

# Recovery Strategy for the Wallis' Dark Saltflat Tiger Beetle (*Cicindela parowana wallisi*) in Canada

## Wallis' Dark Saltflat Tiger Beetle



2016



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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://www.registrelep-sararegistry.gc.ca)<sup>1</sup>.

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<sup>1</sup> <http://www.registrelep-sararegistry.gc.ca>

# RECOVERY STRATEGY FOR THE WALLIS' DARK SALTFLAT TIGER BEETLE (*Cicindela parowana wallisi*) IN CANADA

2016

Under the Accord for the Protection of Species at Risk (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada.

In the spirit of cooperation of the Accord, the Government of British Columbia has given permission to the Government of Canada to adopt the *Recovery Plan for Dark Saltflat Tiger Beetle (Cicindela parowana) in British Columbia* (Part 2) under Section 44 of the *Species at Risk Act* (SARA). Environment Canada has included a federal addition (Part 1) which completes the SARA requirements for this recovery strategy.

The federal recovery strategy for the Wallis' Dark Saltflat Tiger Beetle in Canada consists of two parts:

Part 1 – Federal Addition to the *Recovery Plan for Dark Saltflat Tiger Beetle (Cicindela parowana) in British Columbia*, prepared by Environment Canada.

Part 2 – *Recovery Plan for Dark Saltflat Tiger Beetle (Cicindela parowana) in British Columbia*, prepared by the British Columbia Ministry of Environment.

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Part 2 – *Recovery Plan for Dark Saltflat Tiger Beetle (Cicindela parowana) in British Columbia*, prepared by the British Columbia Ministry of Environment

**Part 1 – Federal Addition to the *Recovery Plan for Dark Saltflat Tiger Beetle (Cicindela parowana) in British Columbia*,  
prepared by Environment Canada**

## Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#)<sup>2</sup> 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 is the competent minister under SARA for the Wallis' Dark Saltflat Tiger Beetle and has prepared the federal component of this recovery strategy (Part 1), as per section 37 of SARA. To the extent possible, it has been prepared in cooperation with the Province of British Columbia as per section 39(1) of SARA. Section 44 of SARA allows the Minister to adopt all or part of an existing plan for a species if it meets the requirements under SARA for content (sub-sections 41(1) or (2)). The Province of British Columbia provided the attached recovery plan for the Wallis' Dark Saltflat Tiger Beetle (Part 2) as science advice to the jurisdictions responsible for managing the species in British Columbia. It was prepared in cooperation with Environment Canada.

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 Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of Wallis' Dark Saltflat Tiger 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 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 the recovery strategy identifies critical habitat, there may be future regulatory implications, depending on where the critical habitat is identified. SARA requires that critical habitat identified within federal protected areas be described in the *Canada Gazette*, after which prohibitions against its destruction will apply. For critical habitat located on federal lands outside of federal protected areas, the Minister of the Environment must either make a statement on existing legal protection or make an order so that the prohibition against destruction of critical habitat applies. For critical habitat located on non-federal lands, if the Minister of the Environment forms the opinion that any portion of critical

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

habitat is not protected by provisions in or measures under SARA or other Acts of Parliament, and not effectively protected by the laws of the province or territory, SARA requires that the Minister recommend that the Governor in Council make an order to extend the prohibition against destruction of critical habitat to that portion. The discretion to protect critical habitat on non-federal lands that is not otherwise protected rests with the Governor in Council.

## Additions and Modifications to the Adopted Document

The following sections have been included to address specific requirements of SARA for federal recovery documents, which are not addressed in the *Recovery Plan for Dark Saltflat Tiger Beetle (Cicindela parowana) in British Columbia* (Part 2 of this document, referred to henceforth as “the provincial recovery plan”) or to provide updated or additional information. Note the provincial recovery plan follows the (aforementioned) provincial naming convention for the species; i.e., the subspecies is not referenced as there is only one subspecies in British Columbia. This federal addition follows COSEWIC (2009) naming conventions and refers to the subspecies Wallis' Dark Saltflat Tiger Beetle (*Cicindela parowana wallisi*).

Under SARA, there are specific requirements and processes set out regarding the protection of critical habitat. Therefore, statements in the provincial recovery plan referring to protection of survival/recovery habitat may not directly correspond to federal requirements. Recovery measures dealing with the protection of habitat are adopted; however, whether these measures will result in protection of critical habitat under SARA will be assessed following publication of the federal recovery strategy.

### 1. Species Status Information

This section replaces the “Species Status Information” (section 2) in the provincial recovery plan.

Legal Status: SARA Schedule 1 (Endangered) (2012).

**Table 1.** Conservation Status of Wallis' Dark Saltflat Tiger Beetle (NatureServe 2015, B.C. Conservation Data Center 2015).

Global (G) Rank*	National (N) Rank*	Sub-national (S) Rank*	COSEWIC Designation	B.C. List**	B.C. Conservation Framework***
G4T3	Canada (N1); United States (N2N4)	Canada: British Columbia (S1); United States: Oregon (SNR), Washington (SNR)	Endangered (2009)	Red	Highest priority: 1 under goal 3

\*Rank 1– critically imperiled; 2– imperiled; 3- vulnerable to extirpation or extinction; 4- apparently secure; 5– secure; H– possibly extirpated; NR – status not ranked; “T-rank” - indicates the status of infraspecific taxa (i.e. the *wallisii* subspecies).

\*\* Red – extirpated, endangered or threatened in B.C.; Blue – special concern in B.C.; Yellow – not at risk in B.C.

\*\*\* Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority); The three goals of the B.C. Conservation Framework are: 1. Contribute to global efforts for species and ecosystem conservation; 2. Prevent species and ecosystems from becoming at risk; 3. Maintain the diversity of native species and ecosystems



## **2. Critical Habitat**

This section replaces the “Species Survival and Recovery Habitat” (section 7) in the provincial recovery plan.

Section 41 (1)(c) of SARA requires that recovery strategies include an identification of the species' critical habitat, to the extent possible, as well as examples of activities that are likely to result in its destruction. A primary consideration in the identification of critical habitat is the amount, quality, and locations of habitat needed to achieve the population and distribution objectives.

The 2014 provincial recovery plan outlines a recovery goal to maintain all extant populations of the species, but notes that that current information about Dark Saltflat Tiger Beetle habitat preferences is not adequate to spatially describe survival/recovery habitat for the species at this time. Environment Canada concurs with the provincial assessment, in that current information for the species' occurrence locations and habitat requirements is considered inadequate and/or unavailable for any critical habitat to be identified at this time.

### **2.1 Identification of the Species' Critical Habitat**

The presence of Wallis' Dark Saltflat Tiger Beetle has been confirmed at two sites near Oliver, B.C., but detailed geographic information for these two sites is not currently available to Environment Canada. The two confirmed sites are described as follows (refer also to provincial recovery plan for details):

1. Manuel's Canyon – Oliver: one specimen caught in 1996
2. McKinney Road – Oliver: one specimen photographed in 2011

Wallis' Dark Saltflat Tiger Beetle is known historically from five additional sites in the South Okanagan but has not been relocated at these locations in more than 50 years despite multiple survey attempts. Owing to the anecdotal nature of historical collections, there is uncertainty regarding the habitat area and biophysical attributes required by the species.

A schedule of studies (Section 2.2) has been included which outlines the activities required to identify the critical habitat that will be sufficient to meet the population and distribution objectives. The identification of critical habitat will be updated when the information becomes available, either in a revised recovery strategy or action plan(s).

### **2.2 Schedule of Studies to Identify Critical Habitat**

The following schedule of studies (Table 2) outlines the activities required to complete the identification of critical habitat for the Wallis' Dark Saltflat Tiger Beetle in Canada.

**Table 2.** Schedule of studies to identify critical habitat for the Wallis' Dark Saltflat Tiger Beetle.

Description of Activity	Outcome/Rationale	Timeline
Obtain data sharing agreement permitting access to geographic information (site location details) for the Wallis' Dark Saltflat Tiger Beetle occurring near Oliver, B.C.	Location details for the species exist, but are currently unavailable to Environment Canada. This activity is required such that sufficient critical habitat is identified to meet the population and distribution objectives.	2016–2021
Conduct targeted surveys in areas of suitable habitat within the proximity of historic observations of Wallis' Dark Saltflat Tiger Beetle in the South Okanagan (i.e. Oliver, Okanagan Falls, Penticton, Carr's Landing and Vernon) and assess any new or reconfirmed populations against criteria for identifying critical habitat.	Comprehensive survey information will permit the identification of area containing critical habitat (through information on species' range and/or application of habitat suitability models), and the identification of biophysical attributes of critical habitat. This activity is required such that sufficient critical habitat is identified to meet the population and distribution objectives.	2016–2021
Address knowledge gaps relating to habitat requirements for each life stage of Wallis' Dark Saltflat Tiger Beetle	Further information regarding habitat requirements of the species is needed in order to identify biophysical attributes of critical habitat.	2016–2021

### 3. Statement on Action Plans

One or more action plan(s) for the Wallis' Dark Saltflat Tiger Beetle will be posted on the Species at Risk Public Registry by 2021.

