COSEWIC
Assessment and Status Report

on the

Sonora Skipper
Polites sonora

in Canada

NOT AT RISK
2016

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:

COSEWIC. 2016. COSEWIC assessment and status report on the Sonora Skipper *Polites sonora* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 35 pp. (http://www.registrelep-sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1).

Previous report(s):

COSEWIC. 2006. COSEWIC assessment and status report on the Sonora Skipper *Polites sonora* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 20 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Production note:
COSEWIC would like to acknowledge Jennifer Heron for writing the status report on Sonora Skipper, *Polites sonora,* in Canada, prepared under contract with Environment and Climate Change Canada. This report was overseen and edited by Paul Grant, Co-chair of the COSEWIC Arthropods Specialist Subcommittee.

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Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur L'hespérie du Sonora (*Polites sonora*) au Canada.

Cover illustration/photo:
Sonora Skipper — Photo credit: Dennis Knopp: Sonora Skipper nectaring on Fragrant White Rein Orchid; photograph taken July 21 2014, at Whipsaw Forest Service Road, BC.

Catalogue No. CW69-14/500-2017E-PDF
ISBN 978-0-660-07722-2

COSEWIC
Assessment Summary

Assessment Summary – November 2016

Common name
Sonora Skipper

Scientific name
Polites sonora

Status
Not at Risk

Reason for designation
This butterfly has a small range in the southern interior of British Columbia. Since it was last assessed, new information has been gathered on its distribution, habitat, host plants, natural history and threats. It is now known to occur in a greater number of natural and disturbed sites, including meadows, roadsides and clearcuts that typically have wet seepages or some form of standing water. It also has much broader host plant preferences than previously known and some ability to use non-native species to complete life stages. Threats remain low and some potential impacts such as clear-cut logging can result in habitat creation and corridors for dispersal for this butterfly.

Occurrence
British Columbia

Status history
Designated Special Concern in April 2006. Status re-examined and designated Not at Risk in November 2016.

COSEWIC
Executive Summary

Sonora Skipper
Polites sonora

Wildlife Species Description and Significance

Sonora Skipper (*Polites sonora*) is in the family Hesperiidae, the skippers. Adults have a wingspan of 25 to 30 mm. The wing uppersides are a combination of rusty orange and brown with blackish wing borders. The forewing undersides have a basal black patch, tawny and pale areas in the median area, and a dark brown border. The ventral surface of the hindwings is ochre brown with a distinct semicircular band of pale spots. There are at least eight possible Sonora Skipper subspecies across its range. The Canadian population may belong to a ninth and undescribed subspecies although the taxonomic work has not been completed. Regardless of the subspecies-level taxonomy, only one subspecies exists in Canada, and the entire species is the subject of this status report.

Distribution

Sonora Skipper, as a species, is widely distributed in western North America, from southern British Columbia (BC) south to Baja California and east in the United States to Wyoming and Colorado. The Canadian population has a small restricted range in the north Cascade Mountains and adjacent Thompson Plateau within southern BC and adjacent to the international border. There are twelve extant subpopulations of Sonora Skipper in Canada; some subpopulations are composed of multiple sites.

Habitat

Sonora Skipper habitats include open moist and mesic grassy forest openings and flowery meadows, gentle slopes, open roadside areas, open streamside banks, fallow agricultural meadows, grassy forest openings of southern exposure, some bordered by forest, clear-cuts or denser vegetation. Sonora Skipper has been recorded from anthropogenic semi-natural areas such as hay fields and old logged areas that have turned to meadows. Sites are typically on a level bench or gentle slope and have wet seepages with some form of standing water (i.e., puddles, pools, dripping seepages).

Biology

Sonora Skipper has four life stages, one generation per year and an adult life-span of seven to ten days. In BC, adults have been recorded from late June to mid-August. Females lay eggs while flying low, within close proximity to host plants. The larval host

plants are unconfirmed in BC. However, females were observed at one BC. site dropping multiple eggs onto non-native Redtop Bentgrass and non-native Common Timothy grass. Elsewhere within the skipper's global range, larvae have been successfully reared on non-native Yellow Bristlegrass, native Idaho Fescue, non-native Common Timothy and native Kentucky Bluegrass. Eggs hatch into larvae within 7-8 days of oviposition. The larvae build and take refuge in silken shelters, emerging to feed on their host plants. Each larval instar builds a new shelter. Larvae overwinter at the fourth instar, break diapause in the spring (April/May) and continue to feed for approximately a month before pupation (fifth instar).

Population Sizes and Trends

To date, surveys have focused on recording new populations, natural history and habitat information and there are few data from which to estimate Sonora Skipper abundance, population size or trends at extant sites. Most records are one or two individuals. The largest number of Sonora Skipper was recorded in 2014 from a site along Granite Forest Service Road (#2 Corrall Creek) where 25 butterflies were observed on July 24, 2014. The natural population fluctuations in butterflies are a result of factors such as parasites, predators, and the previous years' weather. Sonora Skipper does not likely experience extreme fluctuations although there is insufficient information to estimate population fluctuations or trends for Sonora Skipper in Canada or elsewhere in the species' range. Many sites have been visited over multiple years to confirm the species' presence and record number of individuals. However, these sites were only visited on one or two dates of a field season.

Threats and Limiting Factors

Threats to Sonora Skipper subpopulations are considered low and site-specific without any immediate range-wide threat. Specific lows threats include habitat loss from recreational ski hill development; timing of annual or biannual haying that could kill both eggs and larvae; and inappropriate cattle grazing regimes.

Most of the range of Sonora Skipper (excluding provincial parks) is within active timber supply areas. Clear-cut logging may provide temporary habitat (< 10 years), provided the appropriate host plants and suitable moisture conditions are present. These same habitats may provide corridors with other suitable habitats or isolated subpopulations. At some extant sites, past logging appears to have opened habitat: the forest has not regenerated and remained a wet meadow in which Sonora Skipper subpopulations have remained.

Protection, Status and Ranks

Sonora Skipper subpopulations are protected at E.C. Manning Provincial Park under the BC *Park Act*. The BC *Forest and Range Practices Act* lists the Sonora Skipper as Identified Wildlife enabling the species to be protected from forestry and grazing threats through the establishment of Wildlife Habitat Areas. The species is listed as Special Concern under the federal *Species at Risk Act*.

TECHNICAL SUMMARY

Polites sonora

Sonora Skipper

Hespérie du Sonora

Range of occurrence in Canada: British Columbia

Demographic Information

Generation time	1 year
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?	Unknown
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations]	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations].	Unknown
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations].	Unknown
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future.	Unknown
Are the causes of the decline a) clearly reversible and b) understood and c) ceased?	a. Not applicable. b. Not applicable. c. Unknown
Are there extreme fluctuations in number of mature individuals?	No

Extent and Occupancy Information

Estimated extent of occurrence	2176 km² (convex area around points)
Index of area of occupancy (IAO) (2x2 grid value).	88 km²
Is the population "severely fragmented" i.e., is >50% of its total area of occupancy in habitat patches that are (a) smaller than would be required to support a viable population, and (b) separated from other habitat patches by a distance larger than the species can be expected to disperse?	11. No. a) Not likely. b) Unknown.
Number of "locations"*	> 12 locations
Is there an [observed, inferred, or projected] decline in extent of occurrence?	No.
Is there an [observed, inferred, or projected] decline in index of area of occupancy?	No.

* See Definitions and Abbreviations on COSEWIC website and IUCN (Feb 2014) for more information on this term.

Is there an [observed, inferred, or projected] decline in number of subpopulations?	No.
Is there an [observed, inferred, or projected] decline in number of “locations”*?	No.
Is there an [observed, inferred, or projected] decline in [area, extent and/or quality] of habitat?	No.
Are there extreme fluctuations in number of subpopulations?	No.
Are there extreme fluctuations in number of “locations”∗?	No.
Are there extreme fluctuations in extent of occurrence?	No.
Are there extreme fluctuations in index of area of occupancy?	No.

Number of Mature Individuals (in each subpopulation)

Subpopulations (give plausible ranges)	N Mature Individuals
Total	Unknown

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Not calculated. Insufficient data.

