# COSEWIC
# Assessment and Status Report

on the

# Wallis' Dark Saltflat Tiger Beetle
*Cicindela parowana wallisi*

**in Canada**

**ENDANGERED**
**2009**


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

**COSEPAC**
Comité sur la situation
des espèces en péril
au Canada

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

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Wallis' Dark Saltflat Tiger Beetle — Photo courtesy David Kavanaugh, CAS.


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# COSEWIC
# Assessment Summary

**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.

# COSEWIC
# Executive Summary

## Wallis' Dark Saltflat Tiger Beetle
*Cicindela parowana wallisi*

### Species information

Wallis' Dark Saltflat Tiger Beetle (*Cicindela parowana wallisi*), also sometimes called the Parawana Tiger Beetle in BC, is a medium-sized tiger beetle (approximately 1.2 cm long), the only subspecies of *Cicindela parowana* Wickham known to inhabit Canada. Tiger beetles are recognizable by their long, slender legs and antennae, saber-like mandibles and bulbous eyes. In British Columbia, Wallis' Dark Saltflat Tiger Beetle is easily identified by the pattern of markings on the dark background colour of the elytra (hardened front wings).

### Distribution

Wallis' Dark Saltflat Tiger Beetle is associated with the arid habitat of the Great Basin region, extending globally from Vernon, BC (Canada) to southern Oregon (United States), with populations in Washington State as well.

The Okanagan Valley in southern British Columbia, from Vernon south to Oliver, contains the total historical distribution of Wallis' Dark Saltflat Tiger Beetle in Canada. Most specimens were collected in Penticton and the Oliver-Okanagan Falls area between 1909 and 1953; the date of the single Vernon record is unknown but is probably early in the 1900s. The only record since the 1950s is from Manuel's Canyon near Oliver in 1996.

### Habitat

Wallis' Dark Saltflat Tiger Beetle is thought to differ from many other tiger beetles in its preference for slightly dry, chalky alkaline soils. Field surveys of sites where specimens were collected, in addition to aerial photos from the period, suggest that it is also associated with moderate ground cover. Currently, small remnants of these habitats exist in the South Okanagan Valley, although some are in areas that are undergoing development.

## Biology

Wallis' Dark Saltflat Tiger Beetle is active from May until June, with a second activity period in August. Eggs are probably laid in soil either in spring or fall and the larvae live in subterranean burrows for one or two years. Adults live for 8 – 10 weeks and feed in similar habitat to the larvae, eating any arthropods of the same size as itself or smaller. Although the beetle is associated with alkaline soils, no physiological mechanism for this relationship has been proposed.

## Population sizes and trends

Calculation of population sizes and trends for Wallis' Dark Saltflat Tiger Beetle is not possible at this time, given the sparse data that are available. There has been a decrease in the number of specimens collected (only one specimen since the early 1950s).

## Limiting factors and threats

In general, tiger beetles appear to be sensitive to soil disturbances such as beach groomers and soil compaction from vehicles. Although these beetles are not particularly shy of humans, conversion of their habitat to paved roads or residential housing would undoubtedly result in population declines. The habitat of Wallis' Dark Saltflat Tiger Beetle is readily damaged and is rapidly being converted for agriculture, housing and recreation in the south Okanagan Valley. Much of this habitat, including the presumed type locality at Penticton, was destroyed in the past 50 or 100 years.

## Special significance of the species

Wallis' Dark Saltflat Tiger Beetle is a charismatic predator in a scarce habitat in the Okanagan Valley, a region with special natural habitats that are under considerable stress from development and other factors. Globally, tiger beetles are extensively studied and very popular as a result of their attractive metallic colouration. They are the only group of beetles for a which a North American field guide is available and one of very few beetle groups for which popular regional guides are also available.

## Existing protection

Wallis' Dark Saltflat Tiger Beetle is globally listed as G4 and provincially listed as S1 with a BC list status of "red".

## COSEWIC HISTORY

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

## COSEWIC MANDATE

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

## COSEWIC MEMBERSHIP

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

## DEFINITIONS (2009)

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

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

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Canada

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

# COSEWIC Status Report

on the

# Wallis' Dark Saltflat Tiger Beetle

*Cicindela parowana wallisi*

**in Canada**

2009

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## SPECIES INFORMATION

### Name and classification

Kingdom Animalia: Animal, animals, animaux
Phylum: Arthropoda - arthropodes, arthropods, Artrópode
Subphylum: Hexapoda - hexapods
Class: Insecta -- hexapoda, insectes, insects, insectos
Subclass: Pterygota - insects ailés, winged insects
Infraclass: Neoptera - modern, wing-folding insects
Order: Coleoptera Linnaeus, 1758 - beetles, besouro, coléoptères
Suborder: Adephaga Schellenberg, 1806
Family: Carabidae Latreille, 1802 - carabes, ground beetles
Subfamily: Cicindelinae Latreille, 1802 - tiger beetles
Genus: *Cicindela* Linnaeus, 1758
Species: *C. parowana* Wickham, 1905 - Dark Saltflat Tiger Beetle
Subspecies: *C. p. wallisi* Calder, 1922 - Dark Saltflat Tiger Beetle

Wallis' Dark Saltflat Tiger Beetle (*Cicindela parowana wallisi* Calder 1922), also sometimes called the Parawana Tiger Beetle in BC, belongs to the Order Coleoptera, Family Carabidae. It is one of four subspecies of *Cicindela parowana* Wickham 1905, including *C. parowana platti* Cazier 1937, *C. parowana remittens* Casey 1924 and *C. parowana parowana* Casey 1924 (Freitag, 1999). Only *C. parowana wallisi* is found in Canada. It should be noted that *C. parowana remittens* is not recognized as a subspecies by Pearson *et al.* (2006) and is considered to be a part of *C. parowana parowana*, but is still currently listed as a subspecies by NatureServe (2009) and will therefore be listed as a fourth subspecies in this report.

The subspecies *C. p. wallisi* was originally known as *C. parowana azurea* Calder; the name was changed to its current form by Wallis (1961) because the name *azurea* Calder (1922) was already preoccupied in the cicindelids.

### Morphological description

Wallis' Dark Saltflat Tiger Beetle is a medium-sized tiger beetle, approximately 1.2 cm long. Similar to other cicindelids, this beetle has long, slender legs and antennae, with bulbous eyes and a white clypeus or upper "lip". Prominent, sabre-like mandibles are also typical of this group of beetles, extending so far that they cross in front when at rest.

Figure 1. Vernon, BC, *Cicindela parowana wallisi* specimen from Van Dyke Collection at the California Academy of Sciences, San Francisco (Photo courtesy David Kavanaugh, CAS).

This beetle may be easily distinguished from other tiger beetles in the South Okanagan by the colouration and patterns on its body. The head, pronotum (mid-section), legs, and ventral surface are metallic green with copper highlights. The pattern of creamy white and dull copper on the elytra (hardened front wings) of this tiger beetle is distinctive, with approximately 50% of each colour on the elytra (Figure 1). Other tiger beetles found in the South Okanagan have less pale markings and/or are differently coloured. *Cicindela parowana wallisi* is differentiated from other subspecies of *C. parowana* by the width of the white spots on the elytra, which are narrowest in *C. parowana wallisi* (Pearson et al 2006), and the metallic colouration on the underside of the body, which is green in *C. parowana wallisi* but which has more blue in other species of this complex.

Younger beetles have whitish hairs on their frons (area between eyes and “lip”), which are broken off as the beetle ages (Acorn 2001).

