of Head-Smashed-In Buffalo Jump. The spring was flowing at this location and the invertebrate community was examined, but no Bert's Predaceous Diving Beetles were found. Water levels appeared lower than in the photographs taken from the COSEWIC surveys in April 2007, suggesting time of year and lower water levels may have influenced the detection of Bert's Predaceous Diving Beetle at this location.

In 2009, The Alberta Springs Ecology Project conducted detailed ecological surveys and assessments of 11 springs that were between 10-30 km to the west-north-west of Location 1 (Stevens et al. 2010; Springer et al. 2013). The closest spring surveyed was within 6 km of Location 4. The invertebrate community was identified during surveys, and *Sanfilippodytes* were collected at two of the springs; however, these specimens were later confirmed not to be Bert's Predaceous Diving Beetle (K. Miller, pers. comm. 2015).

The current population size and trend for the Bert's Predaceous Diving Beetle is unknown. The COSEWIC status report (2009) based its extent of occurrence⁴ on Location 4 only. It states that in 2007 the extent of occurrence was 2 km² but the actual area occupied by the individuals in 2007 was only 2 m² (COSEWIC 2009).

⁴ Extent of occurrence is the area included in a polygon without concave angles that encompasses the geographic distribution of all known populations of a wildlife species.

3.3 Needs of the Bert's Predaceous Diving Beetle

Little is known of the biology and habitat needs of Bert's Predaceous Diving Beetle as little habitat information was recorded at capture sites. Location 4 is the only site that has habitat information described beyond a description of substrate.

All known locations are in the Oldman River watershed within the arid grasslands of southern Alberta. Based on the limited habitat information recorded from collection sites, Bert's Predaceous Diving Beetle are thought to need natural and fairly undisturbed spring and seep habitat. It is unknown whether the springs or seeps that Bert's Predaceous Diving Beetles rely on must maintain a steady flow of water in order for the population to persist at a given location (COSEWIC 2009).

Locations 1, 2, and 3 were all located near the high water mark on the banks of the Oldman River. Larson et al. (2000) suggested that this indicates that the beetles are likely not restricted to these sites, and that they would occupy sites further back from the riverbank during spring flooding and colonize river bank seeps after water levels have gone down later in the season. Locations 1 and 2 had hard clay, gravel and sandstone rubble substrate. The substrate at Location 3 was not noted (S. Oghiakhe pers. comm., 2015).

In contrast, Location 4 is not along the Oldman River floodplain (although it is within the Oldman River watershed) but rather associated with a creek in rangeland, south of Head-Smashed-In Buffalo Jump. According to the COSEWIC report (2009), this location had a gentle trickle of water exiting a crevice approximately half-way down a rocky outcrop. The mouth of the spring had wet mosses and algae present. The terrain at the bottom of the outcrop dropped below the level of the surrounding grassy hills by approximately 5 m. At the base of the rock, the spring drained into a channel of saturated soil and grasses and a small, channel of trees with near-stagnant water. The substrate was fine-grained sand with small particulates. There was a nearby undisturbed area with mosses over fine particulate soil, thought necessary for the terrestrial pupation stage (COSEWIC 2009).

Substrate and vegetation community apparently strongly influence the colouration and patterns of dytiscid beetles (Larson et al. 2000). Darker beetles are found in shaded and vegetated habitat with sand or gravel substrates (Galewski 1971 and Balke et al. 1997 in Larson et al. 2000). Bert's Predaceous Diving Beetle has a dark head and pronotum with plain elytra, suggesting specimens have been found in such shaded conditions (i.e. Location 4).

Overwintering habitat requirements are unknown for Bert's Predaceous Diving Beetle, but it is suggested that because flight is unlikely, adult beetles likely burrow into crevices in the substrate where they spend the winter months (COSEWIC 2009).

Further field studies are needed to fully understand the habitat requirements of Bert's Predaceous Diving Beetle, including information on dispersal behaviour and dispersal habitat. Populations of this predaceous diving beetle may be reproductively isolated, as

the small size of this beetle and windy climate may make it difficult for them to locate rare pockets of suitable microhabitat that may or may not be inhabited. Insufficient information exists to describe egg laying and incubation habitat, the habitat needs of larvae, and overwintering habitat.