Threats (direct, from highest impact to least, as per IUCN Threats Calculator)

Was a threats calculator completed for this species? Yes. See Table 5.

1.3 Tourism and recreational development. Low impact.
2.1 Annual and perennial non-timber crops. Low impact.
2.3 Livestock farming and ranching. Low impact.

What additional limiting factors are relevant? None.

Rescue Effect (immigration from outside Canada)

Status of outside population(s) most likely to provide immigrants to Canada.	Secure.
Is immigration known or possible?	Unlikely in the short (< 10 years) term.
Would immigrants be adapted to survive in Canada?	Yes.
Is there sufficient habitat for immigrants in Canada?	Yes.
Are conditions deteriorating in Canada?[+]	No.

[+] See Table 3 (Guidelines for modifying status assessment based on rescue effect).

Are conditions for the source population deteriorating?[+]	No.
Is the Canadian population considered to be a sink?[+]	No.
Is rescue from outside populations likely?	No.

Data Sensitive Species

Is this a data sensitive species? Yes, one subpopulation is considered data sensitive.

Status History

COSEWIC: Designated Special Concern in April 2006. Status re-examined and designated Not at Risk in November 2016.

Status and Reasons for Designation:

Status: Not At Risk	**Alpha-numeric codes:** Not applicable
Reasons for designation: This butterfly has a small range in the southern interior of British Columbia. Since it was last assessed, new information has been gathered on its distribution, habitat, host plants, natural history and threats. It is now known to occur in a greater number of natural and disturbed sites, including meadows, roadsides and clearcuts that typically have wet seepages or some form of standing water. It also has much broader host plant preferences than previously known and some ability to use non-native species to complete life stages. Threats remain low and some potential impacts such as clear-cut logging can result in habitat creation and corridors for dispersal for this butterfly.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Not applicable. There is insufficient information.
Criterion B (Small Distribution Range and Decline or Fluctuation): Not applicable. Although EOO and IAO are below thresholds for Endangered, no two subcriteria are met.
Criterion C (Small and Declining Number of Mature Individuals): Not applicable. Insufficient data to estimate decline in total number of mature individuals and subpopulations.
Criterion D (Very Small or Restricted Population): Not applicable. Insufficient data on number of mature individuals within population.
Criterion E (Quantitative Analysis): Not applicable. Insufficient data on this species exists to make population projections showing the probability of extinction or extirpation in the wild.

[+] See Table 3 (Guidelines for modifying status assessment based on rescue effect).

PREFACE

Sonora Skipper (*Polites sonora*) was assessed as Special Concern in April 2006 and listed as such under Schedule 1 of the federal *Species at Risk Act* in the same year. Since the initial status report, new information has been gathered on the Canadian distribution and range extent, habitat, host plants, natural history and site-specific threats. The initial status report listed six subpopulations, plus one additional historical subpopulation, in Canada. Surveys in the past ten years have recorded an additional five subpopulations and the historical subpopulation is now considered extant due to abundant suitable habitat within the vicinity of the record. In total, there are at least 28 Sonora Skipper collection sites grouped into twelve extant subpopulations. In addition, threats to these subpopulations are considered low and some potential impacts such as clear-cut logging can result in habitat creation and corridors for dispersal for this butterfly.

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
(2016)

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.

Environment and Climate Change Canada | Environnement et Changement climatique Canada
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Canada

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

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Sonora Skipper
Polites sonora

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WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Class:	Insecta - insects
Subclass:	Pterygota – winged insects
Order:	Lepidoptera – butterflies, moths
Family:	Hesperiidae Latreille, 1809 – Skippers
Subfamily:	Hesperiinae Latreille, 1809 – Grass-skippers
Genus:	*Polites* Scudder 1872
Species:	*sonora* (Scudder 1872)
Synonyms:	*Ochlodes sonora* Scudder 1872
English Common Names:	Sonora Skipper, Sonoran Skipper, Western Long Dash
French Common Name:	Hespérie du Sonora

Polites sonora (Scudder 1872) is a butterfly in the family Hesperiidae, the skippers. There are five recognized Sonora Skipper subspecies (Pelham 2008): *P. s. flavaventris* Austin 1998, *P. s. longinqua* Austin 1998, *P. s. siris* (Edwards 1881), *P. s. sonora* (Scudder 1872), and *P. s. utahensis* (Skinner 1911).

The subspecies status of Canadian specimens is uncertain (Pyle 2002; Guppy pers. comm. 2015; Kondla pers. comm. 2015), the taxonomy separating this subspecies from others is complex and there is disagreement amongst lepidopterists. Specimens in the Canadian portion of the species' range may belong to an undescribed subspecies (Kondla 2003; Guppy pers. comm. 2015; Kondla pers. comm. 2015). However, this taxonomic work has not been completed. All subpopulations in the United States east of the Sierra Nevada Mountains have been assigned historically to subspecies *utahensis* (Skinner 1911), but more recently Austin (1998) described the subspecies *flavaventris* and *longinqua* from Nevada. These three names do not apply to the Canadian specimens. Canadian specimens were assigned to subspecies *sonora* in some references (McDunnough 1938; Llewellyn-Jones 1951; Guppy and Shepard 2001; Pyle 2002; Pelham 2008), and to subspecies *siris* in others (Holland 1931; Howe 1975; Dornfeld 1980; Layberry *et al.* 1998; Scott 1986; and Tilden and Smith 1986).

Regardless of the subspecies-level taxonomy, only one subspecies exists in Canada with a range that spans the international border in southern BC in the Cascade Mountains (see **Global and Canadian range**) (Pelham 2008), and therefore the entire species is the subject of this status report.

Morphological Description

Adults:

The following description is based on Canadian specimens and was completed by Kondla (pers. data) for the first COSEWIC status report. Sonora Skipper has a wingspan of 25 to 30 mm (Figures 1 and 2; see also Layberry *et al.* (1998), Guppy and Shepard (2001), and Kondla (2003) for photos of Canadian specimens). The dorsal wing surface is a combination of rusty orange and brown with blackish wing margins. The ventral surface of the forewings has a black basal patch, some tawny and pale areas in the median portion of the wing, and an olive-green marginal area that is most pronounced at the apex. The ventral surface of the hindwings is olive-green with a distinct semicircular band of pale spots as well as one, linear, pale spot near the wing base. Males have a black, elongated stigma (prominent cells) on the forewing. Females are similar to males, except they lack stigma markings and are usually larger.

A summary description of the skipper's immature life stage is written below based on information in Scott (1992), James and Nunnallee (2011) and observations of BC specimens by Knopp (pers. comm. 2015) and St. John (pers. comm. 2015).

Figure 1. Dorsal view of Sonora Skipper (*Polites sonora*), observed at Whipsaw Forest Service Road, July 17, 2014. Photo Denis Knopp.

Figure 2. Ventral view of a Sonora Skipper (*Polites sonora*), observed at Whipsaw Forest Service Road, July 21, 2014. Photo Denis Knopp.

Egg:

Eggs and oviposition have been observed in BC (Knopp pers. comm. 2015; St. John pers. comm. 2015). Sonora Skipper eggs are greenish white with a small flattened base, spherical, shiny and, smooth to finely reticulate (surface covered with network of fine lines) with an indistinct micropyle (small opening at the anterior end of an insect egg that allows the entry of sperm for fertilization). The egg basal diameter is 1.0 mm and the height 0.7 mm.

Larva:

Larvae are difficult to find and have not been observed in the wild in BC. Sonora Skipper completes five larval instars before pupation after the fifth instar. First instar larvae (head width 0.6 mm; body length 1.75 mm) have a shiny black head and creamy white body, with a distinct ‘collar’ around the first abdominal segment and two long setae (stiff bristle-like hairs) on the last two segments. Second to fifth instars look similar with a shiny black head and yellowish green body that becomes greener and darker with maturity. Larvae are covered with numerous minute brown dots and as they age the dots become more sclerotized (hardened). By the fifth instar, the body length is 20 mm.