### 4. 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](#)<sup>3</sup>. 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](#)'s<sup>4</sup> (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

<sup>3</sup> [www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1](http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1)

<sup>4</sup> <http://www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1>

the SEA are incorporated directly into the strategy itself, but are also summarized below in this statement.

The provincial recovery plan for the Wallis' Dark Saltflat Tiger Beetle contains a section describing the effects of recovery activities on other species (i.e., Section 9). Environment Canada adopts this section of the provincial recovery plan as the statement on effects of recovery activities on the environment and other species. Recovery planning activities for the Wallis' Dark Saltflat Tiger Beetle will be implemented with consideration for all co-occurring species at risk, such that there are no negative impacts to these species or their habitats. Some management actions for the Wallis' Dark Saltflat Tiger Beetle (e.g., inventory and monitoring, threat mitigation, habitat conservation, education, and research) may promote the conservation of other species at risk that overlap in distribution and rely on similar habitat attributes.

## 5. References

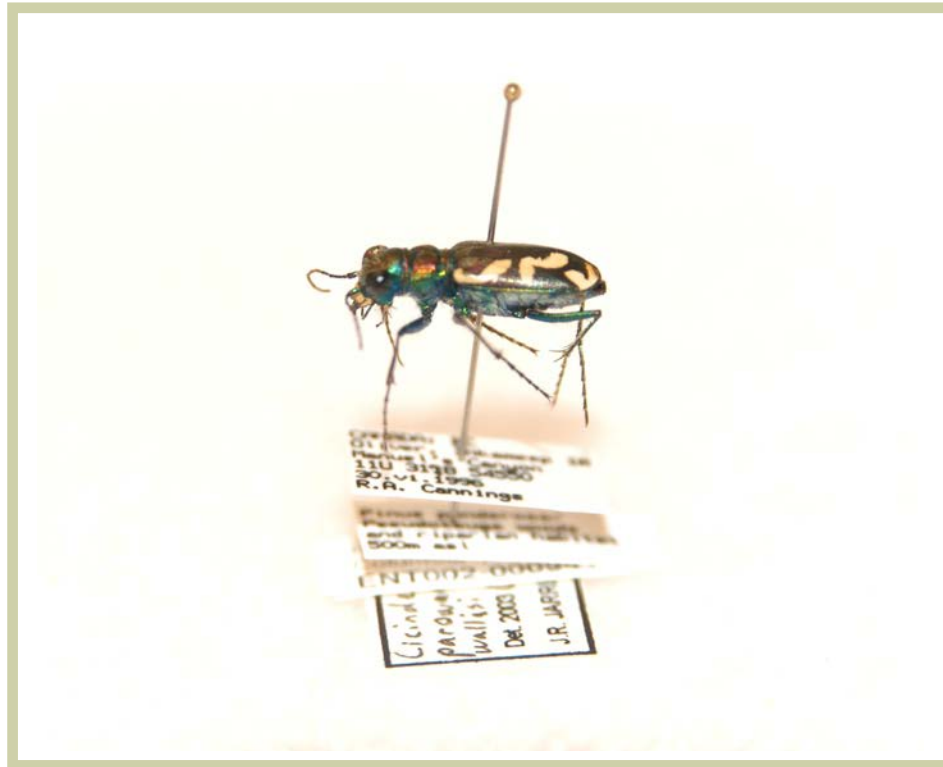
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**PART 2 – *Recovery Plan for Dark Saltflat Tiger Beetle*  
(*Cicindela parowana*) in *British Columbia*, prepared by the  
British Columbia Ministry of Environment.**

## Recovery Plan for Dark Saltflat Tiger Beetle (*Cicindela parowana*) in British Columbia



Prepared by the B.C. Ministry of Environment



Ministry of  
Environment

December 2014

## About the British Columbia Recovery Strategy Series

This series presents the recovery documents that are prepared as advice to the Province of British Columbia on the general approach required to recover species at risk. The Province prepares recovery documents to ensure coordinated conservation actions and to meet its commitments to recover species at risk under the *Accord for the Protection of Species at Risk in Canada* and the *Canada–British Columbia Agreement on Species at Risk*.

### What is recovery?

Species at risk recovery is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of a species' persistence in the wild.

### What is a provincial recovery document?

Recovery documents summarize the best available scientific and traditional information of a species or ecosystem to identify goals, objectives, and strategic approaches that provide a coordinated direction for recovery. These documents outline what is and what is not known about a species or ecosystem, identify threats to the species or ecosystem, and explain what should be done to mitigate those threats, as well as provide information on habitat needed for survival and recovery of the species. This information may be summarized in a recovery strategy followed by one or more action plans. The purpose of an action plan is to offer more detailed information to guide implementation of the recovery of a species or ecosystem. When sufficient information to guide implementation can be included from the onset, all of the information is presented together in a recovery plan.

Information provided in provincial recovery documents may be adopted by Environment Canada for inclusion in federal recovery documents that the federal agencies prepare to meet their commitments to recover species at risk under the *Species at Risk Act*.

### What's next?

The Province of British Columbia accepts the information in these documents as advice to inform implementation of recovery measures, including decisions regarding measures to protect habitat for the species.

Success in the recovery of a species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this document. All British Columbians are encouraged to participate in these efforts.

### For more information

To learn more about species at risk recovery in British Columbia, please visit the B.C. Ministry of Environment Recovery Planning webpage at:

<<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>>

**Recovery Plan for Dark Saltflat Tiger Beetle  
(*Cicindela parowana*) in British Columbia**

Prepared by the B.C. Ministry of Environment

**December 2014**

## **Recommended citation**

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## **Cover illustration/photograph**

Suzie Lavallee

## **Additional copies**

Additional copies can be downloaded from the B.C. Ministry of Environment Recovery Planning webpage at:

<<http://www.env.gov.bc.ca/wld/recoveryplans/rcvry1.htm>>



## Disclaimer

This recovery plan has been prepared by the B.C. Ministry of Environment as advice to the responsible jurisdictions and organizations that may be involved in recovering the species. The B.C. Ministry of Environment has received this advice as part of fulfilling its commitments under the *Accord for the Protection of Species at Risk in Canada*, and the *Canada–British Columbia Agreement on Species at Risk*.

This document identifies the recovery strategies that are deemed necessary, based on the best available scientific and traditional information, to recover Dark Saltflat Tiger Beetle populations in British Columbia. Recovery actions to achieve the goals and objectives identified herein are subject to the priorities and budgetary constraints of participatory agencies and organizations. These goals, objectives, and recovery approaches may be modified in the future to accommodate new objectives and findings.

The responsible jurisdictions have had an opportunity to review this document. However, this document does not necessarily represent the official positions of the agencies or the personal views of all individuals.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this plan. The B.C. Ministry of Environment encourages all British Columbians to participate in the recovery of Dark Saltflat Tiger Beetle.

## **ACKNOWLEDGEMENTS**

Jennifer Heron (B.C. Ministry of Environment) wrote the draft recovery plan, with input from Orville Dyer (B.C. Ministry of Forests, Lands and Natural Resource Operations) and Suzie Lavallee (University of British Columbia). Leah Westereng (B.C. Ministry of Environment) and Peter Fielder (B.C. Ministry of Environment) provided scientific and editorial review and policy guidance. Brenda Costanzo (B.C. Ministry of Environment) provided information about plant communities in the Southern Interior of B.C.

## EXECUTIVE SUMMARY

The Dark Saltflat Tiger Beetle (*Cicindela parowana*) is a metallic green (dorsally and ventrally) beetle with distinct pattern of white markings on its wings. This species reaches 1.2 cm in length, and has bulbous eyes, slender legs and antennae, and a characteristic hop and fly escape movement similar to other tiger beetles.

The Dark Saltflat Tiger Beetle, subspecies *wallisi*, was assessed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and is listed as Endangered in Canada on Schedule 1 of the *Species at Risk Act* (SARA). In British Columbia, Dark Saltflat Tiger Beetle is ranked S1 (critically imperiled) by the Conservation Data Centre and is on the provincial Red list. The B.C. Conservation Framework ranks Dark Saltflat Tiger Beetle as a priority 1 under goal 3 (maintain the diversity of native species and ecosystems). Recovery is considered to be biologically and technically feasible.

The Dark Saltflat Tiger Beetle may have always been rare within the ecosystems of the southern Okanagan. Dark Saltflat Tiger Beetle was thought to be extirpated from Canada as extensive searches throughout the Okanagan Valley had failed to record the species within its known range. Historical records are from sites with vague site names and unclear habitat associations, and were also collected over 50 years ago. This vague information makes it difficult to describe habitat associations and search historical sites. However, upon going through unidentified specimens, it was noted that a specimen had been collected in 1996 outside of Oliver. Subsequently, the species has also been recorded in 2011 near Oliver. Only two extant sites are currently known.