### Genetic description

This tiger beetle is evidently most closely related to and resembles *Cicindela fulgida*, the Crimson Saltflat Tiger Beetle (Pearson *et al.* 2006). The two species do not overlap geographically. They are distinguished by labrum length and male genitalia (Pearson *et al.* 2006). There have been no detailed genetic studies on *C. parowana wallisi.*

### Designatable units

This taxon represents the only subspecies of *Cicindela parowana* found in Canada. The four recognized subspecies of *C. parowana* reflect geographic and morphological differentiation within the species in the United States (Pearson *et al.* 2006).

## DISTRIBUTION

### Global range

*Cicindela parowana* occurs in western North America. The historical distribution of Wallis' Dark Saltflat Tiger Beetle, i.e., subsp. *Wallisi*, includes the northern end of the Great Basin region from Vernon, BC in the north to Oregon in the south (Pearson *et al.* 2006) (Figure 2). The global range of the rest of this species extends further south, west and east. *Cicindela parowana parowana* is found in Oregon, Nevada and Idaho; *C. parowana remittens* occurs in Utah, and *C. parowana platti* occurs in Oregon and Nevada (Pearson 2006; US Geological Survey 2008). Coordinates for North American specimens are included in Appendices 1 and 2. For a complete description of range see Pearson *et al.* (2006).

There is overlap of *C. parowana wallisi* and other subspecies in Southern Oregon, with some hybridization in this area (Pearson *et al.* 2006).

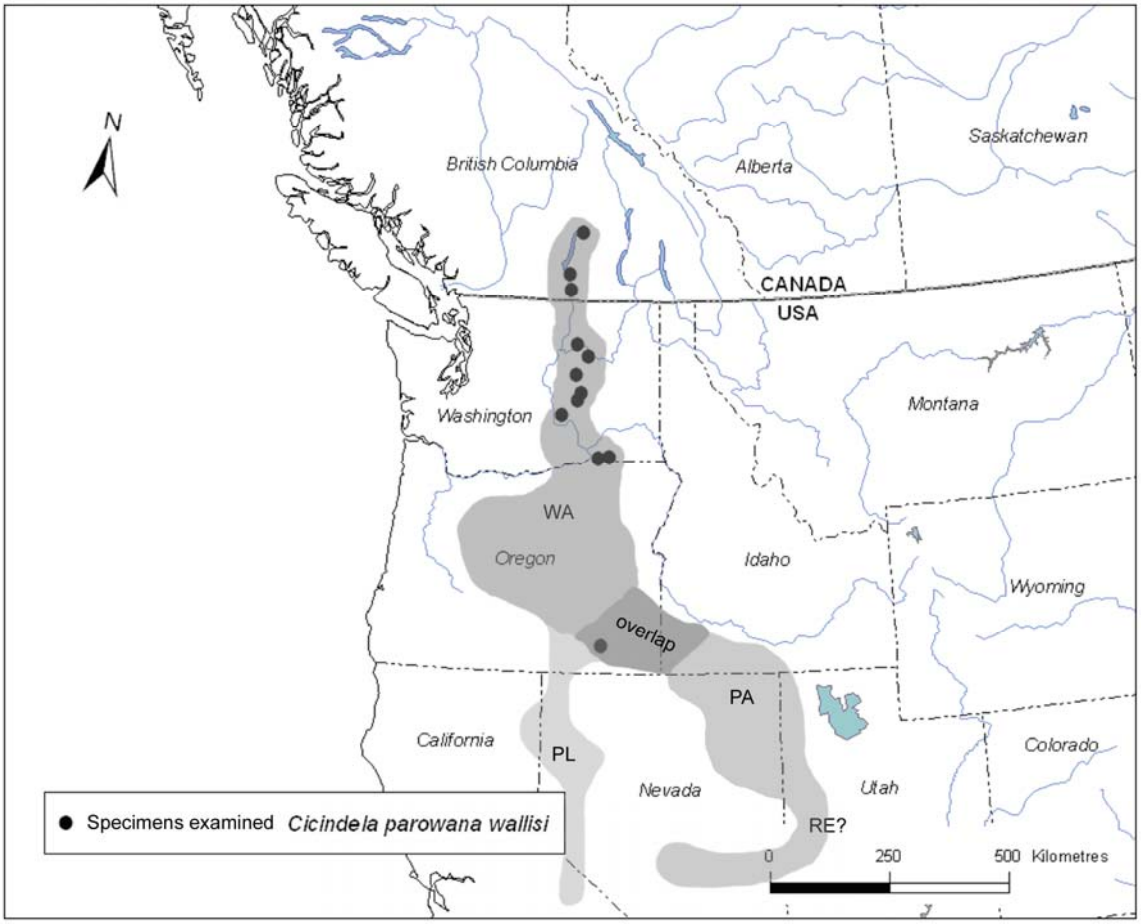


Figure 2. Global geographic distribution of *C. parowana wallisi* and related subspecies. Dots are based on museum specimens examined and are complete for Canadian and adjacent US records, but not for all US records. Shaded areas indicate distributions of subspecies based on Pearson *et al.* (2006, p. 101). WA = subsp. *wallisi;* PA = subsp. *parowana;* PL= subsp. *platti;* RE? = questionable subsp. *remittens.* An area of WA-PA overlap is also indicated. (Map courtesy of Alain Filion and Jenny Wu, Environment Canada and Paul Catling, Agriculture Canada).

## Canadian range

Wallis' Dark Saltflat Tiger Beetle's historical range in Canada extends as far north as Vernon, BC, with other records in Penticton, Okanagan Falls and Oliver (Figure 3). All but one of the specimens from these locations were collected in or before 1953. Recent directed attempts to find this species at the historic sites and more than 50 nearby sites (Table 1) involving at least 75 person hours have failed to locate a specimen.

There are four general locations known for historic records of the Dark Saltflat Tiger Beetle: Vernon, Okanagan Falls, Penticton and Oliver (Figure 3). One historical specimen with the location “Okanagan Valley” does not appear on this map because a definite geographical location could not be assigned to it. Caution should be used when interpreting the exact locations of historic specimens in Appendix 1. Label coordinates based on town or city names only were added in recent years to the CNC specimens examined and have little connection to true and exact collection sites. Therefore, the depiction of these sites in Figure 3 uses only the original information from the specimens (i.e. city name).