Pupa:

Sonora Skipper pupae are black with brown abdominal bands at each segment. The body is covered with pale short-medium length setae. The pupa is similar to that of the Long Dash Skipper (*Polites mystic*) (Scott 1992; James and Nunnallee 2011) and Sandhill Skipper (*P. sabuleti*) although the geographic ranges of these two species do not overlap.

Population Spatial Structure and Variability

The Canadian population of Sonora Skipper may be an undescribed subspecies with a small limited range in the Cascade Mountains, which span a small portion of southern BC and stretch into adjacent Washington State. However, no systematic research has been completed (see **Name and Classification**) (Guppy pers. comm. 2015; Kondla pers. comm. 2015).

Designatable Units

Sonora Skipper is being assessed as one designatable unit. There is no information on discreteness or evolutionary significance among subpopulations in Canada. The species occurs within the COSEWIC Southern Mountain Ecological Area.

Special Significance

Sonora Skipper is one of a small group of butterflies that reach the northern limit of their global range within southern BC. The species is of interest to lepidopterists due to the taxonomic and identification challenges, as well as its rarity within the landscape.

DISTRIBUTION

Global Range

The global range of all five subspecies of Sonora Skipper are within western North America from Baja California in the south, northeast to eastern Wyoming, west through Oregon and Washington States and the Pacific Coast. The northernmost extent of its range is in the north Cascades of southern BC.

The global range of the subspecies that extends into Canada is restricted to the northern Cascade Mountains and the adjacent Thompson Plateau of BC and WA (Figure 3). The BC geographic boundaries are thought to be well-delineated (Knopp pers. comm. 2015; St. John pers. comm. 2015) although the specific geographic boundaries of this subspecies are not well known or delineated for the southern portion of its range.

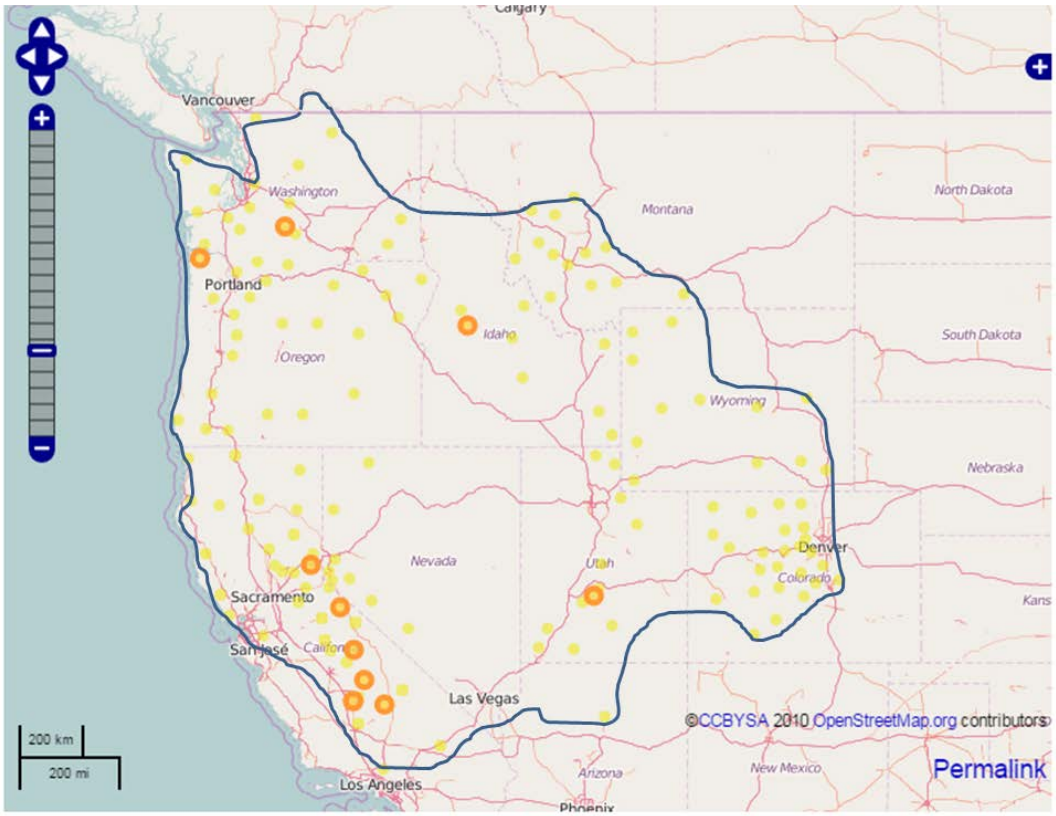

Figure 3. Global range of Sonora Skipper (*Polites sonora*) in western North America (Blue line). Yellow dots are all known records, and orange dots are recently verified records (<10 years). Source: (http://www.butterfliesandmoths.org/species/Polites-sonora).

Canadian Range

Sonora Skipper has a restricted range in Canada. The species is found in the north Cascade Mountains of southern BC (Figure 4) from E.C. Manning Provincial Park, north to Princeton and east through the Ashnola River Valley and Apex Mountain areas. This known range is larger than the range reported in the first COSEWIC status report and maps shown in Layberry *et al.* (1998).

Sonora Skipper is known from 12 extant subpopulations within BC. The subpopulation at Red Bridge Lake (subpopulation #6) was considered historical in the first COSEWIC status report, although is now considered extant (Guppy pers. comm. 2016). The general area has not been inventoried since 1994 (St. John 1995) although aerial photos and low threats suggest there could be a subpopulation remaining in this area (Guppy pers. comm. 2016). The BC Conservation Data Centre (2015) has mapped all records of Sonora Skipper (Figure 4; Tables 1 and 2).

There are also likely additional unsurveyed habitats within the Canadian range of Sonora Skipper. (Guppy pers. comm. 2015; Knopp pers. comm. 2015; St. John pers. comm. 2015).