The two extant records for Dark Saltflat Tiger Beetle are within open ponderosa pine forest habitats, and not typical of the salt flat or alkaline habitats where the species was thought to have been collected historically. Thus, the species may still be within unchecked sparsely vegetated open ponderosa pine habitats. Once the habitat parameters for this species are better understood, more targeted surveys within the southern Okanagan can be conducted.

No significant threats are known at the two extant Dark Saltflat Tiger Beetle sites; however, there may be threats to this species in unchecked habitat where it could still be found. Although historical threats to the species are unknown, it is likely that the habitat loss of sandy alkaline habitats and the more open habitats in the Okanagan Valley bottom has had an impact on this species.

The recovery (population and distribution) goal is to maintain all extant populations of Dark Saltflat Tiger Beetle across the species' range in British Columbia.

The following are the recovery objectives:

1. To secure protection<sup>1</sup> for all known extant sites of Dark Saltflat Tiger Beetle.
2. To address knowledge gaps (e.g., range extent within the south Okanagan, habitat requirements for each life stage, species-specific threats).

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<sup>1</sup> Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

## RECOVERY FEASIBILITY SUMMARY

The recovery of Dark Saltflat Tiger Beetle in B.C. is considered technically and biologically feasible based on the criteria outlined by the Government of Canada (2009):

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.

Yes. There are two recent (within the past 20 years) records of Dark Saltflat Tiger Beetle within a large area of contiguous habitat. This habitat likely supports a larger beetle population and it is assumed they contain the microsites that provide the habitat requirements for all life stages and functions (e.g., foraging and mating).

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

Yes. At this time, there is no evidence that habitat is limiting for this species. The most recent record (2011) is within a pipeline right-of-way adjacent to habitat that is not modified and has no known threats (i.e., within the next 10 years), thus is likely suitable for sustaining a resident population. The only other record (1996) was collected in a roadside right-of-way, also adjacent to natural habitat with no known threats. The specific habitat necessary for life cycle development of the beetle is unknown; however, because the habitat where the species was found is natural, we can assume there are likely other beetles present within that habitat. The distance Dark Saltflat Tiger Beetle is able to disperse is unknown; however, the species likely inhabits the habitat patch in which it is found.

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

Unknown. Currently, no significant threats are known at the two extant Dark Saltflat Tiger Beetle sites. It is expected that threats that may arise or be present in unchecked habitat (e.g., invasive plants, livestock grazing, roadside pesticides, or herbicide application) can be avoided or mitigated. However, since habitat needs for this species need more investigation, it is not possible to say all threats can be avoided or mitigated for certain. Historical records (collected > 50 years before present) are vague, and when mapped encompass large areas of potential habitat. Threats that caused historical extirpations are unknown, although assumed to have been urban and agricultural development within the low elevation areas of the Okanagan Valley, which is ongoing.

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

Yes. No significant threats are known at the two extant Dark Saltflat Tiger Beetle sites at this time. Although threats to unchecked habitat are unknown, effective recovery techniques exist that can help avoid or mitigate the most likely threats, should they be identified. For example, published best practices approaches are available for control of invasive plants;

measures can be taken to control overgrazing within potential larval burrow sites, and approaches taken to minimize the use of pesticides and herbicides. If new records are found within the vague historical collection regions (e.g., Vernon, Oliver), landowners could also be approached and stewardship documents created to assist them with developing best practices for protecting the habitat and minimizing threats. As well, standard inventory techniques exist that can be used to confirm the species' range. Other knowledge gaps such as needs for larval burrow sites and adult foraging territory can be filled by research.

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## 1 COSEWIC\* SPECIES ASSESSMENT INFORMATION

**Assessment Summary: November 2009**
**Common Name:** Wallis' Dark Saltflat Tiger Beetle

**Scientific Name:\*\*** *Cicindela parowana wallisi*
**Status:** Endangered

**Reason for Designation:** This distinctively marked beetle is historically known from five locations in a region where urban and agricultural expansion have reduced and continue to reduce habitat. Extensive recent searches have failed to find the beetle and it may occur at only a single location. The index of area of occupancy is small and there is potential future decline in habitat and in number of individuals due to development.

**Occurrence:** British Columbia

**Status History:** Designated Endangered in November 2009

\* Committee on the Status of Endangered Wildlife in Canada.

\*\* Common and scientific names reported in this recovery plan follow the naming conventions of the British Columbia Conservation Data Centre, which may be different from names reported by COSEWIC.

## 2 SPECIES STATUS INFORMATION

Dark Saltflat Tiger Beetle <sup>a</sup>		
Legal Designation:		
<a href="#">FRPA</a> : <sup>b</sup> No	B.C. <i>Wildlife Act</i> : <sup>c</sup> No	<a href="#">SARA</a> : <sup>d</sup> <a href="#">Schedule 1</a> - Endangered (2012)
<a href="#">OGAA</a> : <sup>b</sup> No		
Conservation Status <sup>e</sup>		
B.C. List: Red	B.C. Rank: S1 (2008)	<a href="#">National Rank</a> : N1 (2012)      Global Rank: G4 (2008)
Other <a href="#">Subnational Ranks</a> : <sup>f</sup> California (SNR), Idaho (SNR), Nevada (S4), Oregon (SNR), Utah (SNR), Washington (S4)		
B.C. Conservation Framework (CF) <sup>g</sup>		
Goal 1: Contribute to global efforts for species and ecosystem conservation.		Priority: <sup>h</sup> 5 (2008)
Goal 2: Prevent species and ecosystems from becoming at risk.		Priority: 6 (2008)
Goal 3: Maintain the diversity of native species and ecosystems.		Priority: 1 (2008)
<a href="#">CF Action Groups</a> :	Inventory, Planning, Habitat Protection, List under <i>Wildlife Act</i> , Private Land Stewardship, Habitat Restoration	

<sup>a</sup> Data source: B.C. Conservation Data Centre (2014) unless otherwise noted.

<sup>b</sup> No = not listed in one of the categories of wildlife that requires special management attention to address the impacts of forest and range activities on Crown land under the *Forest and Range Practices Act* (FRPA; Province of British Columbia 2002) and/or the impacts of oil and gas activities on Crown land under the *Oil and Gas Activities Act* (OGAA; Province of British Columbia 2008).

<sup>c</sup> No = not designated as wildlife under the B.C. *Wildlife Act* (Province of British Columbia 1982).

<sup>d</sup> Schedule 1 = found on the List of Wildlife Species at Risk under the *Species at Risk Act* (SARA).

<sup>e</sup> S = subnational; N = national; G = global; T = refers to the subspecies level; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NR = unranked; U = unrankable.

<sup>f</sup> Data source: NatureServe (2013).

<sup>g</sup> Data source: B.C. Ministry of Environment (2010).

<sup>h</sup> Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

### 3 SPECIES INFORMATION

#### 3.1 Species Description

Dark Saltflat Tiger Beetle (1.1–1.2 cm length) has bulbous eyes, a white upper lip, slender long antennae and legs, and prominent spear-like mandibles that extend and cross at the front of the head (Figure 1; COSEWIC 2009). The body colour (dorsal and ventral surfaces) of the head, legs, and midsection is an overall metallic bluish-green. Reddish-copper highlights occur on the dorsal surface only, in addition to a distinctive white pattern covering approximately 50% of the elytra (hardened front wings) (Figure 2). As the beetle ages, the whitish hairs along the area between their eyes and “lip” are broken off and no longer a good characteristic for identification (Acorn 2001).



**Figure 1.** Dark Saltflat Tiger Beetle underside and white upper lip. Specimen captured in 1996 at Manuel Canyon near Oliver and housed at Royal British Columbia Museum.



**Figure 2.** Dark Saltflat Tiger Beetle showing white hindwing markings. Specimen captured in 1996 at Manuel Canyon near Oliver and housed at Royal British Columbia Museum.

Dark Saltflat Tiger Beetles presumably live 2–3 years based on information from other tiger beetle life cycles (Pearson *et al.* 2006). Adults live for 3–4 months, during which time they mate and females lay up to 100 eggs individually within suitable substrate. Museum and collection records for Dark Saltflat Tiger Beetle in Canada indicate adult beetles have two activity periods: late May through June and again from mid-August to October. Tiger beetles with two activity periods tend to overwinter as adults, emerging in the early spring, during which time they forage, mate, and oviposit eggs into suitable substrates. Adults may then seek shelter and become less active and aestivate throughout the hot summer months, becoming more active again in the early fall. Some adults may also die-off during the hot summer. Tiger beetles active in the fall may have just pupated during mid-August. The adult fall activity period varies with the yearly weather, with longer warmer fall weather allowing for a longer adult activity period. These two

activity periods correspond with the activity patterns of other tiger beetles at northern latitudes (Pearson and Vogler 2001).