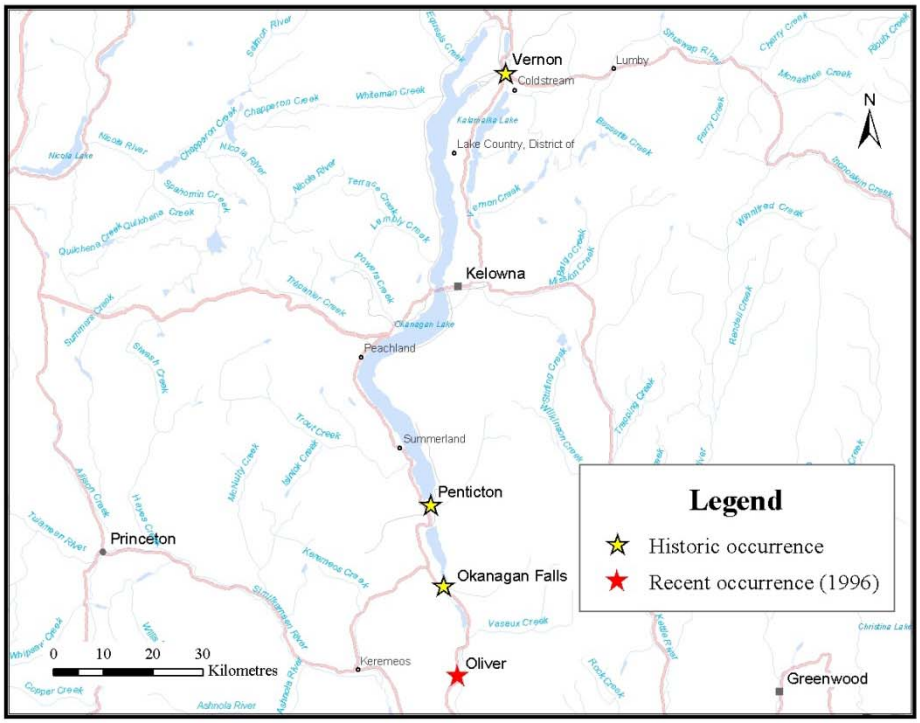


Figure 3. Geographic locations of *Cicindela parowana wallisi* captures in British Columbia, Canada (Map courtesy of Byron Woods, Ministry of Environment, British Columbia). Locations in Penticton, Okanagan Falls and Vernon are approximations, based on limited information from historical specimens.

The most recent specimen was captured during a general survey of Manuel’s Canyon near Oliver, BC in 1996. Because the habitat in Manuel’s Canyon has not changed since 1996, the beetle is likely still present in the area. This is not a place visited by historical collectors in the Oliver area and it is unlikely that it represents any of the Oliver localities where the species was collected in 1924 or 1953. Although tiger beetles fly actively, flights are usually over short distances and it is most likely that the 1996 observation represents a resident population rather than a stray. Access to Manuel’s Canyon is now restricted and there have been no subsequent surveys (L. Ramsay pers. comm., 2008).

The extent of occurrence and index of area of occupancy are both 4 $km^2$ since there is only one location.

## HABITAT

### Habitat requirements

Wallis (1961) suggests that this beetle is tightly associated with alkaline flats and was found near Skaha Lake (referred to as "Lower Okanagan Lake" in Wallis' publication) "on a small path extending across alkaline soil" (see "Habitat protection/ownership" below for details). Recent publications (Pearson *et al.* 2006) also state that this species may occur in drier habitats than other cicindelids, using sparsely vegetated areas that are not necessarily associated with lakes and rivers.

In general, tiger beetles require bare soil to tunnel into, both for larval hunting burrows and adult refugia from heat and cold. Soil moisture and grain size may have an effect on a beetle's ability to tunnel. For example, sand that is too dry collapses tunnels and grains that are too large appear to be difficult to burrow into (pers. Obs., Susanne Lavallee). From past accounts (Wallis 1961) combined with current surveys of local soils, the specific soil requirements of this species appear to be relatively dry soil of a chalky texture.

Based on known historical locations for a number of the collections, it appears that moist habitat relative to the surrounding hot and dry Great Basins landscape may be needed, i.e., recently dried or desiccating flats near temporary streams or wetlands, but not saturated, saline lakeshores which are inhabited by other species of *Cicindela* such as *C. oregona oregona*, which was observed in most saline habitats surveyed. In the chalky soil of moist alkaline areas, soil particles can become cemented and may provide a solid structure for larval burrows.

### Habitat trends

Development in the South Okanagan Valley has resulted in the conversion of most potential Wallis' Dark Saltflat Tiger Beetle habitat to roads, housing, or groomed public beaches (Lea 2008). Specifically, the area referred to by Wallis (1961) has been converted to a small subdivision near the northeast corner of Skaha Lake in Penticton. One small area of alkaline clay bluffs still persists at the south end of Okanagan Lake in northeast Penticton but this is not riparian and is apparently unsuitable habitat. Other dry, alkaline soils that are appropriate for *C. parowana wallisi* may exist in less accessible areas or on private lands. The riparian communities at Penticton, where *C. p.* wallisi occurred in openings, have declined by 58-92% since 1800 and these communities have declined more than any other terrestrial ecosystem in the Okanagan (Lea 2008). Development is continuing in the region of the only known occurrence.

Current projects within the BC Ministry of Environment are underway to map alkaline soils and seeps in the Okanagan region. Sparse patches of alkaline soil are evident on steeper drainage slopes from Vernon to Osoyoos, evidenced by vegetation such as Giant Wild Rye (*Leymus cinereus*), but it is not clear that this is suitable habitat.

**Habitat protection/ownership**

The precise locations where historical specimens were collected in, or before 1953 in Vernon, Okanagan Falls, Oliver and "Okanagan Valley" (see Appendices 1 and 2) are not known. For this reason, it is not possible to discuss specific habitat ownership and protection of these sites. In general, the Okanagan Valley has undergone much development since these collections were made and there is limited protection of lands.

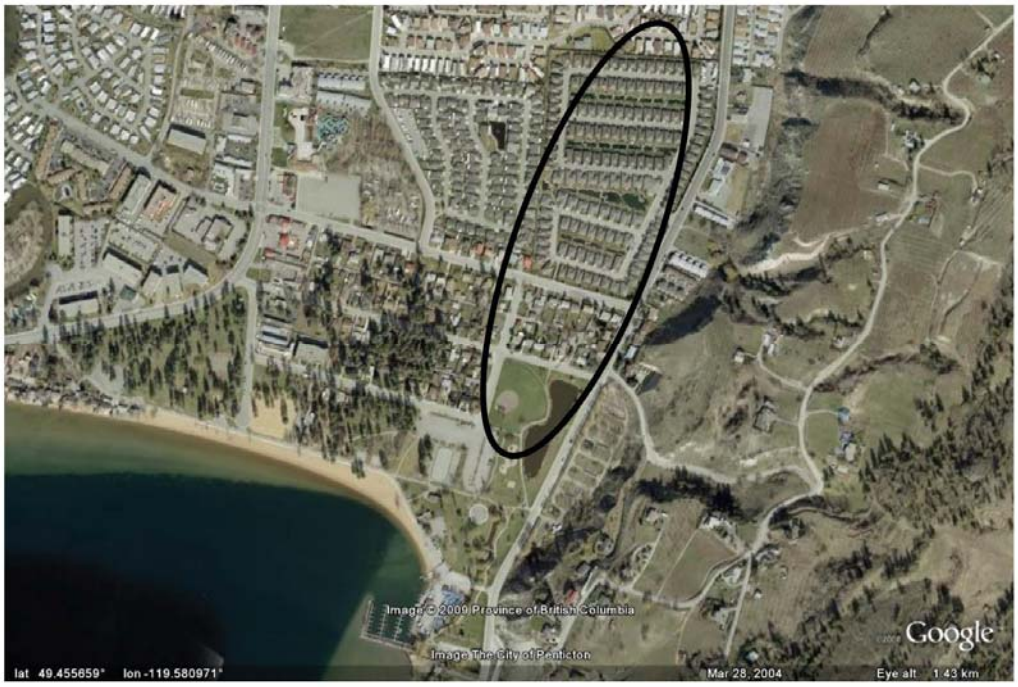


Figure 4. Location (2009 image) showing current condition of historical capture site on north-east end of Skaha Lake, Penticton, BC. Ellipse indicates probable approximate location of trail referred to in Wallis (1961) [Photo courtesy of Google Earth].