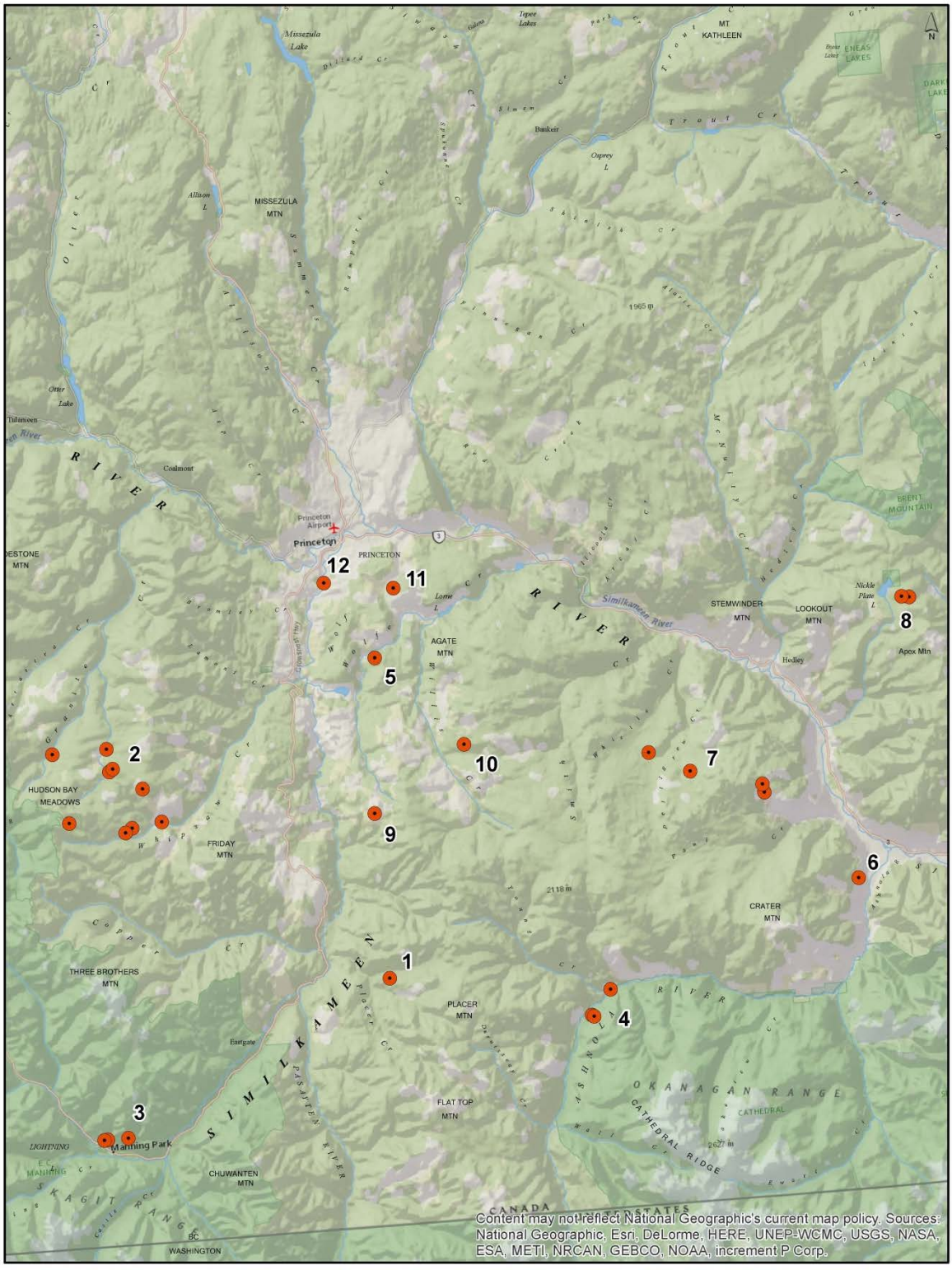

Figure 4. Sonora Skipper (*Polites sonora*) distribution, subpopulations (numbers) and sites of in British Columbia. See Table 2 for subpopulation names.

Table 1. Museum and private collection Sonora Skipper (*Polites sonora*) specimens cited in the first COSEWIC status report.

Number of specimens	Subpopulation	Date	Collector (Institution)*
6	Keremeos; Crater Mountain [NE slope], el. 3800 feet	21 June 1975	C.S. Guppy (CSG) J.L. Gordon (JHS/OSU)
6	Keremeos; Crater Mountain [NE slope], el. 5000 feet	15 July 1978	J.H. & S. Shepard (JHS/OSU)
3	Manning Provincial Park [Twenty Minute Lake]	23 July 1945 27 July 1945	G.A. Hardy (RBCM)
3	Manning Provincial Park	7 August 1989	P. Klassen (MMMN)
Unknown	Hope Mountains, el. 5500 feet	13 August 1932	A.N. Gartrell (CNC)
Unknown	Hope Mountains	16 July 1906	E.H. Blackmore (UBC)
4	Ashnola River (upper)	22 July 1973	D.L. Threatful (VM)
5	Wolfe Creek	11,12 July 2003	N.G. Kondla (NGK)
1	Placer Creek	24,25,28 June 2003	N.G. Kondla (NGK)

*Institutions holding specimens are: CSG = C.S. Guppy private collection; JHS/OSU = J.H. Shepard private collection recently transferred into the Oregon State University collection; MMMN = Manitoba Museum of Man and Nature; NGK = N.G. Kondla private collection; RBCM = Royal BC Museum collection; UBC = Spencer Entomological Museum collection at the University of British Columbia Beaty Biodiversity Museum, VM = Vernon Museum.

Extent of Occurrence and Area of Occupancy

The maximum extent of occurrence (EOO; minimum convex polygon) in Canada is 2726 km^2 based on the generalized areas of known records. The maximum index of area of occupancy (IAO; 2 km x 2 km grid) is 88 km^2 (22 grid squares).

Search Effort

There are a total of 193 Sonora Skipper records in Canada from 1906 to 2015 (Tables 1 and 2; Figure 5). The first Canadian record for the species is from an unknown site named “Hope Mountains” (1906), a historical term referring to the Cascade Mountains between Hope and Princeton in the Hozameen Range of the Cascade Mountains. The most recent Sonora Skipper records are from Apex Mountain and the Ashnola River valley (2015): both these subpopulations are newly recorded since the first COSEWIC status report.

Figure 5. Butterfly search effort from 2009 – 2015 during the flight period for the Sonora Skipper. Black dots are butterfly search effort. Red squares are Sonora Skipper observations and sites. See Table 3 for search effort details.

During fieldwork completed in preparation for the first COSEWIC status report, search effort during the adult flight period spanned 11 days and a minimum of 42 sites. From 2006 – 2015, there has been additional search effort (Table 3) that has focused on suitable habitats within E.C. Manning Provincial Park, Skagit Valley, Merritt, Princeton, Apex Mountain, the lower Similkameen River Valley, and the lower Fraser Valley at the edges of the species' known range (e.g., Pemberton, Lillooet and Boston Bar). Quantified and targeted Sonora Skipper surveys took place in 2006, 2009, 2013, 2014 and 2015 for a total of 232 sites, 76 survey days and recorded a minimum of 152 Sonora Skipper observations.

Surveys in the last ten years have focused on recording the species and collecting habitat and biological information at a site (Tables 2 and 3). The first COSEWIC status report listed six separate subpopulations (referred to as locations in the first status report) and since this report, an additional five new subpopulations have been documented (Tables 3 and 4). Some of the subpopulations have multiple sites. In total, there are 12 extant subpopulations, each separated by apparently unsuitable habitat and grouped according to Natureserve (2015) delineation standards. In some instances, the habitat between known subpopulations has been searched, while in other cases it has not.

The Sonora Skipper is surveyed by wandering transects through potential habitat, stopping periodically, disturbing herbaceous and shrubby vegetation in order to flush out resting butterflies, and observing for butterfly activity. Wandering transects allow the surveyor to change course depending on habitat suitability and follow no set transects, pre-determined grid or fixed route. Wandering transects are an efficient method of determining butterfly presence when little information is available. Flowers and puddling sites were concurrently examined for perched individuals. Surveys do not typically target the larval life stage because the species is cryptic and difficult to find amongst the dry grassy vegetation that are its likely host plants.

The Canadian range of the Sonora Skipper is within an area of southern BC that has been frequently visited for purposes of recreational and research-related insect collecting for more than 100 years. There are many thousands of specimens and specimen records of butterflies from this area, in stark contrast to the few records of Sonora Skipper, which have similar phenology. It is therefore reasonable to conclude, solely on the basis of historical information, that the Sonora Skipper is not a common species.

Researchers, conservancies, naturalists and biologists have conducted non-quantified surveys for the Sonora Skipper in the past ten years, concurrent with their own areas of focus. It is not possible to accurately quantify all search effort by these individuals. There is no Aboriginal Traditional Knowledge available on the distribution or abundance of the Sonora Skipper in the region, nor the potential host plant(s) for the species.

HABITAT

Habitat Requirements

Habitat information written below is summarized from the first COSEWIC status report; Layberry *et al.* 1998; Guppy and Shepard 2001; Pyle 2002; James and Nunnallee 2011; Knopp *et al.* 2013; BC Ministry of Environment 2014; Knopp and Larkin 2014; BC Conservation Data Centre 2015; St. John pers. comm. 2015; and Heron pers. data).

Sonora Skipper inhabits both natural and semi-natural anthropogenic habitats including open dry to moist and mesic grassy forest openings and flowery meadows, natural and human created roadside openings, open grassy and gently sloping streamside banks, natural forest clearings and fallow agricultural meadows. Some habitats are previously logged areas that have not regenerated with trees and remained as open grassy meadows. Some sites are bordered by forest, clear-cuts or denser vegetation.

Most sites have a southern exposure and are typically on a level bench or gentle slope (0-20% slope). Sites typically have wet seepages with standing water such as long-term puddles that dry out towards the end of summer, while other sites have small creeks flowing through the habitat. The size of most sites is from 0.01 to 1 hectare, although habitats have not been accurately measured, and may be spatially larger because of linkages to other similar habitats throughout the forest landscape. Habitat information from historical collections is difficult to characterize, given the lack of information that accompanies older museum specimens (Tables 1 and 2). The 12 extant subpopulations in Canada occur at elevations from 765 m to 1700 m.