Tiger beetles lay their eggs in loose, bare soil that enables good structure for larval burrow construction. Larval biology is unknown (Pearson *et al.* 2006). Information from other tiger beetles suggests the larval life stage lasts up to two or sometimes three years. Dark Saltflat Tiger Beetle larvae are described as colonial (Wallis 1961), likely due to the necessary habitat requirements for larval burrow construction, the clustering of oviposition sites, and subsequent hatching and survival of larvae within the suitable substrate. The larvae of Dark Saltflat Tiger Beetle are difficult to capture and identify based on their reclusive habits; they remain hidden within deep larval tunnels. Their morphological characteristics are not fully described in the literature.

Adult beetles are considered solitary (Pearson *et al.* 2006), although they co-occur within the same habitat of multiple tiger beetle species. Egg fertilization in female tiger beetles is sequential (i.e., the first sperm in is the first sperm to fertilize an egg). This partially explains why male tiger beetles will tend to mate-guard females.

Tiger beetle dispersal depends on the species, and specific dispersal capability for Dark Saltflat Tiger Beetle is unknown.

## 3.2 Populations and Distribution

### 3.2.1 Global Distribution

Globally, there are three described Dark Saltflat Tiger Beetle subspecies: *C. parowana parowana* Calder 1924, *C. parowana platti* Cazier 1937, and *C. parowana wallisi* Casey 1922. These 3 subspecies range in western North America from eastern California, central Nevada to eastern Utah, southwestern Idaho, central Oregon, and central eastern Washington State, reaching the northernmost extent of its range in the southern Okanagan of British Columbia (B.C.) (Pearson *et al.* 2006). A fourth subspecies (*C. parowana remittensis*; Casey 1924) is disputed in the literature (COSEWIC 2009).

In Canada, only the *wallisi* subspecies of Dark Saltflat Tiger Beetle is found (Freitag 1999). The known global range of this subspecies is within the Great Basin of North America, extending from its northernmost extent in Vernon, B.C., to south-central Oregon (Pearson *et al.* 2006). There is likely hybridization with the two other subspecies (*C. parowana parowana* and *C. parowana platti*) at the southernmost extent of the range of *C. parowana wallisi* in southeastern Oregon (Pearson *et al.* 2006).

The index of area of occupancy is 8 km<sup>2</sup> based on a 2 by 2 km grid over the two known extant sites. This historic and present day biological area of occupancy is unknown. The Canadian range is likely less than 1% of the subspecies' global range.

### 3.2.2 B.C. Distribution

In Canada, Dark Saltflat Tiger Beetle is only found in B.C. (Figure 3). There are at least 12<sup>2</sup> known museum or photographic collection records for B.C. dating from the 1914 to 2011 (Table 1). These records are grouped into a total of 5 general geographic areas, as historical records are difficult to spatially define. From north to south they are: Vernon, Carr's Landing, Penticton, Okanagan Falls, and Oliver.

In B.C., both extant<sup>3</sup> occurrences are found within the Oliver geographic area: (1) Manuel's Canyon and (2) McKinney Road (Table 1, Figure 3). Both of these records have been the result of opportunistic observations or collections and not the result of directed search effort for this species (e.g., the knowledge that this species was in fact so rarely observed in the Okanagan was not realized until well after the observation). The habitat at Manuel's Canyon is natural, abundant, and does not appear to have changed since the initial collection in 1996 (R. Cannings, pers. comm., 2013). The McKinney road site is within a gas pipeline right-of-way and although the site has been disturbed and cleared during construction and maintenance, the surrounding habitats are natural (K. Sadler, pers. comm., 2013; M. Sarell, pers. comm., 2013). Both these sites likely contain resident populations of Dark Saltflat Tiger Beetle based on the natural state of the surrounding habitat and dispersal/home range of other tiger beetle species.

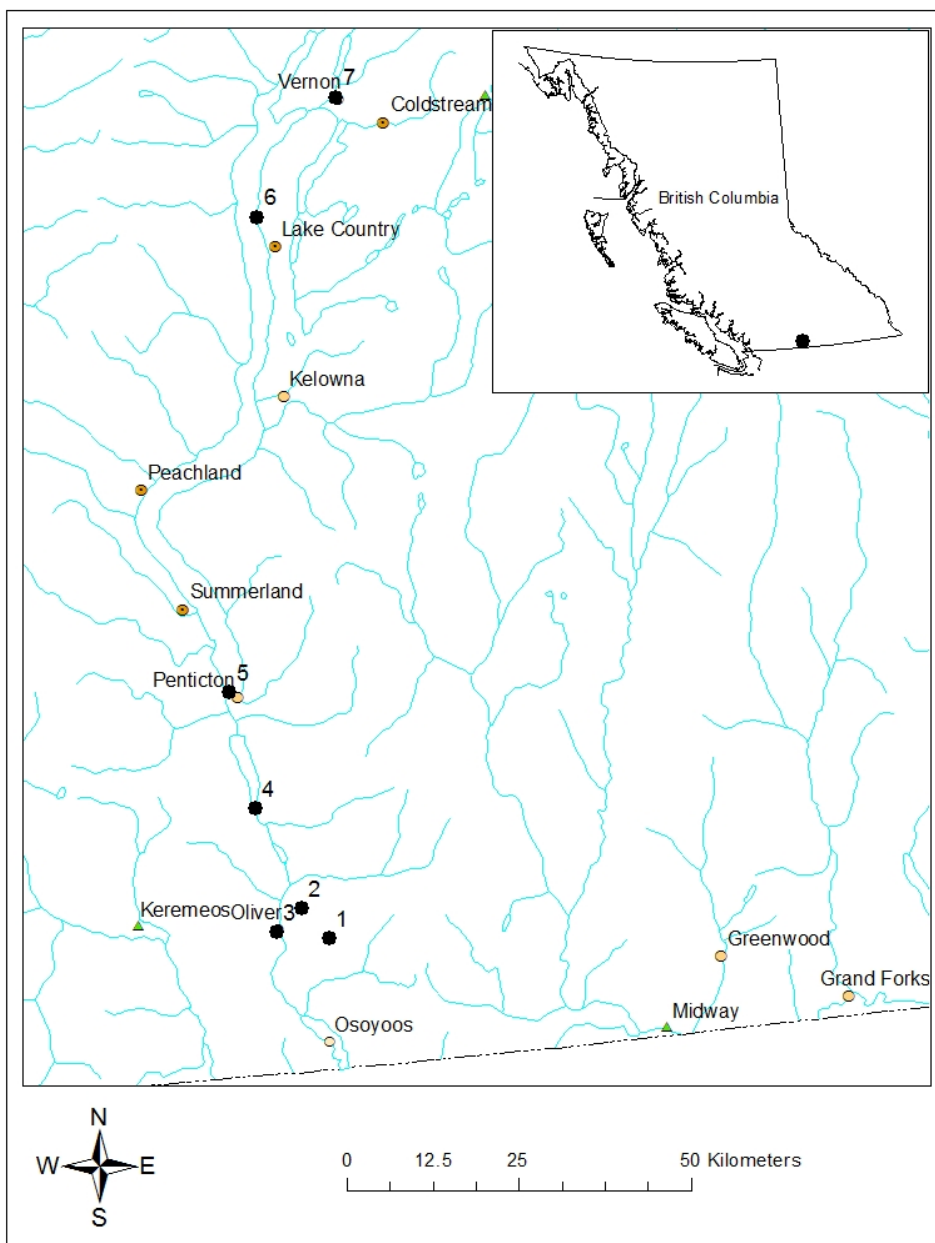
All other sites are considered historical.<sup>4</sup> Recent attempts to find this species at the historical sites and more than 50 nearby sites involving at least 75 person hours and failed to locate a specimen (COSEWIC 2012). Records from these areas have little habitat or otherwise associated information on their museum collection labels. The site from which the specimen was recorded could potentially be a large radius around the geographic name. It is likely that habitat conversion has caused most of the potentially suitable habitat to be lost after the initial record.

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<sup>2</sup> Some museum specimens that are cited in literature (e.g., Wallis 1961); however, the associated specimen has been lost. These dates only include records with confirmed and associated specimens.

<sup>3</sup> These extant sites refer to a collection record where the specific, exact geographic area of collection is known and a GPS point is available for the collection record.

<sup>4</sup> A site is considered historical if no specimens have been collected within the general vicinity for greater than 50 years.



**Figure 3.** Dark Saltflat Tiger Beetle distribution in British Columbia (courtesy of O. Dyer 2014). Site numbers on map correspond to those found in Table 1. Sites 3, 4, 5, 6, and 7 are approximations based on limited information from historical specimens.