In Penticton, specimens collected from 1909 (not 1919 as erroneously reported in Wallis (1961)) to 1951 were obtained along a "small path extending across alkaline soil" (Wallis 1961). Rob and Syd Cannings, who grew up in Penticton, believe that this location is approximately outlined in Figure 4 where there was a rather large alkaline flat as part of a large complex of meadows, bands of trees, wetlands and other open habitats, at least until the 1950s. The records from Penticton (1951) came from the exact same location (Wallis 1961) so the habitat there was probably little changed. Some of this relatively natural area was still present until the early 1970s; subsequently

a small golf course was built on the remaining alkaline flats and by the late 1980s and 1990s this golf course and more of the surrounding land was converted to the dense housing as seen in Figure 4. Along the east side of South Main Street, which forms the eastern boundary of this area, there are still some open silt banks with sage brush.

The site of the last known collection of *C. parowana wallisi* is on Osoyoos Indian band land near Oliver in an area known locally as “Manuel’s Canyon”. Although this area is not currently under development, there is no formal protection of the habitat by the Osoyoos Indian Band.

## BIOLOGY

### Life cycle and reproduction

Tiger beetles lay their eggs in bare soil that is appropriate for larvae to burrow into after hatching. Although the larvae of this species have been described, their biology remains relatively unknown. Adult specimens from Canada have been found from late May through late June and in mid-August (Appendix 1 and 2), but collections from the United States suggest that activity periods in Washington and Oregon may extend from late April to June and from July through September (Appendix 1; Pearson *et al.* 2006). Despite the small number of specimens, the activity period of tiger beetles in northern latitudes is typically spring/fall active (Pearson and Vogler 2001), which is roughly consistent with the collection dates of specimens.

Tiger beetles may remain as larvae for up to two years, and may live as adults for three to four months (semivoltine) (Pearson and Vogler 2001). Frequently, species in more northern latitudes require two years to complete their lifecycle (Pearson and Vogler 2001).

Wallis’ Dark Saltflat Tiger Beetle has been described both as a colonial (Wallis 1961) and a solitary species (Pearson *et al.* 2006). Other tiger beetles such as *C. oregona oregona* may be locally abundant, but there is no suggestion in the literature of intraspecific social behaviour other than mating. Mate guarding in tiger beetles is relatively common, with males using their mandibles to grasp females around their midsection, remaining “in tandem” for extended periods of time.

### Herbivory/predation

Both larvae and adult cicindelid beetles are predacious, with larvae hunting from burrows in the soil so as to ambush predators, and adults using their fast running and flying to chase down prey in similar habitat. Larval tunnels may extend very deep (several dm) into soil and occur in areas with sparse to moderate vegetation cover.

Both adult and larval tiger beetles consume a wide variety of arthropod prey (Pearson and Vogler 2001).

## Physiology

Although many species of tiger beetles are associated with saline and/or alkaline environments, there does not appear to be a physiological explanation for this correlation. Many tiger beetles rely on line-of-sight and open habitat for foraging, so it is possible that this habitat selection is based on behavioural qualities.

Tiger beetle larvae are sensitive to ground freezing temperatures, but appear to be able to cope with low temperatures by burrowing deeper, if the conditions permit.

## Dispersal/migration

Tiger beetles are fast runners on bare soil but will also readily fly if disturbed. Typically, beetles will fly 2 – 10 metres when disturbed, turning to face the disturbance as they land. Although some species of tiger beetles have quickly colonized new habitats, they generally do not wander great distances. The extent of long distance dispersal in this species is unknown and migration has not been documented for this species.

## Interspecific interactions

Competition for food between tiger beetle species has been demonstrated in several studies; however, temporal habitat partitioning is also a relatively common occurrence (Pearson and Vogler 2001). Food limitation is thought to be the main factor constraining tiger beetle populations in general (Pearson and Vogler 2001). It is not clear if Wallis' Dark Saltflat Tiger Beetle coexists in close proximity with other tiger beetles, given that the habitat and usage is poorly documented.

## Adaptability

The extent to which Wallis' Dark Saltflat Tiger Beetle could adapt to changing conditions is unclear. In general, tiger beetles are not particularly shy of human activity and will live on public beaches where larval tunnels are allowed to persist; however, they are wary and usually fly away short distances with little provocation. They are sensitive to soil disturbance. Given their predatory nature, rearing of tiger beetles in controlled environments (laboratories) would be very difficult. It is unlikely that a breeding program would meet with success.

## POPULATION SIZES AND TRENDS

### Search effort

Searches for *C. parowana wallisi* have occurred sporadically over the last 30 years by Syd and Rob Cannings, Leah Ramsay, and others, around White and Mahoney Lakes near Oliver, BC, with no sightings.

Searches by P.M. Catling were conducted in Penticton and Osoyoos regions from June 2 – 4, 2007. The search generally involved open, saline and sparsely vegetated sites. Weather was hot and sunny and no specimens were located in these searches. Areas searched included Twin Lakes and White Lake area, Okanagan River near Oliver, nature trail in Osoyoos, Skaha Lake Beach near Penticton, and near Keremeos, BC. Total search effort approximately 20 search hours (Table 1).

Further surveys of saline lakes in the Oliver area were conducted in June and August 2007 by Jennifer Heron, Orville Dyer, Leah Ramsay, and four BC Conservation Corps members. Lavallee conducted surveys on May 28, 2007 around Mahoney, White, and Stinky Lakes (near Oliver, BC). Search involved open saline lakes with little or no vegetation. Weather was hot and sunny with some overcast cloud. No specimens were located in these searches, despite an abundance (>300) of *C. oregona oregona* in these habitats.

Surveys of chalky, alkaline soils for signs of *C. parowana wallisi* were conducted by Orville Dyer and Jennifer Heron in chalky alkaline cliff habitat on Okanagan Lake in Penticton, and by Susanne Lavallee in August 2007. No individuals were found during this work, although it is possible that the timing of the surveys was not optimal for sighting adults.

Searches by Susanne Lavallee conducted June 14 – 18, 2007 included beach habitats on Okanagan and Kalamalka Lakes around Vernon, habitat around Vernon Airport (June 14 and 15, approximately 8 search hours, conditions sunny/overcast with some wind), small saline lakes along Commonage/Glenmore Roads from Vernon to Winfield (June 16, approximately 4 search hours, conditions sunny with extended cloudy periods), public beaches on Skaha and Okanagan Lakes near Penticton, Green Lake near Okanagan Falls, Neily Farm (4188 Green Lake Rd.), and alkaline flats habitat associated with White Lake (June 17, approximately 8 search hours, conditions overcast with sunny periods), and Rattlesnake Lake (saline, in Bighorn Wildlife Reserve, Oliver, BC), as well as visual surveys for appropriate habitat near No. 21 Rd and Conifryd Lake (June 18, approximately 5 search hours, conditions sunny with some clouds). All surveys were conducted with net and binoculars; no specimens were located during these searches.

In addition, the Okanagan is relatively well studied from an entomological point of view. Recently, Geoff Scudder has conducted invertebrate surveys using thousands of pitfall trap nights in sage and antelope brush habitats in the southern Okanagan, but did not report a single specimen of this species (D. Fraser, pers. comm., May 2009).