The matrix and dimensions of larval and nectar food plant habitat patch sizes, spatial boundaries, specific habitat characteristics and features necessary to sustain Sonora Skipper subpopulations are poorly understood. Subpopulations are considered colonial and local (James and Nunnallee 2011). The species tends to occupy only a portion of what would otherwise appear to be suitable habitat, as was noted at #1 Placer Creek and #5 Verde Creek in 2003 during fieldwork for the preparation of the first COSEWIC status report (Kondla pers. data). At #5 Verde Creek, the skipper was present in only one of the four visually suitable habitat patches searched. Several hours of searching revealed that within the occupied habitat patch of approximately 105,000 m^2, this species was present only in an area of approximately 400 m^2 (0.4%). A similar observation was made at #1 Placer Creek.

Sonora Skipper habitat includes larval and nectar host plants and low-lying shrub vegetation for perching or resting (Guppy and Shepard 2001; James and Nunnallee 2011). The plant composition at Sonora Skipper sites is not consistent across all sites and does not match a specific plant community. Sonora Skipper surveys in 2014 and 2015 aimed to gather more specific habitat information, nectar preferences and host plant information (Knopp and Larkin 2014; St. John *et al.* 2014; Heron pers. data). Results from these surveys showed a strong correlation between Sonora Skipper presence and the presence of Fragrant White Rein Orchid (*Platanthera dilatata*) although this correlation is due mainly to both species having similar habitat types (Knopp and Larkin 2014). This plant is used as a nectar source although the butterfly is not dependent on this plant for its life cycle nor do all Sonora Skipper sites have this plant.

Additional plants often found in habitats where mating and oviposition have been observed (Knopp and Larkin 2014; St. John pers. comm. 2015) include Arrow-leaved Groundsel (*Senecio triangularis*), Northern Gentian (*Gentianella amarella*), Leafy Aster (*Symphyotrichum foliaceum*), Fireweed (*Chamerion angustifolium*), willow (*Salix* spp.), Wild Strawberry (*Fragaria virginiana*), Small-flowered Penstemon (*Penstemon procerus)*, White

Clover (*Trifolium repens)*, pussytoes (*Antennaria* spp.), Common Timothy (*Phleum pratense*), bluegrasses (*Poa* spp.), buttercups (*Ranunculus* spp.), Black Gooseberry (*Ribes lacustre*), Rocky Mountain Juniper (*Juniperus scopulorum*) and Yarrow (*Achillea millefolium*). Cotton grass (*Eriophorum* spp*.)* is present at wetter sites. Graminoid composition is typically at least 10% of the occupied herb/forb community.

Larval host plants:

The larval host plants for Sonora Skipper are unconfirmed in BC. However, breeding and oviposition has been observed at Whipsaw Forest Service Road (Subpopulation #2) on July 16, 21 and August 17, 2014 (Knopp and Larkin 2014). Females dropped multiple eggs into non-native Redtop Bentgrass (*Agrostis gigantea*) (within 1 m² of the egg drop sites) and one observation was of an egg drop on the non-native Common Timothy grass (Knopp and Larkin 2014). During subsequent visits to this site, larvae were not observed.

Elsewhere within the skipper's range, larvae have been successfully reared on non-native Yellow Bristlegrass (*Setaria pumila* ssp. *pumila*) (James and Nunnallee 2011). This plant has been introduced to BC from Eurasia, grows in dry fields, roadsides, and other disturbed habitats and is commonly observed in the range of Sonora Skipper (BC Conservation Data Centre 2015). Sonora Skipper has also been reared on Idaho Fescue (*Festuca idahoensis*) (Newcomer 1967), a native perennial bunchgrass which occurs throughout the southern interior of BC. In WA, larvae have been successfully reared on Common Timothy (James and Nunnallee 2011), a non-native grass which occurs throughout the range of Sonora Skipper (BC Conservation Data Centre 2015). In Colorado, the skipper has been reared on Kentucky Bluegrass (*Poa pratensis*) (Scott 1992). During captive rearing experiments, larvae have been fed numerous other grasses with mixed success (see James and Nunnallee 2011).

Nectar plants:

The Sonora Skipper has a flight period that lasts almost two months. During this flight period, the floral nectar availability and bloom time changes. In early July, the Sonora Skipper has been observed nectaring on Fragrant White Rein Orchid, Arrow-leaved Groundsel, Showy Daisy (*Erigeron speciosus*) and Northern Gentian. Towards late July and August, the species has been observed nectaring on Edible Thistle (*Cirsium edule*), Heal All (*Prunella vulgaris*) and various asters (e.g., Leafy *Aster and Showy Aster*) (Knopp and Larkin 2014; St. John pers. comm. 2015). Tall Buttercup (*Ranunculus acris*), Large-leaved Avens (*Geum macrophyllum*) and Pearly Everlasting *(Anaphalis margaritacea*) were sporadically recorded and Yarrow was only used at sites with little nectar choice (Knopp and Larkin 2014). In open mesic forests, the Sonora Skipper was observed nectaring on Sticky Geranium (*Geranium viscosissimum*). Along roadsides Alfalfa (*Medicago sativa*), Alsike Clover (*Trifolium hybridum*) and Pearly Everlasting.

See Table 2 for specific habitat information for each of the 12 extant Sonora Skipper subpopulations.

Habitat Trends

The Sonora Skipper ranges in a part of southern BC with a low human population and little historical or ongoing urban or agricultural development pressure. Studies to assess habitat trends within this area are lacking. Historical and projected habitat trends over the past 150 years include the cumulative and long-term effects of logging (including road building), fire suppression and changes to wildfire regimes, mining and gravel extraction, and livestock ranching. In the past 10 – 20 years, there have been significant changes to the forest landscape from the large outbreak of Mountain Pine Beetle (*Dendroctonus ponderosae*). Climate change is compounding these long-term habitat trends.

The factors influencing long-term habitat trends may temporarily increase the potential habitats available to the Sonora Skipper. For example, logging temporarily creates open habitats for approximately 20 years. However, forest ingrowth and natural succession into open meadows otherwise sustained by wildfire is a significant factor reducing the size and number of natural meadows available to the Sonora Skipper. Wildfire control may have decreased the amount of suitable natural habitat by increasing the total area occupied by mature forests. Turner and Krannitz (2000) have documented ingrowth of trees into meadows and grasslands, and point out that there is likely a positive interaction between grazing and fire suppression that hastens forest ingrowth. Within the range of the skipper, patches of suitable habitat are continually created and lost.

BIOLOGY

Life Cycle and Reproduction

The Sonora Skipper has four life stages: egg, larva (with five instars), pupa and adult. The species has one generation per year.

In BC, adults have been recorded from June 21 to August 13 with the later dates from higher elevations (BC Conservation Data Centre 2015). Males are territorial and perch in depressions to wait for females. Females are considered more reclusive, and tend to remain concealed in vegetation (James and Nunnallee 2011). The adult life span is estimated at seven to ten days (Guppy pers. comm. 2015; Knopp pers. comm. 2015; St. John pers. comm. 2015).

Observations of female oviposition in the field in BC (Knopp and Larkin 2014) and in captivity (St. John pers. comm. 2015) have noted the female lays eggs singly and randomly by flying low and within close proximity to host plants, dropping eggs at the base of (suspected) host plants. Eggs lack “glue” to hold them to grasses, and it is suspected the eggs lay in the grass until hatching. There have been a few instances of eggs being attached to host plants and of females crawling amongst grasses and depositing eggs at the base of grass clumps (James and Nunnallee 2011). The number of eggs deposited varies from a few to 35 (James and Nunnallee 2011).