**Table 1.** Status and description of Dark Saltflat Tiger Beetle collection sites in B.C.

Geographic Area	Site #	Site name <sup>a</sup>	Status and description <sup>a</sup>	Land tenure
Oliver	1	Manuel's Canyon	Extant. Most recent record is 1996. One specimen caught at the roadside. Described as open with some ponderosa pine ( <i>Pinus ponderosa</i> ) and Douglas-fir ( <i>Pseudotsuga menziesii</i> var. <i>glauca</i> ), riparian, and moderate ground cover at time of collection (COSEWIC 2009).	Federal (Osoyoos Indian Reserve)
	2	McKinney Road	Extant. Record from October 18, 2011. One specimen photographed within the right-of-way. McKinney Road, at the pipeline crossing. The actual site is almost 200 m along the pipeline to the right (south) of the road.	Federal (Osoyoos Indian Reserve)
	3	Oliver	Historical. Most recent record 1953. The site locality is unknown and the species may still be within potential suitable habitats within the general regional area.	Unknown
Okanagan Falls	4	-	Historical. Most recent record 1953. The site locality is unknown and the species may still be within potential suitable habitats within the general regional area.	Unknown
Penticton	5	-	Historical. Most recent record is 1951. Likely extirpated. Areas referred to by Wallis (1961) have been converted to a small housing subdivision (northwest corner of Skaha Lake, Penticton) (COSEWIC 2009). However, the site locality is unknown and the species may still be within potential suitable habitats within the general regional area.	Unknown
Carr's Landing	6	-	Historical. Collection date is 1914 and labeled "Okanagan" in the Canadian National Collection. Further work by Lavallee (2007) indicates this record is from Carr's Landing on the east side of Okanagan Lake. Habitat includes alkaline soils and topography shows ravine and deciduous cover, suggesting potential habitat (Lavallee 2007).	Unknown
Vernon	7	-	Historical. The collection date is unknown, but likely 1930s. The site locality is unknown and the species may still be within potential suitable habitats within the general regional area.	Unknown

<sup>a</sup> Site name associated with historical records refers to a large area in the general vicinity of the gazette name.

<sup>b</sup> A site is considered historical if no specimens have been collected within the general vicinity for greater than 50 years.

### 3.3 Habitat and Biological Needs

The Dark Saltflat Tiger Beetle likely forms a metapopulation structure within suitable habitat patches containing essential habitat features such as larval sites, foraging grounds, and adult overwintering sites. A metapopulation structure assumes that a species is spread out amongst numerous populations within habitats needed at the various life stages, and that the population intermixes in some years. The habitat at one site may become unsuitable for a few years (e.g., excess flooding, trampling) but will be eventually repopulated by the adjacent population that remains within suitable habitats. Thus unoccupied habitats may need to be maintained to link Dark Saltflat Tiger Beetle metapopulations

At a range-wide (global) scale, habitat information for Dark Saltflat Tiger Beetle includes habitats with saline and/or alkaline soils, open and sparse sagebrush and pine vegetation, and often habitats that are not wet or close to lakes or rivers (Pearson *et al.* 2006). Historical

collection records for B.C. have little associated habitat information. Based on the range-wide, generalized information for Dark Saltflat Tiger Beetle, it has been assumed that these historical B.C. collections were within characteristically-described habitat, i.e. mostly within alkaline and saline flats with perhaps some trees (COSEWIC 2009). However, there is no definitive information to indicate that the B.C. collections were made within these habitat types.

The two most recent records for Dark Saltflat Tiger Beetle are within open pine forest habitats, which are very different from the salt flat or alkaline habitats where the species was presumed to have been collected historically.<sup>5</sup> This suggests that the Dark Saltflat Tiger Beetle may be able to persist in a broader range of habitat types than previously known and/or that this species may occur in other habitats not previously checked.

Given the uncertainty of the habitat associated with the historical records, the following general habitat description for Dark Saltflat Tiger Beetle is based on terrestrial ecosystem mapping available for the two extant sites near Oliver only:<sup>6</sup>

- Ponderosa Pine biogeoclimatic subzone, very dry hot variant (PPxh1) as described by Meidinger and Pojar (1991).
- The plant communities surrounding the collection site include Ponderosa pine – big sagebrush – bluebunch wheatgrass; bluebunch wheatgrass – compact selaginella; Ponderosa pine – bluebunch wheatgrass – Idaho fescue; Ponderosa pine – red three-awn. There is also antelope-brush in the area.
- Elevation range of PPxh1 subzone is from 336 to 900 m (extant site at McKinney Road is 760 m above sea level; the Manuel's Canyon site elevation has not been recorded from the field).

The PPxh1 subzone is generally a mosaic of grasslands and open ponderosa pine forests with some Douglas-fir in the northern sites (Meidinger and Pojar 1991). Soils are generally loamy and moderately well-drained and derived from moraine and glaciofluvial deposits. These deposits range from medium- to fine-textured morainal blankets to steep glaciofluvial escarpments with rock outcrops. The climate is dry, with low snowfall; soils are droughty and nutrient poor.

Based on aerial photography, the habitat at Manuel's Canyon is natural open ponderosa pine forest and likely has a sparsely vegetated understory. The habitat in which the beetle was observed at McKinney Road is within a pipeline crossing, which has been cleared of taller vegetation and kept open. The adjacent habitat, which is presumably where the species likely lives and forages, is ponderosa pine forest and open sagebrush habitats, with a mixed understory of shrubs and herbs. The commonalities between these two extant sites are the open habitat, which is needed for adult predation (stalking and hunting prey), and suitable oviposition and long-term open larval burrow sites. Detailed plant inventory and ecosystem descriptions have not been completed at these sites.

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<sup>5</sup> It is possible that the availability of saline/alkaline soils has diminished within the region owing to threats (but possibly still represents optimal habitat type), and/or there has not been sufficient resurvey of the full area around historical sites.

<sup>6</sup> Additional habitat description should be added if this species is found within other habitat types in B.C.

The most recent habitat information is from observations at the McKinney Road site near Oliver in 2012.<sup>7</sup> The beetle was recorded from within a pipeline crossing, which appears to have recently been cleared of tree and shrubs through manual cutting. However, the adjacent habitat at the McKinney Road is a sparsely vegetated at approximately 760 m elevation. The site has an overstory of ponderosa pine, with an understory predominantly of Big Sagebrush (*Artemisia tripartita* ssp. *tripartita*), and, in lesser amounts, antelope-brush (*Purshia tridentata*) and the occasional squaw currant (*Ribes cereum* var. *cereum*). Herb layer dominants include yarrow (*Achillea millefolium*) and non-native lemonweed (*Lithospermum ruderale*). Surrounding community types (as referenced by Meidinger and Pojar 1991) include the following: Ponderosa pine – bluebunch wheatgrass – Idaho fescue; Ponderosa pine – red three-awn; Ponderosa pine – big sagebrush – bluebunch wheatgrass; and bluebunch wheatgrass – compact selaginella. Within these four plant communities the shrub layers are open or absent, there is usually no moss layer, but there can be some lichen crust. As a result of low vegetation cover, exposed mineral soil is common (Meidinger and Pojar 1991).

Habitat needs of the Dark Saltflat Tiger Beetle vary depending on its life stage and are described below. There is no specific life history information on this species from B.C. Generalized information on the habitat needed by tiger beetle at each life stage (Pearson and Vogler 2001, Pearson *et al.* 2006, and COSEWIC 2009) is summarized below.

### Adults

Adult beetles use open habitat for foraging/hunting during seasonal activity. Adults are visual predators, actively stalking and pursuing prey or sitting and waiting within shaded areas to ambush prey (Pearson *et al.* 2006). Some adult tiger beetles consume dead organisms and/or fallen fruits (Pearson *et al.* 2006). It is unknown if Dark Saltflat Tiger Beetle has these same food preferences.

Adult tiger beetles dig burrows (sometimes daily) to seek overnight refuge, shelter from rain, or extreme daily heat temperatures (e.g., lethal temperatures for tiger beetles is approximately 39°C). These daily burrows may not require the same specific soil parameters as overwintering larval or adult burrow sites. The overwintering burrows of both adults and larvae are generally longer (generally > 30 cm) and are dug deeper for insulation and protective needs (Acorn 2001). The specific soil requirements are unknown, but likely contain a component of clay to allow for burrows to maintain structure over the long term (see Section 3.6).

### Eggs

Oviposition likely occurs sometime during the spring adult activity period, May through June, although oviposition has not been observed in B.C. or elsewhere within the species range. Adult females need suitable substrates as oviposition sites. Females use the tip of their abdomen to dig a shallow hole (< 1 cm depth) within which to lay an individual egg. Tiger beetles, in general, lay up to 100 eggs (Pearson *et al.* 2006). The egg life stage is the most vulnerable to mortality and requires areas that are not likely to be disturbed. The specific soil requirements are unknown,

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<sup>7</sup> Note that specific habitat information from the Manuel's Canyon site has not been collected.



but likely contain a component of clay to allow for burrows to maintain structure over the long term (see Section 3.6).