A summary of field surveys is provided in Table 1 below. Maps of these search efforts are also provided (Figs. 5-.9)

**Table 1. Summary of search efforts for *Cicindela parowana wallisi***

| Date | Location | Observers | Person hours spent searching |
|---|---|---|---|
| 1975 – present | White Lake, Mahoney Lake, and other saline lakes in Oliver/Osoyoos area | Robert and Sydney Cannings | ~500 |
| 1985-2009 | White Lake, Mahoney Lake, and other saline lakes in Oliver/Osoyoos area | Leah Ramsay | >20 hours |
| May 28 and 29, 2007 | Mahoney, White and Stinky Lakes (near Oliver, BC) | Jennifer Heron, Orville Dyer, Leah Ramsay, Susanne Lavallee and 4 BC Conservation Corps members | 50 |
| 2-4 June 2007 | Penticton - gully | P.M. Catling | ~20 |
| 2-4 June 2007 | Penticton NW | P.M. Catling | |
| 2-4 June 2007 | Penticton NW | P.M. Catling | |
| 2-4 June 2007 | Penticton Airport | P.M. Catling | |
| 2-4 June 2007 | Saline lake, Twin Lakes | P.M. Catling | |
| 2-4 June 2007 | Saline lake, White Lake | P.M. Catling | |
| 2-4 June 2007 | Saline lake, W of Osoyoos | P.M. Catling | |
| 2-4 June 2007 | Okanagan River | P.M. Catling | |
| 2-4 June 2007 | Okanagan River, Oliver | P.M. Catling | |
| 2-4 June 2007 | Salty flats | P.M. Catling | |
| 2-4 June 2007 | lakeshore | P.M. Catling | |
| 2-4 June 2007 | Nature trail – Osoyoos E | P.M. Catling | |
| 2-4 June 2007 | Nature trail – Osoyoos W | P.M. Catling | |
| 2-4 June 2007 | Okanagan Falls | P.M. Catling | |
| 2-4 June 2007 | Penticton Beach | P.M. Catling | |
| 2-4 June 2007 | Keremeos | P.M. Catling | |
| June 14, 2007 | Kin Beach, Vernon, BC | Susanne Lavallee | 1 |
| June 14, 2007 | Goose Lake northwest of Vernon, BC | Susanne Lavallee | 0.5 |
| June 14, 2007 | Swan Lake north shore, Vernon, BC | Susanne Lavallee | 0.5 |
| June 15, 2007 | Kennedy Lane, north shore of Okanagan Lake near Vernon, BC | Susanne Lavallee | 0.25 |

| Date | Location | Observers | Person hours spent searching |
|---|---|---|---|
| June 15, 2007 | Boat launch, north shore of Okanagan Lake near Vernon, BC | Susanne Lavallee | 0.25 |
| June 15, 2007 | Kin Beach, Vernon, BC | Susanne Lavallee | |
| June 15, 2007 | Paddlewheel Park, south shore of Okanagan Lake near Vernon, BC | Susanne Lavallee | 0.5 |
| June 16, 2007 | Kalamalka Park beaches, Vernon, BC | Susanne Lavallee | 4 |
| June 16, 2007 | Coldstream Park Beach, Vernon, BC | Susanne Lavallee | 0.5 |
| June 16, 2007 | Kukuli Provincial Park, Vernon, BC | Susanne Lavallee | 0.25 |
| June 16, 2007 | McKay Wastewater Reservoir, Vernon, BC | Susanne Lavallee | 0.25 |
| June 16, 2007 | Predator Ridge water trap, near Vernon, BC | Susanne Lavallee | 0.25 |
| June 16, 2007 | Saline lake in 3900 block of Glenmore Road, Kelowna, BC | Susanne Lavallee | 0.25 |
| June 16, 2007 | Saline lake in 2900 block of Glenmore Road, Kelowna, BC | Susanne Lavallee | 0.25 |
| June 16, 2007 | McKinley Reservoir, Kelowna, BC | Susanne Lavallee | 0.25 |
| June 16, 2007 | Robert Lake, Kelowna, BC | Susanne Lavallee | 0.5 |
| June 17, 2007 | Canyon on Penticton Creek, Penticton, BC | Susanne Lavallee | 0.5 |
| June 17, 2007 | Skaha Meadows Golf Course, Penticton, BC | Susanne Lavallee | 1.0 |
| June 17, 2007 | Riverwalk Park, Penticton, BC | Susanne Lavallee | 0.5 |
| June 17, 2007 | Madeline Lake, Penticton, BC | Susanne Lavallee | 0.25 |
| June 17, 2007 | Sudbury Beach on Skaha Lake, Penticton, BC | Susanne Lavallee | 0.25 |
| June 17, 2007 | Skaha Beach, Penticton, BC | Susanne Lavallee | 2.0 |
| June 17, 2007 | Wright's Beach RV Park, Penticton, BC | Susanne Lavallee | 0.5 |
| June 17, 2007 | Green Lake (north end), Okanagan Falls, BC | Susanne Lavallee | 0.5 |
| June 17, 2007 | Neily's Farm, 4188 Green Lake Road, Okanagan Falls, BC | Susanne Lavallee | 1.0 |
| June 17, 2007 | Alkaline flats on Fairview-White Lake Road, Oliver, BC | Susanne Lavallee | 1.0 |
| June 17, 2007 | Burnell (Sawmill) Lake, Oliver, BC | Susanne Lavallee | 0.5 |

| Date | Location | Observers | Person hours spent searching |
|---|---|---|---|
| June 18, 2007 | Rattlesnake Lake and western area of Bighorn Wildlife Reserve, Oliver, BC | Susanne Lavallee | 4 |
| June 18, 2007 | Riparian area near intersection of 21 Road and Highway 97 | Susanne Lavallee | 0.25 |
| June 18, 2007 | Conifryd Lake, Osoyoos, BC | Susanne Lavallee | 0.25 |

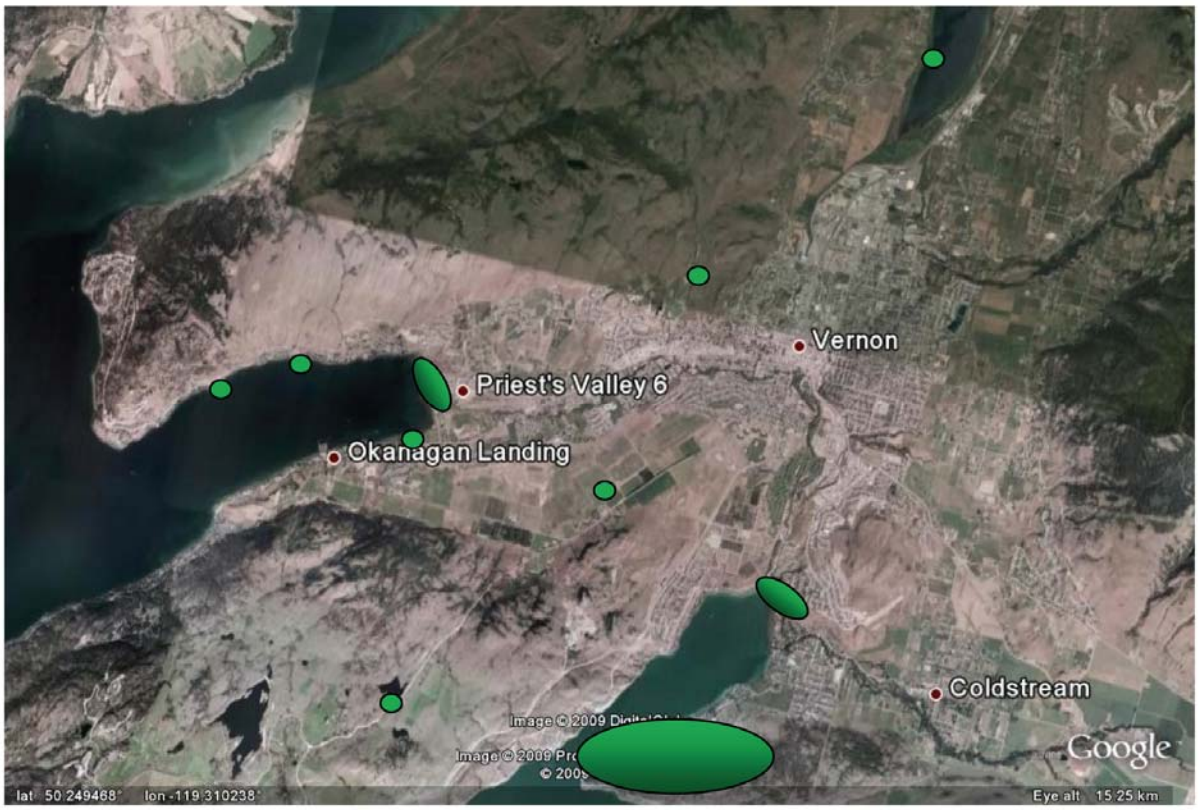


Figure 5. Vernon and area (image 2009) locations where searches were made for *C. parowana wallisi* during the preparation of this report.