In laboratory/captive bred conditions, eggs hatch into larvae within 7 – 8 days of oviposition. During captive rearing, larvae were fed Yellow Foxtail (*Setaria glauca*), Quackgrass (*Elytrigia repens*), a bluegrass/fescue mixture, Kentucky Bluegrass and Timothy Grass with variable success (James and Nunnallee 2011). Larvae build silken shelters within which they take refuge, emerging to feed on their host plants (see **Habitat**) and at other times retreating and/or building/repairing their shelters. The Sonora Skipper has five larval instars (stages); each larval instar builds a new shelter. The first instar shelters are light; the second to fifth instar larvae build 'vertical, aerial tubular nests in the upper half of the grass, more extensive and untidier in each instar" (James and Nunnallee 2011). Larvae overwinter at the fourth instar, break diapause in the spring (April/May) and continue to feed for approximately a month before reaching the fifth and final instar. Pupation likely takes place in the soil (James and Nunnallee 2011). Larvae or pupae have not been observed in the wild in BC, and captive rearing to gain further knowledge on its life cycle has been attempted but did not result in completion of its life cycle (St. John pers. comm. 2015).

Physiology and Adaptability

The Sonora Skipper occurs in a wide range of open natural and semi-natural habitats, and appears to have the ability to colonize anthropogenic areas, such as hay fields and open logged areas, when host plants and moisture conditions are suitable. In BC, females have been observed dropping eggs into non-native Redtop Bentgrass and non-native Common Timothy grass, suggesting larva have host plant adaptability. The longevity of a colony within an anthropogenic habitat, or completion of the species' life cycle in the wild using non-native hosts, is unknown.

Dispersal and Migration

There is no information on dispersal for the Sonora Skipper. Pyle (2002) notes significant ability by the Sonora Skipper to colonize newly available suitable habitats in WA. The distance over which the skipper will disperse across unsuitable habitat is unknown, but is likely less than 10 kilometres. There is no evidence for migration in any *Polites* species, including the Sonora Skipper. The related Sandhill Skipper has apparently undergone range extension northward in WA and BC in the last 50 years, suggesting considerable dispersal and colonization ability.

Interspecific Interactions

The Sonora Skipper does not appear to have specific obligate associations with other species, is not considered an essential pollinator of any one host plant or to have other crucial ecological roles such as food-web dynamics. Larval feeding likely damages food plants but does not cause plant mortality. This species does not depend entirely on one larval host plant and there is no information on specific predators or parasitoids. Specialist parasitoids are likely those in the Braconidae (parasitic wasps) family. General butterfly predators include insectivorous birds, small mammals, spiders, and numerous groups of predaceous insects.

POPULATION SIZES AND TRENDS

Sampling Effort and Methods

Sonora Skipper surveys to date have focused on recording new subpopulations, natural history and habitat information. Surveys have been primarily by wandering transects through suitable habitat (Table 2) (see **Search Effort**).

Abundance

There are few data from which to estimate Sonora Skipper abundance at extant sites. Most observations and collections are of one or two individuals. The largest number of Sonora Skipper was recorded in 2014 from a site along Granite Forest Service Road (#2 Corral Creek) where 25 butterflies were observed on July 24, 2014 (Knopp and Larkin 2014).

Fluctuations and Trends

The natural population fluctuations in butterflies are a result of factors such as parasites, predators, and the previous years' weather. The Sonora Skipper does not likely experience extreme fluctuations although there is insufficient information to estimate population fluctuations or trends for the Sonora Skipper in Canada or elsewhere in the species' global range. Many sites have been visited over multiple years (Tables 2 and 3); however, these sites were visited on one or two dates of a field season with the purpose of confirming the species' presence and recording the abundance.

Table 2. Sonora Skipper subpopulations and associated information. All subpopulations are considered extant.

Subpopulation	# Sites in Subpopulation	Data Sensitive	Subpopulation Name	First Obs. Date (Y/M/D)	Most Recent Obs. Date (Y/M/D)	Observation Information (as cited by the BC Conservation Data Centre 2015)
1	1	N	Placer Creek	2003-06-24	2003-06-28	2003: 15 Sonora Skipper observed over 4 days during fieldwork for the preparation of the first status report. Moist grassy logged areas near Placer Creek.

Subpopulation	# Sites in Subpopulation	Data Sensitive	Subpopulation Name	First Obs. Date (Y/M/D)	Most Recent Obs. Date (Y/M/D)	Observation Information (as cited by the BC Conservation Data Centre 2015)
2	9	N	Corral Creek (Whipsaw Creek)	2006-08-05	2015-07-22	2015: 6 Sonora Skipper observed over two sites (Heron pers. data). 2014: A total of 91 Sonora Skipper were observed at 7 sites over three dates (Knopp and Larkin 2014). Mating and egg laying observed at Whipsaw FSR at Hope Pass junction. 2011: 5 Sonora Skipper observed nectaring (D. Knopp, pers. comm. 2012). 2006: One Sonora Skipper observed (Knopp 2006).
3	3	N	Twenty Minute Lake, E.C. Manning Provincial Park	1906-07-16	2014-07-26	2015: No Sonora Skipper observed (Heron pers. data). 2014: One Sonora Skipper was observed and photographed at the Pacific Crest Trailhead (N. Kondla, pers. comm. 2014). 2009: One Sonora Skipper was collected (Marks *et al.* 2009; Werden and Hobbs 2013). 1906, 1932, 1989: One Sonora Skipper was collected in each year as well as 2 near Twenty Minute Lake.
4	3	N	McBride Creek, 2.6 km north of	1973-07-22	2014-08-01	2014: 13 Sonora Skipper were observed over two dates (St. John *et al.* 2014). 2012: 5 Sonora Skipper observed (Werden and Hobbs 2013), 1973: 3 Sonora Skipper collected.
5	1	N	Verde Creek (Wolfe Creek)	2003-07-11	2014-07-09	2014: Three Sonora Skipper observed (Knopp and Larkin 2014). 2013: Sonora Skipper observed (no numbers given) (Morgan 2013). 2003:15 Sonora Skipper were observed.

Subpopulation	# Sites in Subpopulation	Data Sensitive	Subpopulation Name	First Obs. Date (Y/M/D)	Most Recent Obs. Date (Y/M/D)	Observation Information (as cited by the BC Conservation Data Centre 2015)
6	1	Y	Red Bridge Lake (Crater Mountain)	1975-06-21	1978-07-15	1978: An unknown number of Sonora Skipper collected. 1975: Two Sonora Skipper collected. On Crater Mountain, west of Ashnola Road, approximately 13 km west of Keremeos. Surveyed in 1994 (St. John 1995) and there likely remains suitable habitat in the area (Guppy pers. comm. 2016).
7	4	N	Paul Creek, north of	2014-07-17	2014-07-20	2014: A total of 14 Sonora Skipper were seen at four sites over three days in 2014 (Knopp and Larkin 2014).
8	1	N	Apex Mountain	2014-08-18	2015-07-23	2015: Three Sonora Skipper were observed (Heron pers. data). 2014: One Sonora Skipper (Heron pers. data).
9	2	N	Sunday Creek, 1.8 km east of	2014-07-12	2014-07-12	2014: A single female Sonora Skipper was observed along the roadside in 2014 (Knopp and Larkin 2014).
10	1	N	Wilbert Hills, southwest of	2014-07-13	2014-07-13	2014: One male Sonora Skipper was seen (Knopp and Larkin 2014).
11	1	N	August Lake, south of	2014-07-09	2014-07-09	2014: One adult male Sonora Skipper (Knopp and Larkin 2014).
12	1	N	Allenby, northwest of	2014-06-30	2014-06-30	2014: Three Sonora Skipper were observed (J. Gatten, pers. comm. 2015). 2014: One individual seen in 2014 (Knopp and Larkin 2014).

Table 3. Sonora Skipper search effort 2003 – 2015.