4. Threats

Table 2. Threat Classification Table for Bert's Predaceous Diving Beetle

Threat #	Threat description	Impact ^a	Scope ^b	Severity ^c	Timing ^d	Detailed Threats
2	Agriculture & aquaculture	High - Low	Large	Serious - Slight	High	
2.3	Livestock farming & ranching	High - Low	Large	Serious - Slight	High	Trampling, damaging outlets
3	Energy production & mining	Unknown	Unknown	Unknown	Moderate	
3.1	Oil & gas drilling	Unknown	Unknown	Unknown	Moderate	Potential expansion of gas wells
4	Transportation & service corridors	Unknown	Large	Serious	Unknown	
4.1	Roads & railroads	Unknown	Large	Serious	Unknown	Roads and repairs
6	Human intrusion & disturbance	Low	Large	Slight	High	
6.1	Recreational activities	Low	Large	Slight	High	Activities in River Valley Park in Fort McLeod, All-terrain vehicles (ATVs)
6.3	Work & other activities	Low	Large	Slight	High	Farm vehicles, ATVs
7	Natural system modifications	Very High	Pervasive	Extreme	High	
7.2	Dams & water management/use	Very High	Pervasive	Extreme	High	Altered hydrological regime
9	Pollution	Unknown	Large	Unknown	High	
9.3	Agricultural & forestry effluents	Unknown	Large	Unknown	High	Cattle defecation

11	Climate change & severe weather	Unknown	Pervasive	Unknown	Low - High	
11.2	Droughts	Unknown	Pervasive	Unknown	Low-High	Extended drought cycle

^a **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each threat is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment timeframe (e.g., timing is insignificant/negligible or low as threat is only considered to be in the past); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.

^b **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species’ population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).

^c **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or three-generation timeframe. Usually measured as the degree of reduction of the species’ population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit ≥ 0%).

^d **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

4.1 Description of Threats

Little is known on the ecology of, and threats to Bert's Predaceous Diving Beetle as it is known globally from only four locations. However, due to the specific habitat requirement of springs and seeps, this species is highly susceptible to habitat change at extant locations. Spring and seep habitat is limited and any habitat degradation is likely to compromise the long-term survival of the species. The potential threats to this species are described below, in approximate order of impact, and are based on the specific need for spring habitat by the species.

IUCN #2 Agriculture and Aquaculture (high – low impact)

Threat 2.3 Livestock farming & ranching

Many rare Canadian water beetles inhabiting seeps or springs have been extirpated from seep or spring disturbance by cattle (Roughley and Larson 1991; Larson et al. 2000). Larson et al. (2000) lists four water beetle species in Canada that have been lost or diminished in streams or springs subject to cattle grazing. Current knowledge suggests that Bert's Predaceous Diving Beetle may also be restricted to undisturbed seeps or springs, as cattle were noted at only one location (Location 4) (COSEWIC 2009). High density, concentrated livestock activity in and around springs and seeps can destroy habitat conditions by damaging outlets, trampling or removing emergent vegetation, stirring up the stream bed creating muddy conditions, changing water chemistry by depositing manure in the water, and increasing erosion (Roughley and Larson 1991; COSEWIC 2009). The springs and seeps in the rangelands west of Bert's Predaceous Diving Beetle locations are accessible to livestock and generally occur on private land subject to grazing (COSEWIC 2009).

IUCN # 3 Energy production and mining (unknown impact)

Threat 3.1 Oil and gas drilling

Gas production is present in southern Alberta and is an industry that disturbs habitat and uses water. The scope and severity of the impact of gas wells is unknown because the effect of gas wells on springs at extant locations has not been examined. The density of the gas wells in and around the extant Bert's Predaceous Diving Beetle locations is lower than in the rest of the province (Waterline Resource Inc. 2012), but there is the possibility of more gas wells in the future.

IUCN # 4 Transportation and Service Corridors (unknown impact)

Threat 4.1 Roads and railroads

The construction of a new overpass on Highway 2 northwest of Fort McLeod after 1980 is thought to have destroyed the spring associated with Location 1. While there are no known road construction projects currently planned to take place near Bert's

Predaceous Diving Beetle occurrences in the next 10 years, unforeseen repairs to roadways need to be considered. Locations 3 and 4 are in close (< 1 km) proximity to roadways and could potentially be impacted, should road maintenance be conducted.