### **Larvae**

Eggs hatch into larvae sometime in the summer months and remain in this life stage for up to 2 years, especially in more northerly latitudes (Pearson and Vogler 2001). Larvae are not highly mobile, remaining in their burrow and ambushing passing prey. Larvae maintain their burrow by constantly excavating and moving soil particles from the burrow site. Larvae require bare or sparsely vegetated stable soil of a certain granular and clay content for the excavation and construction of larval burrows. The soil needs to be loose and friable, to drain well, and be deep enough to allow for easy excavation (Pearson and Vogler 2001).

Although the larvae have been described, the larval biology is unstudied (Pearson *et al.* 2006). Larval burrow sites have not been found in B.C. but elsewhere are thought to be within saline or alkaline soils, often referred to as salt flats (Pearson *et al.* 2006). These soil types are frequently found around areas that are seasonally wet or ephemeral, such as mud flats, sand bars, creek banks, or similar habitats. However, the two most recent adult Dark Saltflat Tiger Beetle records in B.C. were not found close to these types of habitats. Thus, the larval burrow site requirements in B.C. are unknown and need further study.

## **3.4 Ecological Role**

Dark Saltflat Tiger Beetle is not known to have obligate relationships with other species. Tiger beetles (in general) are often used as indicator species in ecological studies on biodiversity (Pearson and Cassola 1992). Tiger beetle species co-occurring within similar habitats, such as Cow Path Tiger Beetle (*Cicindela purpurea*), Hairy-necked Tiger Beetle (*C. hirticollis*), Blowout Tiger Beetle (*C. lengi*), Sagebrush Tiger Beetle (*C. pugetana*), and Badlands Tiger Beetle (*C. decemnotata*), may compete for food, although temporal habitat partitioning is also a relatively common occurrence (Pearson and Vogler 2001).

Wingless parasitic wasps (family Tiphidae, *Methocha* spp.) are known to lay their eggs on larvae of *Cicindela* (Burdick and Wasbauer 1959; Acorn 2001). Tiger beetle predators include robber flies (family Asilidae); lizards; and birds such as shrikes, kestrels, and flycatchers (Pearson *et al.* 2006).

## **3.5 Limiting Factors**

Limiting factors are generally not human induced and include characteristics that make the species less likely to respond to recovery/conservation efforts.

Limiting factors for Dark Saltflat Tiger Beetle are not well documented. Limiting factors for tiger beetles, in general, are summarized from Acorn (2001); Pearson and Vogler (2001); Pearson *et al.* (2006); and COSEWIC (2009) and outlined below.

- Parasitic arthropods. Bee flies (*Anthrax* spp.) are known to flick their eggs (e.g., deposit by flicking their abdomen) in larval holes, although the fly is not specific to tiger beetle larval tunnels (Acorn 2001).
- Temperature extremes. Surface and ambient temperatures govern tiger beetle activity (Pearson and Vogler 2001). Adults are less active at lower temperatures.
- Specific requirements for burrow sites. Soil substrate (although specific substrate composition is unknown) may limit larval tunnel depths and larvae are likely sensitive to ground freezing temperatures and typically burrow deeper to avoid freezing. If larvae cannot burrow deeper, mortality can occur. Adult burrows may be limited by similar soil parameters.

## 4 THREATS

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational) (adapted from Salafsky *et al.* 2008). For purposes of threat assessment, only present and future threats are considered.<sup>8</sup> Threats do not include limiting factors<sup>9</sup> which are presented in Section 3.5.

For the most part, threats are related to human activities, but they can also be natural. The impact of human activity may be direct (e.g., destruction of habitat) or indirect (e.g., invasive species introduction). Effects of natural phenomena (e.g., fire, , flooding) may be especially important when the species is concentrated in one location or has few occurrences, which may be a result of human activity (Master *et al.* 2012). As such, natural phenomena are included in the definition of a threat, though they should be considered cautiously. These stochastic events should only be considered a threat if a species or habitat is damaged from other threats and has lost its resilience. In such cases, the effect on the population would be disproportionately large compared to the effect experienced historically.

### 4.1 Threat Assessment

The threat classification below is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system and is consistent with methods used by the B.C. Conservation Data Centre. For a detailed description of the threat classification system, see the Open Standards website (The Open Standards 2014). Threats may be observed, inferred, or projected to occur in the near term. Threats are characterized here in terms of scope, severity, and timing. Threat “impact” is calculated from scope and severity. For information on how the values are assigned, see [Master \*et al.\* \(2012\)](#) and table footnotes for details.

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<sup>8</sup> Past threats may be recorded but are not used in the calculation of Threat Impact. Effects of past threats (if not continuing) are considered when determining long-term and/or short-term trend factors (Master *et al.* 2012).

<sup>9</sup> It is important to distinguish between limiting factors and threats. Limiting factors are generally not human induced and include characteristics that make the species less likely to respond to recovery/conservation efforts.

Threats for Dark Saltflat Tiger Beetle were assessed for the entire province (Table 2). Note that scoring for threats was only based on known sites (i.e., two extant sites). As previously noted, habitat occupied by Tiger Beetle in historical locations is unknown, and the mechanisms by which historical threats may have impacted these populations are speculative. Owing to the ambiguous nature of these records, the lack of understanding of habitat parameters for this species, and the resulting uncertainty of the species' distribution, there is no ability to assign threat criteria to historical records (i.e., scope, severity), or use them as a basis for assessing ongoing impacts. Accordingly, suspected and/or potential threats to unchecked and historically described habitat are noted but not scored in this assessment due to inadequate information. The threats assessment for Tiger Beetle will require updating once these important knowledge gaps pertaining to distribution and habitat use are addressed.

**Table 2.** Threat classification table for Dark Saltflat Tiger Beetle.

Threat # <sup>a</sup>	Threat description	Impact <sup>b</sup>	Scope <sup>c</sup>	Severity <sup>d</sup>	Timing <sup>e</sup>	Population(s)
1	<a href="#">Residential &amp; commercial development</a>	Not Calculated	Not scored	Not scored	Insignificant/ Negligible	
1.1	Housing & urban areas	Not Calculated	Not scored	Not scored	Insignificant/ Negligible	Unchecked habitat within general historical site.
2	<a href="#">Agriculture &amp; aquaculture</a>	Negligible (< 1%)	Small (1–10%)	Negligible (< 1%)	High	
2.3	Livestock farming & ranching	Negligible (< 1%)	Small (1–10%)	Negligible (< 1%)	High	Manuel's Canyon; McKinney Rd. Unchecked habitat
4	<a href="#">Transportation &amp; service corridors</a>	Not Calculated	Not scored	Not scored	Insignificant/ Negligible	
4.2	Utility & service lines	Not Calculated	Not scored	Not scored	Insignificant/ Negligible	McKinney Road
6	<a href="#">Human intrusions &amp; disturbance</a>	Negligible (< 1%)	Negligible (< 1%)	Not scored	High	
6.1	Recreational activities	Negligible (< 1%)	Negligible (< 1%)	Not scored	High	Manuel's Canyon; McKinney Rd. Unchecked habitat
7	<a href="#">Natural system modifications</a>	Unknown	Small (1–10%)	Unknown	High	
7.1	Fire & fire suppression	Unknown	Small (1–10%)	Unknown	High	Manuel's Canyon; McKinney Rd. Unchecked habitat
8	<a href="#">Invasive &amp; other problematic species &amp; genes</a>	Unknown	Unknown	Unknown	High	
8.1	Invasive non-native/alien species	Unknown	Unknown	Unknown	High	Manuel's Canyon; McKinney Rd. Unchecked habitat
11	<a href="#">Climate change &amp; severe weather</a>	Not Calculated	Small (1–10%)	Unknown	Low	
11.2	Droughts	Not Calculated	Small (1–10%)	Unknown	Low	Manuel's Canyon; McKinney Rd. Unchecked habitat

<sup>a</sup> **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.

<sup>b</sup> **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%).

<sup>c</sup> **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 3-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%).

<sup>d</sup> **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.

## 4.2 Description of Threats

There are no significant threats to the two known extant Dark Saltflat Tiger Beetle sites at this time.<sup>10</sup> The two extant sites at McKinney pipeline crossing and Manuel's Canyon are at higher elevations where habitat remains fairly intact. Lower elevation habitats, which include the historical sites, are highly degraded and fragmented (i.e., past threats not included in assessment). There may be threats to this species in unchecked and/or historical habitat where this species could still be found. Once the habitat parameters for this species are better understood, more targeted surveys within unchecked and historical habitats can be conducted and threats determined. Scoring for threats currently is only based on known extant sites and does not consider historical sites. Details are discussed below under the Threat Level 1 headings.

### IUCN-CMP Threat 1. Residential & commercial development

#### 1.1 Housing & urban areas

Residential and commercial development is not considered a current threat at the two extant Dark Saltflat Tiger Beetle sites. At present, these sites and habitats are not close to residential or commercial housing plans, nor do they sit within urban growth boundaries. There is some residential development within 6 km of Site 2 McKinney Road; however, the development is small.