Year	Distance (km)	Number of days over flight season	Total Number of hours	Number of sites searched*	Sonora Skipper Observations	Reference
2003	6	11	Not recorded	42	Yes. Four sites had Sonora Skipper (unknown number of observations).	Surveys conducted by N. Kondla during preparation of the first COSEWIC status assessment.
2006	Not recorded.	24	Not recorded	27	Yes. One Sonora Skipper recorded from within Manning Provincial Park (which now includes the Cascade Recreational Area where the species was recorded); and one at Marmot City Horse Camp, Skagit Valley.	Knopp 2007
2009	Not recorded.	8	49	24	Yes. One Sonora Skipper at E.C. Manning Provincial Park, old Amphitheatre site.	Marks and Young 2009
2009	17	14	107	75	No.	Knopp, Larkin and Heron 2009
2013	Not recorded.	5	210	37	Yes. Five Sonora Skipper at two sites.	Werden and Hobbs 2013
2014	Not recorded.	16	Not recorded	45	Yes. A total of 111 Sonora Skipper. Sonora Skipper was recorded at 13 new sites (72 individuals) and confirmed at 2 previously known sites.	Knopp and Larkin 2014
2014	Not recorded.	4	20	4	Yes. Sonora Skipper were recorded at three of the four sites surveyed (previously known sites). The Amphitheatre site at E.C. Manning Provincial Park was surveyed but no Sonora Skipper were recorded.	Knopp *et al.* 2014
2015	20.4	5	31.5	20	Yes. A total of 19 Sonora Skipper were observed within habitats of known subpopulations (Apex Mountain and Ashnola Valley).	Data collected during the preparation of this updated status report (Heron pers. data)
Total 2003 - 2015	**43.4 km**	**87 days**	**417.5 hours**	**274 sites**		

Rescue Effect

The Sonora Skipper occurs at 12 extant subpopulations in Canada. Some of these subpopulations are composed of multiple sites and are considered to be self-sustaining based on a large separation distance of unsuitable habitat (> 10 km).

Natural re-dispersal and recolonization of the Sonora Skipper would likely be slow; the species is local and not known to disperse far. There are few known Sonora Skipper sites in the north Cascade Mountains of WA (Hinchliff 1996; Lotts and Naberhaus 2016), and there is at least a 50 km separation of habitat between these subpopulations and those in Canada (Guppy pers. comm. 2016). During preparation of the first COSEWIC status report, review of United States Geological Survey (USGS) topographic maps and satellite images indicated that the area of the disjunction is entirely forested below the subalpine (about elevation 1900 m). Therefore the 50 km disjunction is apparently lacking in habitat suitable for the Sonora Skipper, and there is a low probability of additional northern, WA populations. Since this initial analysis, the habitat area below the subalpine has been burned (using imaging available on Google Earth) (Guppy pers. comm. 2016). Subpopulations within the burned areas may have been extirpated, although burning may also improve short-term habitat throughout the area. Regardless, there may still be a dispersal barrier of subalpine and alpine habitat between WA and BC subpopulations. Natural re-establishment from the known WA subpopulations, in the event that Canadian subpopulations were to become extirpated, is unlikely or extremely slow to occur (Guppy pers. comm. 2016). Natural re-establishment from the known WA subpopulations, may be possible, but limited.

THREATS AND LIMITING FACTORS

Threats

There is little information on specific threats to the Sonora Skipper; the species ranges in a part of BC with a low human population and little development pressure. Threats to Sonora Skipper have been updated from information in the Sonora Skipper Management Plan (BC Ministry of Environment 2014) and recent survey information gathered in 2014 (Knopp and Larkin 2014; St. John *et al.* 2014) and 2015 (Heron pers. data).

The International Union for Conservation of Nature – Conservation Measures Partnership (IUCN-CMP) threats classification for Sonora Skipper that was originally prepared for the recovery plan (BC Ministry of Environment 2014) was updated. Most threats to Sonora Skipper in BC are unknown or considered to have a low impact (Tables 4 and 5), resulting in an overall province-wide threat impact of Low. The threats listed below have been identified as threats based on existing research and threat information from other species at risk within similar habitats in BC. Details are discussed below under the IUCN-CMP level 1 headings (see Table 5).

Table 4. Sonora Skipper subpopulations and threats applicable to each subpopulation. All subpopulations are considered extant.

Subpopulation Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
Subpopulation Name assigned by BC Conservation Data Centre	**Placer Creek**	**Corral Creek (Whipsaw Creek)**	**Twenty Minute Lake, E.C. Manning Provincial Park**	**McBride Creek, 2.6 km north of**	**Verde Creek (Wolfe Creek)**	**Red Bridge Lake**	**Paul Creek, north of**	**Apex Mountain**	**Sunday Creek, 1.8 km east of**	**Wilbert Hills, southwest of**	**August Lake, south of**	**Allenby, northwest of**	**Total**
# Sites comprising subpopulation	**1**	**9**	**3**	**3**	**1**	**1**	**4**	**1**	**2**	**1**	**1**	**1**	**28**
Ownership	**Unknown**	**Crown Provincial**	**Crown Provincial; E.C. Manning Provincial Park**	**Crown Provincial; Within WHA #8-232 and nearby Cathedral Lakes PP.**	**Private**	**Crown Provincial, Lower Similkameen Indian Band.**	**Crown Provincial**	**Crown Provincial**	**Unknown, likely Crown Provincial.**	**Unknown, likely Crown Provincial.**	**Unknown, likely Crown Provincial.**	**Private**	
Threat 1.3	0	0	Negligible		0	0	0	Potential.	0	0	0	0	2
Threat 2.1	0	0	0	0	Yes. Haying	0	0	0	0	0	0	0	1
Threat 2.3	Yes. Cattle grazing.	Yes. Cattle grazing.	0	Yes. Cattle grazing.	Yes. Cattle grazing.	Likely.	Over-grazing	Over-grazing	Yes. Cattle grazing.	Yes. Cattle grazing.	Yes. Cattle grazing.	Yes. Cattle grazing.	11
Threat 3.2	0	Habitat adjacent to mineral claim.	0	Potential gravel extraction	Habitat is adjacent to a mine site.	Unknown	Potential gravel extraction	Potential gravel extraction	Potential gravel extraction	Potential gravel extraction	Potential gravel extraction	0	9
Threat 4.1	Within close proximity to FSR.	Within close proximity to FSR.	0	Within close proximity to FSR.	Within close proximity to FSR.	Unknown	Within close proximity to FSR.	Yes. Infrastructure dev't.	Within close proximity to FSR.	Within close proximity to FSR.	Within close proximity to FSR.	Within close proximity to FSR.	10
Threat 5.3	Yes.	Yes.	0	Yes.	0	Unknown	Yes.	Yes.	Yes.	Yes.	Yes.	Unknown	8
Threat 6.1	Potential.	Potential. ATV and camping.	Potential.	0	0	Unknown	Potential. ATV and camping.	Yes.	Potential. ATV and camping.	Potential. ATV and camping.	Potential. ATV and camping.	Potential. ATV and camping.	9
Threat 7.1	Wildfire	Wildfire	Wildfire	Wildfire	Wildfire	Wildfire	Wildfire	Wildfire	Wildfire	Wildfire	Wildfire	Wildfire	12
Threat 7.3	Yes.	Yes.	Yes.	Yes.	Yes.	Yes	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	12
Threat 8.1	Yes.	Yes.	Yes.	Yes.	Yes.	Yes, likely.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	12
Threat 9.3	Yes. Potential Btk or roadside herbicide application.				0				Yes. Potential Btk or roadside herbicide application.				11
Threat 11.1	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	12

Table 5. The International Union for Conservation of Nature – Conservation Measures Partnership (IUCN-CMP) threats calculator outputs for Sonora Skipper.

Species Name	Sonora Skipper (*Polites sonora*)
Date:	2015-12-11
Assessor(s):	Jennifer Heron (report writer), Paul Grant (Arthropod SSC Co-chair), Angele Cyr (COSEWIC Secretariat), James Miskelly (Arthropod SSC). Further input from Dennis St. John (Lepidopterist), Crispin Guppy (Lepidopterist), Jeremy Gatten (Lepidopterist) and Denis Knopp (Lepidopterist) about threats to specific sites and subpopulations.