IUCN #6 Human Intrusion and Disturbance (low impact)

Threat 6.1 Recreational activities

The municipal boundaries of the Town of Fort McLeod have nearly 7 km² of land adjacent to the Oldman River. The Municipal Development Plan of the Town of Fort McLeod (Town of Fort McLeod 2011) suggests that development plans in the river valley lands are influenced by susceptibility to flood events, and development cannot take place within the 100 year flood area (Town of Fort McLeod 1999). The floodplain was designated as the River Valley Park in 1991, and is reserved for recreation, parks and open space (Town of Fort McLeod 2011; 2013). Along the Oldman river, there are trails, playgrounds, sitting benches, pit toilets, information signs detailing the local flora and fauna and some day use areas with picnic tables. Recreational activity makes springs and seeps susceptible to direct loss from trail development and construction, disturbance from removal of vegetation, and disruption of seepage outlets from human and horse trampling that damage the substrate, and create muddy conditions.

Threat 6.3 Work and other activities

Farm vehicles (trucks and tractors) and recreational all-terrain vehicles may have a detrimental impact on Bert's Predaceous Diving Beetle through removing vegetation, disrupting seepage outlets, damaging the substrate, and creating muddy conditions in the spring or seep, and may also result in the direct loss of adults and larvae (COSEWIC 2009). The threat of farm vehicle and all-terrain vehicle within the area of all occurrences of Bert's Predaceous Diving Beetle may have a higher severity given that tracks were noted at Location 4, but there is no further information on this threat (COSEWIC 2009).

IUCN # 7 Natural System Modification (very high impact)

Threat 7.2 Dams and water management/use

The Oldman river is one of the most disturbed watershed in Alberta, with only 3% undisturbed habitat remaining (COSEWIC 2009). It is highly altered and developed for ranching, agriculture, and feedlots (COSEWIC 2009). Crop production is the main land use in 60% of the Oldman River watershed, 30% of which is irrigated (Oldman Watershed Council 2010).

Alberta Environment and Sustainable Resource Development has enforced a moratorium on surface water diversion in the Oldman River watershed (Waterline Resources Inc. 2012) suggesting, at present, building of new dams and impoundments or increases in surface water withdrawals are unlikely. The status of the water budget in

the Oldman River watershed, given the current level of diversion remains a significant consideration for Bert's Predaceous Diving Beetle.

A current focus in Alberta is to understand, inventory and manage groundwater resources in the Oldman River watershed as it relates to surface water (Oldman Watershed Council 2011). There currently is insufficient specific information and understanding of the ground and surface hydrology in the Oldman River watershed to detail the specifics of natural system modifications to Bert's Predaceous Diving Beetles. Generally, because Bert's Predaceous Diving Beetle appears to completely depend on springs and seeps in the Oldman River watershed, any diminution, curtailment or interruption of the groundwater is a serious threat to the species.

IUCN #9 Pollution (low impact)

Threat 9.3 Agricultural and forestry effluents

Water quality in the Oldman River watershed sub-basin within all occurrences of the Bert's Predaceous Diving Beetle is considered 'fair' with higher levels of nitrogen, phosphorus, total suspended solids and fecal coliforms from non-point sources (i.e. agriculture, pastures) and point sources (i.e. municipal, industrial, irrigation) (Oldman Watershed Council 2010). Cattle at springs or seeps, could cause changes in water chemistry associated with manure deposition that may degrade habitat (Larson et al. 2000; COSEWIC 2009).

IUCN # 11 Climate Change and Severe Weather (unknown impact)

Threat 11.2 Droughts

Springs and seeps fed by shallow recharge areas may be susceptible to drought. Studies of climate change suggest that the Northern Great Plains where Bert's Predaceous Diving Beetle occur may experience increasing drought conditions and increased mean annual temperature (Karl and Heim 1991; Rizzo and Wiken 1992; Lemmen et al. 1997), which is anticipated to reduce surface water, groundwater and the availability of springs and seep habitat for Bert's Predaceous Diving Beetle.

5. Population and Distribution Objectives

There is limited information available on the abundance and distribution of Bert's Predaceous Diving Beetle. Comprehensive surveys at extant locations are needed to understand season water patterns at springs and seeps and confirm the presence of Bert's Predaceous Diving Beetle. Surveys should also be conducted at other suitable spring and seep habitat in the Oldman River watershed to determine the extent of the Canadian distribution as its distribution may be more widespread in Alberta (COSEWIC 2009; Larson et al. 2010). As a result of the lack of information available on

populations of Bert's Predaceous Diving Beetle, it is not currently feasible to establish quantitative population and distribution objectives.