Historically, residential and commercial development have likely contributed to the extirpation of Dark Saltflat Tiger Beetle at some sites by removing the open bare ground necessary for larval burrow construction and adult predatory hunting. This most likely occurred in the lower elevation valley bottoms within the urban areas of Penticton, Oliver, Osoyoos, and Vernon. Historical ecosystem mapping completed for the south Okanagan shows extensive conversion of natural habitat to roads, beaches, housing, and other forms of urban development with riparian communities declining 58–92% since 1800 (Lea 2008). Areas referred to by Wallis (1961) have been converted to a small housing subdivision (northwest corner of Skaha Lake, Penticton) (COSEWIC 2009).

Due to the lack of knowledge regarding the specific habitat needed by Dark Saltflat Tiger Beetle, this threat could apply to much of the unchecked natural habitats within the urban growth boundaries around the low elevation areas of the Okanagan Valley corridor where vague historical sites are named (e.g., Osoyoos, Penticton, and Vernon). Examples of habitat include B.C. Crown land within these urban growth boundaries, which is prioritized for future housing developments (e.g., Osoyoos West Bench property [> 300 ha] immediately adjacent to the west side of the municipal boundary of Osoyoos) (O. Dyer, pers. comm., 2013). Further inventory and habitat information is needed before the scope of this threat can be assessed beyond that of the known sites.

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<sup>10</sup> Overall threat impact is calculated following Master *et al.* (2009) using the number of Level 1 Threats assigned to this species where Timing = High or Moderate. The overall threat impact considers the cumulative impacts of multiple threats; however, the calculated impact of the threats to Dark Saltflat Tiger Beetle was determined to be negligible or unknown.

**IUCN-CMP Threat 2. Agriculture & aquaculture****2.3 Livestock farming & ranching**

It is unlikely the Dark Saltflat Tiger Beetle inhabits intensely managed agricultural areas. However, livestock grazing likely occurs at both extant Dark Saltflat Tiger Beetle sites. Much of the natural private and provincial Crown grassland in the Okanagan and Similkameen River valleys has domestic livestock grazing at various times during the year and therefore likely also occurs within unchecked habitats. Grazing will increase some shrubs, such as the big sagebrush and common rabbit-bush (*Ericameria nauseosa* var. *speciosa*), and cheatgrass (*Bromus tectorum*) will predominate in the understory on severely grazed sites.

Tiger beetle larval burrows are often situated close to water, where livestock may congregate. Trampling, soil disturbance, manure deposition, and urination may contribute to the incremental decline of potential larval burrow habitat. Although the severity of this threat needs to be confirmed, it is likely negligible impact based on the low number of observed adults and the low intensity of the livestock.

**IUCN-CMP 11. Climate change & severe weather****11.2 Droughts**

Climate change is a potential but poorly understood threat to habitats within the south Okanagan. The climate envelope suitable for plant communities within the Okanagan could potentially increase as a result of climate change, which could dramatically increase the range where these communities could theoretically grow. Climate change may increase summer drought in southern B.C. and change rain patterns during the larval period, potentially reducing juvenile survival. Further studies are required to understand the habitat needs of this species and the threat impact of drought.

**Other threats considered but not scored in the threats assessment:****IUCN-CMP Threat 4. Transportation & service corridors****4.1 Utility and service lines**

One of the two most recent records for Dark Saltflat Tiger Beetle is within a gas line right-of-way (Table 1, Figure 3). At this time, there are no plans for pipeline expansion and this is not considered a threat.

**IUCN-CMP Threat 6. Human intrusions & disturbance****6.1 Recreational activities**

Recreational activities can cause disturbance through compacting the soil and causing larval tunnel collapse and disturbance to adult foraging areas. The 2 known extant sites are adjacent to roadsides or right-of-ways so it is possible there is some all-terrain vehicle use in the area. However, at this time recreational activity is considered minimal in this area and this threat is not considered substantial at these sites.

Recreational activities could be a threat at potential habitats at some of the historical sites in the Okanagan Valley, particularly surrounding Okanagan, Skaha, Vaseaux, and Osoyoos lakes.

Many of these areas are inaccessible to hikers, although summer boating activities often bring recreational users to remote areas adjacent to these lakeshores where tiger beetle larval sites may be present. All-terrain vehicle use, horseback riding, and mountain biking also have the potential to impact unchecked potential sites within the species' historic range.

## **IUCN-CMP Threat 7. Natural system modifications**

### 7.1 Fire & fire suppression

There is always a threat of fire in the south Okanagan (e.g., lightning strikes or campfires, especially in dry summers), although the actual timing of any one fire is unknown. Before fire suppression programs that are still ongoing were implemented in the Southern Interior, wildfires were smaller, less intense, and patchy; some patches of non-burned habitat would remain following such events. With fire suppression, fires tend to be large stand-replacing fires that burn hotter and deeper into the organic matter and soil layers. This type of fire is more of a threat to this species as the depth of the larval tunnel may not be deep enough to escape the heat of an intense fire.

## **IUCN-CMP Threat 8. Invasive & other problematic species & genes**

### 8.1 Invasive non-native/alien species

The impact non-native invasive species have on Dark Saltflat Tiger Beetle and their habitat is unknown. Ultimately, bare open areas are needed for adult foraging and larval burrow construction. Invasive plants such as cheatgrass, sulphur cinquefoil (*Potentilla recta*), diffuse knapweed (*Centaurea diffusa*), and Dalmatian toadflax (*Linaria genistifolia* ssp. *dalmatica*) are increasing at variable distribution rates and abundance throughout the Okanagan Valley. Some species, such as sulphur cinquefoil, can form monocultures and may change the open soil available for larval sites. The presence of these plants in low abundance may not affect tiger beetle populations. Research is needed to determine what impact invasive species may have on Dark Saltflat Tiger Beetle.

## **IUCN-CMP Threat 9. Pollution**

### 9.3 Agricultural & forestry effluents

It is unknown if vegetation is managed using herbicides within the oil and gas pipeline right-of-way (McKinney Road).

The application of herbicides or insecticides may impact tiger beetles in unchecked agricultural areas that contain remnant patches of potential tiger beetle habitat. Some unchecked areas may be close to ephemeral wetlands that contain potential larval and adult burrow sites, and adult foraging territory.

Some studies (e.g., Bouffard *et al.* 2009 on *Cicindela repanda*) have shown vegetation management with herbicides containing imazapic and glyphosate may not exhibit toxicity to larvae, although it is unknown what effects this management may have on Dark Saltflat Tiger Beetle; further study is needed.

## **5 RECOVERY GOAL AND OBJECTIVES**

### **5.1 Recovery (Population and Distribution) Goal**

The recovery (population and distribution) goal is to maintain all extant populations of Dark Saltflat Tiger Beetle across the species' range in British Columbia.

### **5.2 Rationale for the Recovery (Population and Distribution) Goal**

The Dark Saltflat Tiger Beetle is currently known from two extant sites in the Okanagan Valley. Both of these records have been the result of opportunistic observations or collections and not the result of directed search effort for this species. Although detailed habitat information is lacking, these two most recent collection events were within habitat different from the salt flat or alkaline habitats that the species was thought to have been collected from historically. This finding has challenged the previous understanding around the species' habitat needs. Historical collection information is vague and inventory in more than 50 years has not revealed a new record. However, historical sites should still be considered in confirming the species' range extent, for example in surveying previously unchecked habitats within the historical areas described. The recovery goal includes maintaining any additional populations that may be found. This goal was set to ensure the persistence of this species in B.C. Due to its small area of occupancy it is likely that the Dark Saltflat Tiger Beetle will remain Endangered even with recovery efforts.

Due to knowledge gaps (e.g., presence at historical sites, population numbers, dispersal and recolonization capabilities, habitat requirements, and threats to the species), the recovery goal for Dark Saltflat Tiger Beetle cannot be quantified in terms of population or distribution targets. Fulfilling these knowledge gaps will provide important information to help maintain known sites and allow the recovery goal to be quantified in the future.

### **5.3 Recovery Objectives**

The following are the recovery objectives:

1. To secure protection for all known extant sites and new sites of Dark Saltflat Tiger Beetle.<sup>11</sup>
2. To address knowledge gaps (e.g., range extent within the south Okanagan, habitat requirements for each life stage, species-specific threats).

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<sup>11</sup> Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.



## 6 APPROACHES TO MEET OBJECTIVES

### 6.1 Actions Already Completed or Underway

The following actions have been categorized by the action groups of the B.C. Conservation Framework (B.C. Ministry of Environment 2010). Status of the action group for this species is given in parentheses.

#### Compile Status Report (complete)

- COSEWIC report completed (COSEWIC 2009). Update due 2019.

#### Planning (in progress)

- B.C. Recovery Plan completed (this document, 2014).