Figure 6. Kelowna and area (image 2009) locations where searches were made for *C. parowana wallisi* during the preparation of this report.


Figure 7. Penticton and area (image 2009) locations where searches were made for *C. parowana wallisi* during the preparation of this report

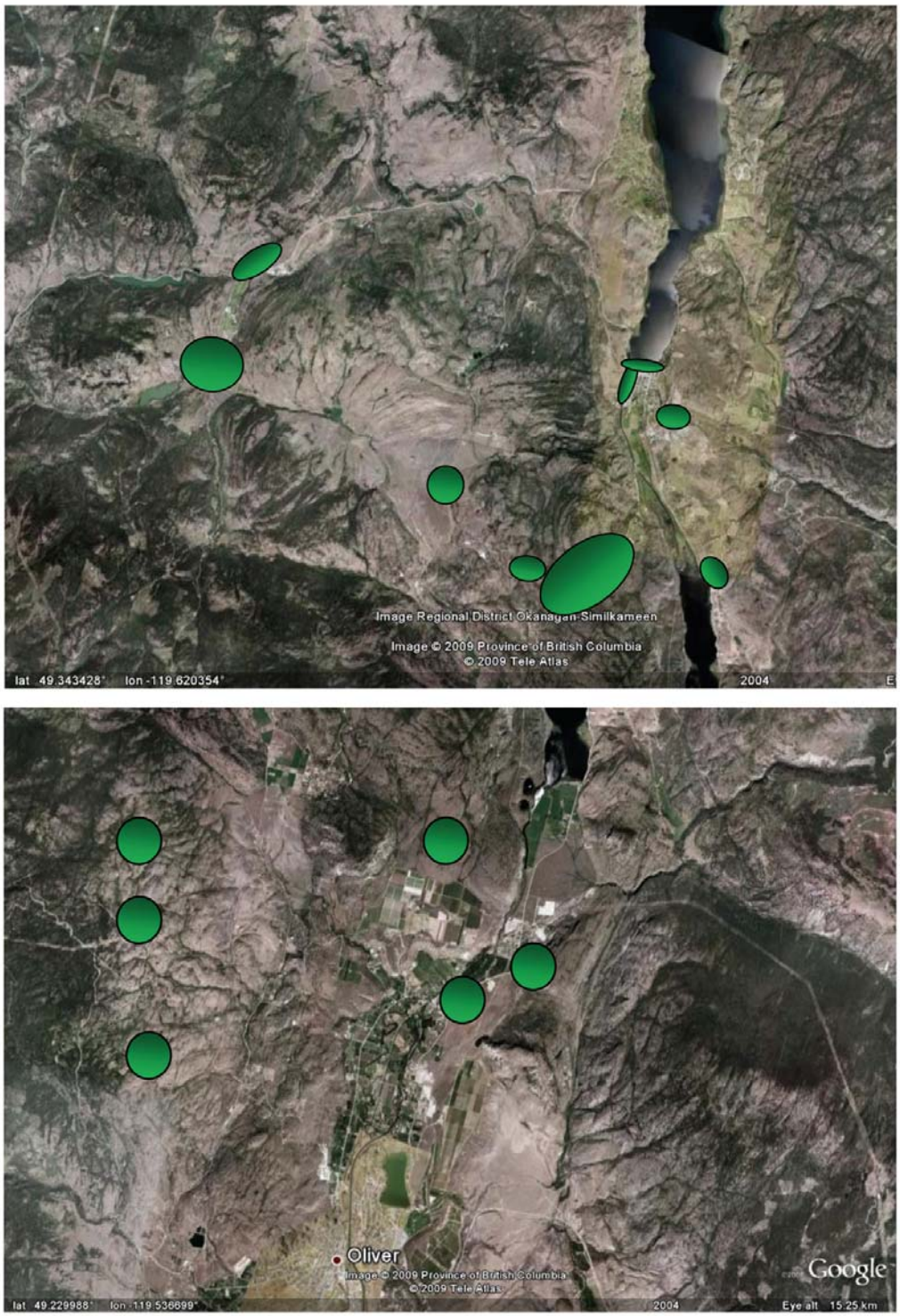


Figure 8. Okanagan Falls, Oliver, and area (image 2009) locations where searches were made for *C. parowana wallisi* during the preparation of this report