The population and distribution objective for Bert's Predaceous Diving Beetle in Canada is to maintain occupancy at the two extant occurrences (should they be confirmed) and any newly-discovered occurrences.

6. Broad Strategies and General Approaches to Meet Objectives

6.1 Actions Already Completed or Currently Underway

- Extensive survey of museum collections was completed during preparation of the National Research Council Monograph on the diving beetles of Canada (see Larson et al. 2000).
- Targeted surveys were undertaken in 2007 for Bert's Predaceous Diving Beetle while preparing the COSEWIC status report for this species (see COSEWIC 2009).
- All known Bert's Predaceous Diving Beetle locations were revisited in August 2015 by Environment Canada to confirm presence of habitat and search for the species.
- Alberta Springs Ecology Project (2008-2012): an ecological inventory and assessment of 56 springs in southern Alberta described their physical, biological and cultural attributes (Springer et al. 2013). The 11 springs surveyed in 2009 as part of this project were within 6-32 km from all Bert's Predaceous Diving Beetle occurrences (Stevens et al. 2010).
- Alberta Geological Survey, Springs of Alberta Inventory Project (Alberta Geological Survey 2013) is compiling information on spring location and spring behaviour from published and unpublished sources into a single database.

6.2 Strategic Direction for Recovery

Table 3. Recovery Planning Table

Threat or Limitation	Priority ^a	Broad Strategy to Recovery	General Description of Research and Management Approaches
Population Inventory and Monitoring			
Knowledge gaps: species range, distribution and abundance	High	Address gaps in knowledge of Bert’s Predaceous Diving Beetle range, distribution and abundance in Canada	<ul style="list-style-type: none"> • Survey extant locations where the species has been previously recorded to confirm occupancy as well as at other sites with potentially suitable habitat and determine the extent of the Canadian distribution. • Coordinate sampling efforts with those monitoring and inventorying springs in Southern Alberta.
Research			
Knowledge gap: species biology	High	Address gaps in knowledge on the biology of Bert’s Predaceous Diving Beetle	<ul style="list-style-type: none"> • Fill important knowledge gaps on Bert’s Predaceous Diving Beetle life history (e.g., reproduction and habitat associations, egg laying, incubation [length of time or habitat requirements], larval development, overwintering [life stage or habitat requirements] or longevity of adults)
Habitat Assessment, Management and Conservation			
All threats	High	Identify threats and develop mitigation techniques to ensure availability of suitable habitat	<ul style="list-style-type: none"> • Determine the distribution of seeps and springs in the Oldman River watershed and their physical, biophysical and temporal characteristics to better understand and inventory potential habitat • Develop and implement a monitoring protocol for Bert’s Predaceous Diving Beetle to improve our knowledge of the species’ population size, distribution, habitat use, and sensitivity to disturbances. Coordinate sampling efforts with those monitoring and inventorying springs in Southern Alberta. • Assess impacts of current land management activities on Bert’s Predaceous Diving Beetle and its habitat at extant locations. Develop additional best management practices, as needed. • Develop a stewardship plan which enables participation of local residents in conservation issues on springs and seeps.

^a “Priority” reflects the degree to which the broad strategy contributes directly to the recovery of the species or is an essential precursor to an approach that contributes to the recovery of the species.

6.3 Narrative to Support the Recovery Planning Table

Population Inventory and Monitoring

To address gaps in knowledge on the range, distribution and abundance of Bert's Predaceous Diving Beetle in Canada, previously occupied locations need to be revisited to confirm occupancy, and potentially suitable spring and seep habitat needs to be identified and surveyed for Bert's Predaceous Diving Beetle.

Although Bert's Predaceous Diving Beetle is difficult to detect and identify due to its size, there is available information on spring locations in Alberta to commence and direct search effort (Alberta Geological Survey 2014). Moreover, there is available spring habitat in the area around the known species occurrences. Within a distance of 20 km (this is the maximum distance between the four occurrences) there are 28 known springs. Coordination with spring inventory and monitoring projects in southern Alberta (e.g. Alberta Springs Ecology Project, Alberta Geological Survey) can address knowledge gaps on the distribution of Bert's Predaceous Diving Beetle.