#### Inventory (in progress)

- Dark Saltflat Tiger Beetle has intrigued local biologists for many years, particularly because of its apparent rarity and lack of records from the Okanagan. There has been some non-quantified search effort since the completion of the COSEWIC (2009) status report. All of this search effort was within historically known areas.
- A project to map alkaline soils and seeps in the Okanagan (COSEWIC 2009) is underway (started in 2009 but currently on hold).

**Table 3.** Year inventory conducted for Dark Saltflat Tiger Beetle in the Okanagan.

Year	Inventory actions and reference
Before 2008	See COSEWIC 2009 (Table 1) for summary of search effort before 2008.
2009	Tiger Beetle inventory in the south Okanagan, B.C. Over 50 tiger beetles (numerous species) were observed over 84.2 km of targeted searching in September. No Dark Saltflat Tiger Beetles were recorded (Marks and Young 2009).
2010	Approximately 20 hours (four person-days) on provincial Crown land in provincial parks and Crown land within lower elevation areas in alkaline and saline areas (O. Dyer, pers. comm., 2012; J. Heron, pers. comm., 2012).
2011	Approximately 20 hours (four person-days) on provincial Crown land in provincial parks and Crown land within lower elevation areas in alkaline and saline areas (O. Dyer, pers. comm., 2012; J. Heron, pers. comm., 2012).
2012	Approximately 5 hours surveys on provincial Crown land adjacent to McKinney Pipeline crossing in September (O. Dyer, pers. comm., 2012; L. Ramsay, pers. comm., 2012).

### 6.2 Recovery Planning Table

Recovery planning for Dark Saltflat Tiger Beetle is concurrent with recovery planning approaches for similar species under the South Okanagan-Similkameen Conservation Program. Because of the extensive knowledge gaps for this beetle, most of the recovery planning activities listed in Table 4 center on inventory, habitat information gathering, and habitat mapping. These activities will help prioritize areas for future surveys and help inform habitat protection efforts. A combined approach to recovery also includes engaging the academic, naturalist, and stewardship

community in recovery projects for the species, including inventory, natural history, and habitat information gathering.

**Table 4.** Recovery planning table for Dark Saltflat Tiger Beetle.

Objective	Actions to meet objectives	Threat <sup>a</sup> or concern addressed	Priority <sup>b</sup>
1	<b>Protect extant sites</b> <ul style="list-style-type: none"> <li>Confirm land ownership and/or land management authority at the extant sites and within the same habitat polygons surrounding extant sites, as habitat polygons may span multiple landowners.</li> <li>Work with landowners to determine appropriate measures to protect beetle habitat.</li> <li>Develop specific best management practices guidelines for landowners.</li> <li>Recommend Dark Saltflat Tiger Beetle be a priority for listing in the category Species at Risk under the provincial <i>Forest and Range Practices Act</i>.</li> </ul>	All threats	Essential
2	<b>Determine habitat at extant sites</b> <ul style="list-style-type: none"> <li>Spatially define habitat polygons at each Dark Saltflat Tiger Beetle site using established mapping techniques (e.g., terrestrial ecosystem mapping), plant community classification, and other resources for describing habitat attributes.</li> <li>Use habitat information obtained from mapping to develop a habitat model that can be used to prioritize survey sites in unchecked potential habitat.</li> <li>Survey Crown properties adjacent and/or near extant sites to better determine habitat that could be prioritized for inventory and potentially protected.</li> </ul>	Knowledge Gaps	Essential
2	<b>Determine range extent (potential sites)</b> <ul style="list-style-type: none"> <li>Map potential habitat within the Okanagan, based on knowledge of habitat at extant sites and using habitat model.</li> <li>Map potential habitat within close proximity to the historical sites, based on information on the saline and alkaline habitat requirements of populations elsewhere within its global range.</li> <li>Prioritize survey sites based on habitat mapping and develop a 10-year survey schedule and landowner contact strategy.</li> <li>Work with landowners to identify potential beetle habitat and survey priority sites.</li> </ul>	Knowledge Gaps	Essential
2	<b>Determine habitat requirements for each life stage and threats:</b> <ul style="list-style-type: none"> <li>Develop standard protocol for gathering information during surveys, including habitat attributes (even at null sites) and site-specific threats within areas surveyed.</li> <li>Use knowledge gained through surveys to refine the habitat model.</li> <li>Explore the feasibility of mark-recapture studies to obtain information on the life history, movements,</li> </ul>	Knowledge Gaps	Essential

Objective	Actions to meet objectives	Threat <sup>a</sup> or concern addressed	Priority <sup>b</sup>
	habitat use, and population biology of the species. This will enable a better understanding of habitat requirements for each life stage, and the potential dispersal to adjacent habitats. <ul style="list-style-type: none"> <li>• Develop a habitat monitoring project at known sites (e.g., photographic monitoring) to record habitat changes to monitor threats.</li> </ul>		

<sup>a</sup> Threat numbers according to the IUCN-CMP classification (see Table 2 for details).

<sup>b</sup> Essential (urgent and important, needs to start immediately); Necessary (important but not urgent, action can start in 2–5 years); or Beneficial (action is beneficial and could start at any time that was feasible).

## 7 SPECIES SURVIVAL AND RECOVERY HABITAT

Known information on habitat requirements for Dark Saltflat Tiger Beetle is provided in Section 3.3. Specific habitat requirements for this species are unknown and additional work needs to be done before the biophysical attributes of its habitat can be fully described or mapped in B.C. Actions to fulfill habitat knowledge gaps are included in the recovery planning table (Table 4). The recovery goal focuses on maintaining all extant populations of Dark Saltflat Tiger Beetle. These sites should be included as survival habitat. Current information about Dark Saltflat Tiger Beetle habitat preferences is not adequate to spatially describe survival/recovery habitat at this time for this species. No substantive threats to the species' habitat have been identified at the two extant sites. As new sites are recorded, or sites close to historical collection areas are confirmed, our understanding of habitat information will be refined and the threats to those habitats better understood. Survival and recovery habitat should include new and/or confirmed sites.

## 8 MEASURING PROGRESS

The successful implementation of recovery actions for Dark Saltflat Tiger Beetle will be indicated through monitoring extant populations and further inventory within habitats proximal to historical collection areas. As Dark Saltflat Tiger Beetle lifespan is thought to be 2–3 years, population monitoring will allow for an indication of possible extirpation at a known site, changes in area of extent at a known site, and whether the number of extant populations is stable or increasing. The recovery plan will be reviewed in 5 years to assess progress and to identify additional approaches or changes that may be required to achieve recovery.

The performance indicators presented below provide a way to define and measure progress toward achieving the population and distribution goal and recovery objectives. Performance measures are listed below for each objective.

**Measurables for Objective 1:**

- Recommend Dark Saltflat Tiger Beetle be a priority for listing as Species at Risk under the provincial *Forest and Range Practices Act* by 2016.
- Establish stewardship agreements and/or covenants for known (and any new) Dark Saltflat Tiger Beetle sites on regional district and municipal lands by 2018.

**Measurables for Objective 2:**

- Studies addressing knowledge gaps initiated by 2015.
- Complete habitat mapping and develop a habitat model by 2017.
- Identify and continue to inventory additional potential habitat within the species' range and refine habitat model (ongoing).
- Threats at extant sites investigated further by 2018.

## **9 EFFECTS ON OTHER SPECIES**

In addition to Dark Saltflat Tiger Beetle, 320 provincially listed (excluding aquatic species) and 87 species assessed by COSEWIC occur within similar habitats in the south Okanagan (note some COSEWIC species are also provincially listed). Protection for Dark Saltflat Tiger Beetle habitat will benefit some of these species, although no species at risk have been specifically identified within the known sites (e.g., Manuel's Canyon or McKinney Road). Negative impacts on other species at risk are not expected. Conservation strategies are concurrent with South Okanagan-Similkameen Conservation Program.

Based on general tiger beetle adult activity patterns in the southern Okanagan, surveys for Dark Saltflat Tiger Beetle are best completed in the early spring (April) or late fall (mid-September to early October). Surveys within open ponderosa pine habitats may increase knowledge about other species at risk:

- Spring and fall: tiger beetles including Badlands Tiger Beetle (*Cicindela decemnotata*) and Sagebrush Tiger Beetle (*Cicindela pugetana*). These tiger beetles use similar habitats (grassland, shrub-steppe, and open ponderosa pine) and/or have overlapping distributions in the Okanagan. COSEWIC has not assessed these species.
- Spring: White-headed Woodpecker (*Picoides albolarvatus*) (COSEWIC Endangered 2010), Lark Sparrow (*Chondestes grammacus*) (Not assessed by COSEWIC; Red-listed in B.C.), and less often Nuttall's Cottontail (*Sylvilagus nuttallii*) (COSEWIC Special Concern 2006) are observed in open ponderosa pine habitats.

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