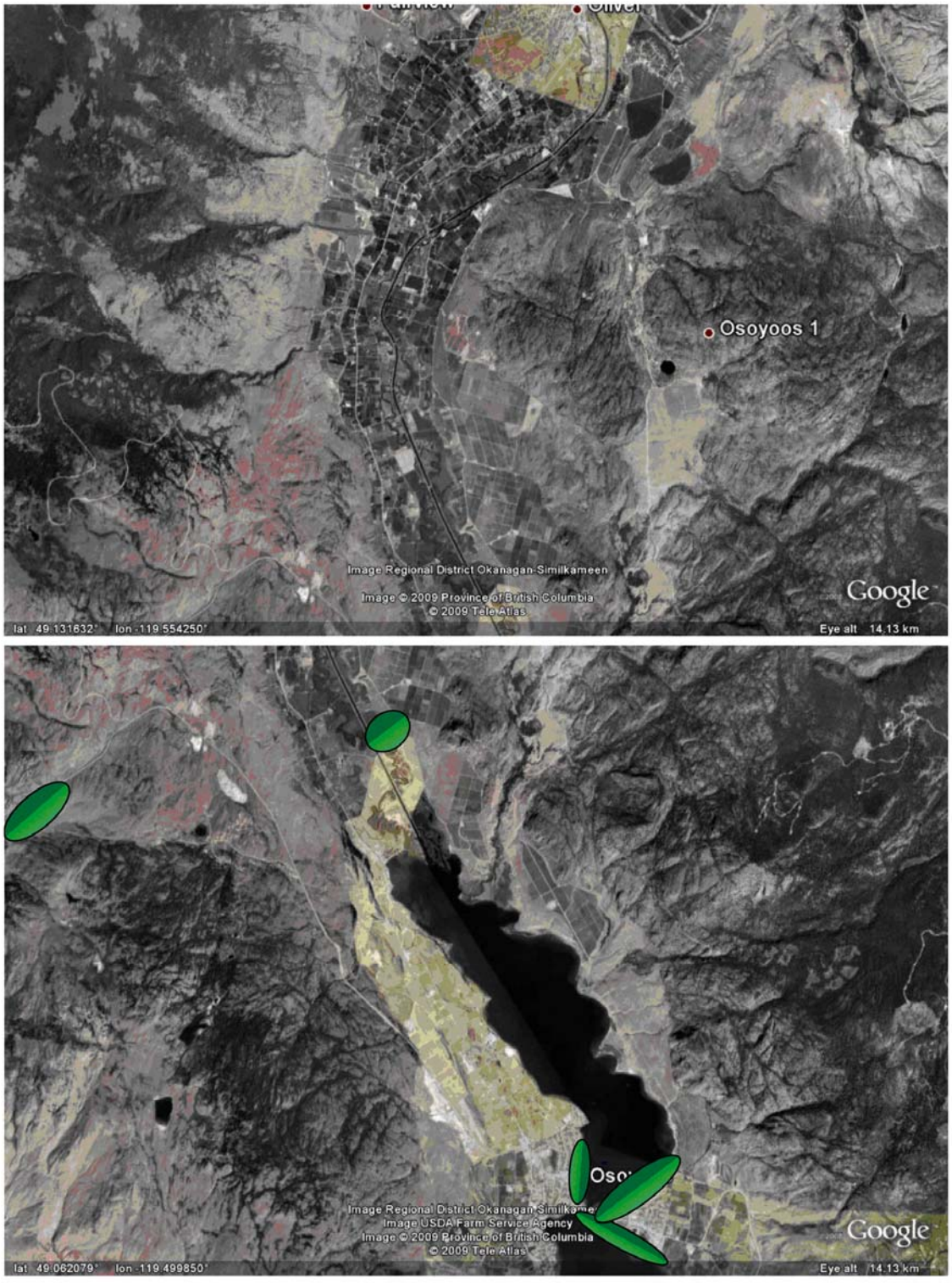


Figure 9. Osoyoos and area (image 2009) locations where searches were made for *C. parowana wallisi* during the preparation of this report

### Abundance

It is not possible to make accurate estimates of any *C. parowana wallisi* populations, owing to a sparse number of specimens and no recent sightings of the beetle.

### Fluctuations and trends

It appears that the Canadian population has substantially declined based on lack of recent observations despite substantial search effort. Loss of habitat is probably the main cause of decline.

### Rescue effect

There are several specimens collected in April 2006 from the Pacific Northwest of the United States in Canadian collections (see Appendix 1). Although no formal survey work has been done to determine movements in these populations, it is possible, but unlikely, that individuals could move 360 km from the most northern location in Beverly, Washington into Canada. It is unlikely because tiger beetles rarely stray far from their specific habitats, based on various observations including mark-recapture studies (e.g. *C. marginipennis* in New Brunswick, see status report). Specific information on dispersal of *C. parowana wallisi* is lacking. The longest distance of dispersal reported for tiger beetles is 160 km (Charlton and Kopper 2000), far short of the 360 km that would be required for rescue effect in this case

## LIMITING FACTORS AND THREATS

Threats are noted below in approximate order of their significance:

1. Loss of habitat to urbanization and conversion to agricultural lands is a primary threat to the Wallis' Dark Saltflat Tiger Beetle. The location where specimens were collected by Wallis, Criddle, and White and in Penticton has been converted to an urban landscape, and it is possible that other historical sites have been destroyed as well. The Penticton location is one of only two sites for the Wallis' Dark Saltflat Tiger Beetle in Canada that can be determined to within about 500 m. Other sites have not been as precisely identified. Most of the gentle slope valley bottom ecosystems once occupied by *C. p. wallisi* are lost (Lea 2008) and the rate and scale of habitat development in the South Okanagan Valley is such that potential habitats are rapidly undergoing development or conversion and the species that rely on these habitats are under an imminent threat.

2. The habitat of *C. parowana wallisi* is also subject to trampling and soil disturbances, which are likely threats to the survival of adults and larvae alike. Direct mortality to adults is unlikely, but the removal of adult and larval burrows prevents the beetles from seeking refuge from extreme temperature conditions and predators.

3. The habitat of the Wallis' Dark Saltflat Tiger Beetle is also very fragmented on the landscape, occurring only in localized areas. Although mapping of alkaline soil habitats in the Okanagan is underway, our understanding of the distribution of required habitat for these beetles is incomplete. Fragmentation of alkaline habitats is an isolating factor in some species of tiger beetles (Pearson and Vogler 2001).

4. Use of herbicides and insecticides may pose a threat to *C. parowana wallisi* as a top predator, either directly by exposure to spraying in nearby agricultural and urban habitat, or indirectly by the consumption of prey that have accumulated toxic chemicals in their tissues.

## SPECIAL SIGNIFICANCE OF THE SPECIES

This species represents one of several tiger beetle species found in the South Okanagan, a region well known to contain unusual and threatened ecosystems. These beetles also have high esthetic appeal with their metallic patterns and unique body proportions. Globally, tiger beetles are extensively studied and very popular as a result of their attractive metallic colouration. There is substantial public appeal for these insects, which are diurnal and small, but ferocious predators. They are the only group of beetles for which a North American field guide is available and one of the few groups of beetles for which popular regional guides are also available.

## EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

The species *Cicindela parowana wallisi* is globally listed as G4. The subspecies *G. p. wallisi* is listed as G4T2T4 and provincially listed as S1 with a BC list status of "red". Nationally in the United States it is listed as N2N4 and in Oregon and Washington it is listed as SNR (NatureServe, 2009).

# TECHNICAL SUMMARY

*Cicindela parowana wallisi*
Wallis' Dark Saltflat Tiger Beetle Cicindèle de Wallis
Range of Occurrence in Canada: British Columbia

**Demographic Information**

| | |
|---|---|
| Generation time (average age of parents in the population) | yrs |
| [Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 or 5 years, or 3 or 2 generations]. | unknown |
| [Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 or 5 years, or 3 or 2 generations]. | unknown |
| [Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 or 5 years, or 3 or 2 generations] period, over a time period including both the past and the future. | unknown |
| Are the causes of the decline clearly reversible? | Not applicable |
| Are the causes of the decline understood? | Not applicable |
| Have the causes of the decline ceased? | Not applicable |
| [Observed, inferred, or projected] trend in number of populations – declines prior to 10 years ago | declined |
| Are there extreme fluctuations in number of mature individuals? | unknown |
| Are there extreme fluctuations in number of populations? | unknown |

**Extent and Area Information**

| | |
|---|---|
| Estimated extent of occurrence | 4 $km^2$ |
| [Observed, inferred, or projected] trend in extent of occurrence | unknown |
| Are there extreme fluctuations in extent of occurrence? | unknown |
| Index of area of occupancy (IAO) – based on a single location since 1953 | 4 $km^2$ |
| [Observed, inferred, or projected] trend in area of occupancy | unknown |
| Are there extreme fluctuations in area of occupancy? | unknown |
| Is the total population severely fragmented? | yes |
| Number of current locations | 1 |
| Trend in number of locations – but more than 10 years ago | declined |
| Are there extreme fluctuations in number of locations? | unknown |
| Trend in [area and/or quality] of habitat – declining in the broad region and in the region of the single known location but not necessarily in the single habitat, although expected to. | declining |

**Number of mature individuals in each population**

| **Population** | **N Mature Individuals** |
|---|---|
| | unknown |
| | |
| Total | unknown |
| Number of populations (locations) | 1 |

**Quantitative Analysis**

| | |
|---|---|
| | Not available |

**Threats (actual or imminent, to populations or habitats)**

| |
|---|
| Habitat destruction through human disturbances of soil, and habitat fragmentation, mostly as a result of continuing increases in agriculture and urban development. Development is continuing in the general region of the only known location. |