Research

Knowledge gaps exist, including a lack of understanding of some of the biology of the Bert's Predaceous Diving Beetle and its life cycle (e.g., reproduction and habitat associations, egg laying, incubation [length of time or habitat requirements], larval development, overwintering [life stage or habitat requirements] or longevity of adults), the location of springs and seeps (including ephemeral springs) within and near its known range, and the sensitivity of the species to habitat disturbance. This information is important to ensure that appropriate recovery approaches are adopted. Key questions include: how and when do Bert's Predaceous Diving Beetle disperse to new locations, are populations within a location stable, and how sensitive is Bert's Predaceous Diving Beetle to changes in spring water quantity and quality?

Habitat Assessment, Management and Conservation

Priorities for habitat assessment are: mapping the location of springs and seeps, understanding the hydrology and recharge zone for each spring, and developing an appropriate survey methodology for Bert's Predaceous Diving Beetle that will have minimal impact on the long-term viability of the habitat or the population. Stewardship will be one conservation measure that can help engage local stakeholders in the conservation of spring and seep habitat important to Bert's Predaceous Diving Beetle. Best management practices that consider cattle density, exclusionary fencing of spring and seep habitats, and the availability of alternative watering sites need to be developed and implemented to manage livestock grazing around seep and spring habitats, particularly in steep hill terrain. A number of best management practices for grazing near riparian habitat already exist (i.e. Cows and Fish program), and where applicable the use of these practices should be encouraged. Integrating the management of

Bert's Predaceous Diving Beetle with these approaches that have already been developed to conserve spring and stream habitat would be particularly effective.

7. Critical Habitat

7.1 Identification of the Species' Critical Habitat

Critical habitat is defined in SARA (Subsection 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 the recovery strategy or in an action plan for the species”.

Critical habitat has not been identified for Bert's Predaceous Diving Beetle in this recovery strategy. There is currently insufficient information available on this species' distribution and specific habitat requirements to identify critical habitat. Location 4 is the only site that has information beyond a description of substrate; however, while a brief description of the site and surrounding area is available, no measurements of ecohydrology and biophysical attributes were taken. Locations 1-3 are found on the Oldman River flood plain, while Location 4 is associated with a creek in rangeland. The little information available from Location 4 cannot be extrapolated to Locations 1-3, given the differences in habitat type.

Occupancy of the species has not been re-confirmed at any previously recorded location. Additional surveys of extant locations, as well as other locations with suitable habitat need to be carried out to confirm the species presence and identify specific habitat needs of the species. These studies are outlined below in the schedule of studies to identify critical habitat for Bert's Predaceous Diving Beetle.

7.2 Schedule of Studies to Identify Critical Habitat

Table 4. Schedule of Studies to Identify Critical Habitat

Description of Activity	Rationale	Timeline
Survey extant locations where Bert's Predaceous Diving Beetle has been previously recorded	Confirm occupancy of the species at previously recorded locations	2017-2019
Survey suitable spring and seep sites in Oldman River watershed to obtain population distribution and abundance data, biophysical attributes and habitat quality	Understand the distribution and population of Bert's Predaceous Diving Beetle and its habitat requirements	2017-2021
Determine the biophysical attributes of habitat used by Bert's Predaceous Diving Beetle for egg laying, larval development, pupation, overwintering and dispersal	Determine specific habitat requirements for Bert's Predaceous Diving Beetle at different life stages	2017-2021

8. Measuring Progress

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution objectives.

- Occupancy for the two extant occurrences and any newly discovered occurrences have been confirmed and maintained.

9. Statement on Action Plans

One or more action plans will be posted on the Species at Risk Public Registry for Bert's Predaceous Diving Beetle by 2022.

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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](#)⁵. 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 and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the [Federal Sustainable Development Strategy](#)'s⁶ (FSDS) goals and targets.

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.

Spring ecosystems are critical water supplies, refugia for rare and unique species, and are keystone ecosystems (Perla and Stevens 2008) that require better understanding and protection. This recovery strategy will clearly benefit the environment by promoting the conservation of the Bert's Predaceous Diving Beetle and by protecting and enhancing spring and seep habitat within the Oldman River Catchment. Spring ecosystem and habitat protection, the identification of potential approaches to mitigate environmental and cultural stressors, and understanding the sensitivity of the groundwater seeps and streams to changes in the quantity and quality of source water will inevitably benefit other invertebrate species found in association with the Bert's Predaceous Diving Beetle. 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.

⁵ www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1

⁶ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1