**Rescue Effect (immigration from an outside source)**

| | |
|---|---|
| Status of outside population(s)?<br>USA: Oregon and Washington incomplete information (NatureServe 2008) | |
| Is immigration known? | no |
| Would immigrants be adapted to survive in Canada? | maybe |
| Is there sufficient habitat for immigrants in Canada? | maybe |
| Is rescue from outside populations likely? | no |

**Current Status**

| |
|---|
| COSEWIC: Endangered (November 2009)<br>Global listing: G4, Provincial listing: S1, Red |

**Status and Reasons for Designation**

| **Status:** | **Alpha-numeric code:** |
|---|---|
| Endangered | B1ab(iii)+2ab(iii); C2a(ii) |
| **Reasons for designation:**<br>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. | |

**Applicability of Criteria**

| |
|---|
| **Criterion A** (Decline in Total Number of Mature Individuals): Not applicable. No population information. |
| **Criterion B** (Small Distribution Range and Decline or Fluctuation): Meets Endangered B1ab(iii)+2ab(iii). There is a single location, EO and IAO are both 4 km², and the specific habitat is threatened based on increasing development in the immediate area. |
| **Criterion C** (Small and Declining Number of Mature Individuals): Meets Endangered C2a(ii) since a decline in number of mature individuals is projected based on potential loss of habitat and all individuals are contained in one population. |
| **Criterion D** (Very Small Population or Restricted Distribution): Meets Threatened D2 based on a single location and small area of occupancy. This taxon is prone to the effects of human activities and stochastic events and could become endangered or extinct over a very short time period. |
| **Criterion E** (Quantitative Analysis): Not available |

## ACKNOWLEDGEMENTS AND AUTHORITIES CONSULTED

The report writer wishes to thank Robert Cannings, Jennifer Heron, Paul Catling, Leah Ramsay, and Ron Hall for their contributions and advice. Comments on draft reports from members of the Arthropod SSC, particularly Rob Cannings, and also from Dave Fraser of BC Ministry of Environment were much appreciated.

Information on collections at California Academy of the Sciences and photos of specimens therein were kindly sent by David Kavanaugh, curator. Information on Royal British Columbia Museum collections was obtained from Robert Cannings, curator. Yves Bousquet provided information on specimens from the Canadian National Collection in Ottawa.

Please note that all information pertaining to conditions in Manuel's Canyon, specifics of the location and the results of searches of Osoyoos Indian Band lands are considered to be Aboriginal Traditional Knowledge (ATK). Extensive effort to gain permission to include ATK on *C. parowana wallisi* for this report was sought, but as of May 2009, was not obtained.

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## BIOGRAPHICAL SUMMARY OF REPORT WRITER

Dr. Susanne Lavallee has studied the ecology of carabid beetles in forest environments in British Columbia for thirteen years. She obtained her Ph.D. from UBC, completing her studies on the ecology and prey of *Scaphinotus angusticollis* (Coleoptera, Carabidae) in 2006, including some research on gastropods of coastal BC forests. She has served on the BC Invertebrates at Risk Recovery Team for the past five years and is an avid field ecologist.

## COLLECTIONS EXAMINED

Collections at the Royal British Columbia Museum, Victoria, BC; the Canadian National Collection, Ottawa, ON; the California Academy of the Sciences, San Francisco, CA; the J.B. Wallis Museum of Entomology, University of Manitoba, MB; and the Spencer Entomological Museum, University of British Columbia, BC were examined by curators for specimens. A complete listing of all specimens in Canada is in Appendix 1 and a complete listing of some Canadian specimens in collections in the United States is in Appendix 2.

Although specimens in the Canadian National Collection have latitude and longitude associated with their occurrence information, these coordinates are only approximate based on town or city name. and do not represent the exact location of a specimen's capture. This information is not part of the label data and was only recently added to the computer record for databasing purposes,.

## Appendix 1: Summary of *Cicindela parowana wallisi* Calder holdings in Canada

Royal BC Museum, Victoria, BC

| Collector | Date Coll. | Location | Current habitat at coordinates given |
|---|---|---|---|
| R.C. Cannings | 30.vi.1996 | Manuel's Canyon, Oliver, BC | Open with some Ponderosa pine and Douglas fir, riparian, moderate ground cover at time of collection and apparently unchanged in 2008. |

Spencer Entomological Museum, UBC, Vancouver, BC

| Collector | Date Coll. | Location on label | Current habitat at coordinates given (At time of collection) |
|---|---|---|---|
| S. Criddle | 24.v.1951 | Penticton, BC | Unknown, but according to Wallis (1961), this is the same location as his 1909 collection and the habitat should be considered the same as for that record. In 2007 this area was dense housing with associated man-made ponds (see Figure 4). Along the east side of South Main Street, which forms the eastern boundary of this area, there are still some open silt banks with sage brush. |

J.B. Wallis Museum of Entomology, University of Manitoba, MB

| Collector | DateColl. | Location on label | Current habitat at coordinates given (At time of collection) |
|---|---|---|---|
| Todd Lawton | 28-iv-06 | Black Lake, Grant County, Washington, USA | Unknown |
| Todd Lawton | 28-iv-06 | Lower Crab Creek Rd., Grant County, Washington, USA | Unknown |
| Todd Lawton | 28-iv-06 | Lower Crab Creek Rd., Grant County, Washington, USA | Unknown |
| Todd Lawton | 28-iv-06 | Lower Crab Creek Rd., Grant County, Washington, USA | Unknown |
| Todd Lawton | 28-iv-06 | Lower Crab Creek Rd., Grant County, Washington, USA | Unknown |

Canadian National Collection, Ottawa, ON

| Collector | Date Collected | Location on label | Current habitat at coordinates given |
|---|---|---|---|
| Tom Wilson | 22.v.1914 | Okanagan | Unknown |
| J.R. McGillis | 23.v.1953 | Okanagan Falls | Unknown |
| J.E.H. Martin | 6.vi.1953 | Oliver | Unknown |
| J.E.H. Martin | 26.v.1953 | Oliver | Unknown |
| P.N. Vroom | 12.v.1924 | Oliver | Unknown |
| J.B. Wallis | 13.viii.1909 | Penticton | on a small path extending across alkaline soil (Wallis 1961). See “Habitat protection/ownership”. Probably alkaline flat, part of a large complex of meadows, bands of trees, wetlands and other open habitats. In 2007 this area was dense housing with associated man-made ponds (see Figure 4). Along the east side of South Main Street, which forms the eastern boundary of this area, there are still some open silt banks with sage brush. |
| S. Criddle | 27.v.1951 | Penticton | Unknown, but according to Wallis (1961), this is the exact same location as his 1909 collection and the habitat should be considered the same as for that record. In 2007 this area was dense housing with associated man-made ponds (see Figure 4). Along the east side of South Main Street, which forms the eastern boundary of this area, there are still some open silt banks with sage brush. |
| M. Criddle | 27.v.1951 | Penticton | “ |
| R.M. White | 27.v.1951 | Penticton | “ |

## Appendix 2: Summary of *Cicindela parowana wallisi* Calder holdings (Canadian specimens) in the United States

California Academy of the Sciences, San Francisco, CA (Courtesy David Kavanaugh)

| Collector | Date Coll. | Location | Current habitat at coordinates given |
|---|---|---|---|
| R.M. White (Received from Dr. de Wendler-Funaro?) (N.L. Rumpp Collection at CAS) | 27-v-1951 | Penticton | Date and collector are identical to CNC specimen; certainly from same collection event. |
| Unk. (Van Dyke collection at CAS) | Unk. (Prior to 1930? T. Wilson known to be collecting in vicinity in 1914) He died in March 1917. | Vernon | Unknown. |