		Level 1 Threat Impact Counts	
Threat Impact		**high range**	**low range**
A	Very High	0	0
B	High	0	0
C	Medium	0	0
D	Low	2	2
	Calculated Overall Threat Impact:	Low	Low
	Assigned Overall Threat Impact:	**Low**	

Threat		**Impact (calculated)**		**Scope (next 10 Yrs)**	**Severity (10 Yrs or 3 Gen.)**	**Timing**	**Comments**
1	Residential & commercial development	D	Low	Small (1-10%)	Extreme (71-100%)	Moderate (Possibly in the short term, < 10 yrs)	
1.1	Housing & urban areas						Not applicable.
1.2	Commercial & industrial areas						Not applicable.
1.3	Tourism & recreation areas	D	Low	Small (1-10%)	Extreme (71-100%)	Moderate (Possibly in the short term, < 10 yrs)	Applicable to two subpopulations: #8 Apex Mountain and #3 E.C. Manning Provincial Park.
2	Agriculture & aquaculture	D	Low	Pervasive (71-100%)	Slight (1-10%)	High (Continuing)	
2.1	Annual & perennial non-timber crops	D	Low	Small (1-10%)	Extreme - Serious (31-100%)	High (Continuing)	Applicable to one subpopulation on a private land site where haying occurs.
2.3	Livestock farming & ranching	D	Low	Pervasive (71-100%)	Slight (1-10%)	High (Continuing)	Applicable. Domestic livestock grazing, mainly cattle, occurs at variable scope and severity within the habitats of 10 Sonora Skipper subpopulations. Overgrazing is evident within at least two of these subpopulations.
3	Energy production & mining		Negligible	Pervasive (71-100%)	Negligible (<1%)	Moderate (Possibly in the short term, < 10 yrs)	
3.2	Mining & quarrying		Negligible	Pervasive (71-100%)	Negligible (<1%)	Moderate (Possibly in the short term, < 10 yrs)	Applicable. Mining has the potential to occur at two subpopulations (#2 Corral Creek and #5 Verde Creek), which are adjacent to a mine site or within a mineral claim area (Knopp and Larkin 2014). There is potential for gravel pits within these open habitats and/or at the roadside habitats.

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
4	Transportation & service corridors		Negligible	Negligible (<1%)	Negligible (<1%)	Moderate (Possibly in the short term, < 10 yrs)	
4.1	Roads & railroads		Negligible	Negligible (<1%)	Negligible (<1%)	Moderate (Possibly in the short term, < 10 yrs)	Applicable to one subpopulation. The Apex Mountain (#8) subpopulation may be impacted by roadside expansion or construction in the next ten years. The butterfly is unlikely to experience extensive roadkill.
4.2	Utility & service lines						Not applicable. Utility service lines likely created the habitat at Apex Mountain, although the butterfly would have colonized the site from adjacent natural areas.
5	Biological resource use		Not a Threat	Pervasive (71-100%)	Neutral or Potential Benefit	High (Continuing)	
5.1	Hunting & collecting terrestrial animals						Not applicable. Butterfly collectors are not considered a threat.
5.2	Gathering terrestrial plants						Not applicable. Sonora Skipper host plants are not collected or harvested.
5.3	Logging & wood harvesting		Not a Threat	Pervasive (71-100%)	Neutral or Potential Benefit	High (Continuing)	Applicable. Most of the range of Sonora Skipper (excluding #3 E.C. Manning Provincial Park), is within active timber supply areas within ongoing and yearly logging and forest operations. Clear-cut logging likely provides temporary habitat (< 10 years) for the species, provided the host plants and necessary moisture conditions are present, and may allow for corridors with other suitable habitats or isolated subpopulations. In some habitats, past logging may have opened habitat where the forest has not regenerated, and these openings have enabled Sonora Skipper subpopulations to expand. For example, the Placer Creek (#1) subpopulation is within a recently (30 years) logged area and although the site has likely experienced natural succession, there may still be remnant adjacent patches of suitable meadow habitat that remain.
6	Human intrusions & disturbance		Negligible	Large - Small (1-70%)	Negligible (<1%)	High (Continuing)	
6.1	Recreational activities		Negligible	Large - small (1-70%)	Negligible (<1%)	High (Continuing)	Recreational activities such as hiking and horseback riding occur within Sonora Skipper habitats in EC Manning Provincial Park and the Apex Mountain sites. Other habitats with populations experience all-terrain vehicle use, such as mud bogging, roadside camping (camping is legal throughout provincial crown forest land), and for parking adjacent to favourable river swimming holes.
7	Natural system modifications		Negligible	Pervasive (71-100%)	Negligible (<1%)	Moderate (Possibly in the short term, < 10 yrs)	

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
7.1	Fire & fire suppression		Negligible	Pervasive (71-100%)	Negligible (<1%)	Moderate (Possibly in the short term, < 10 yrs)	Forest wildfires occur frequently throughout the range of Sonora Skipper. In 2015, there were at least 25 wildfires within the range of Sonora Skipper, as reported by the Wildfire Branch of the BC Ministry of Forests, Lands and Natural Resource Operations (2015). The overall impact on Sonora Skipper subpopulations in the long-term is likely negligible, as wildfires would increase open habitat and provided a subpopulation did not become extirpated it is assumed the species would repopulate these new habitat patches. The scope of fire applies to all Sonora Skipper sites, although the severity and timing is variable and/or unknown. Fire suppression is considered a proximate threat and discussed in 7.3 Other ecosystem modifications.
7.3	Other ecosystem modifications		Negligible	Pervasive (71-100%)	Negligible (<1%)	High (Continuing)	This threat captures the proximate and cumulative habitat changes as a result of fire suppression and ongoing natural succession, changes to forests as a result of an expansive Mountain Pine Beetle outbreak and more localized Western Spruce Budworm (*Choristoneura occidentalis*) outbreaks, the slow ingrowth of non-native plants and resulting ecosystem and soil changes, and the long-term effects of cattle grazing. Fire suppression and resulting succession eventually reduces the size and extent of open meadow habitat for this species. The range of Sonora Skipper in BC overlaps with outbreaks of Mountain Pine Beetle and various species of insects that affect forest health (BC Ministry of Forests, Lands and Natural Resource Operations Forest Health, Cascade Forest District 2015). These outbreaks likely create more open Sonora Skipper habitats and may benefit the species in the long term.
8	Invasive & other problematic species & genes		Unknown	Pervasive (71-100%)	Unknown	High (Continuing)	

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
8.1	Invasive non-native/alien species		Unknown	Pervasive (71-100%)	Unknown	High (Continuing)	The slow ingrowth and spread of invasive non-native plants is considered a proximate threat and discussed in 7.3 Other ecosystem modifications. However, Sonora Skipper larvae have been reared on non-native Yellow Bristlegrass (*Setaria pumila*). This plant was introduced to BC from Eurasia and grows in dry fields, roadsides, and other disturbed habitats. This presence of this non-native plant may benefit Sonora Skipper subpopulations. Introduced tachinid flies (family Tachinidae) used as biological control agents for European Gypsy Moth (*Lymantria dispar*) and other agricultural pests are potential threats to Sonora Skipper. Beginning in 1906 and for the next 50 years, more than 45 species of tachinid flies were introduced to North America (Mahr 1999; Elkington and Boettner 2004). Tachinid flies such as *Compsilura concinnata* are known to parasitize more than 200 host species of lepidoptera in the United States (Mahr 1999; Elkington and Boettner 2004) including non-pest species. The distribution of this species and other non-native tachinid flies is unknown in western North America. The potential threats from this biological control mechanism are unknown.
8.2	Problematic native species						Not applicable. Captured in other ecosystems modifications.
9	Pollution		Negligible	Negligible (<1%)	Extreme (71-100%)	Moderate (Possibly in the short term, < 10 yrs)	
9.3	Agricultural & forestry effluents		Negligible	Negligible (<1%)	Extreme (71-100%)	Moderate (Possibly in the short term, < 10 yrs)	Applicable. A portion of the range of Sonora Skipper is within the potential range of numerous defoliating insect pests. Btk spray may be applied to control these pests. Herbicides may be used within BC parks to manage invasive plants. However, consideration for species at risk values would ensure impacts to Sonora Skipper are avoided. At present this is not thought to be a threat within Sonora Skipper locations.
11	Climate change & severe weather		Not Calculated (outside assessment timeframe)	Pervasive (71-100%)	Unknown	Low (Possibly in the long term, >10 yrs)	
11.1	Habitat shifting & alteration		Not Calculated (outside assessment timeframe)	Pervasive (71-100%)	Unknown	Low (Possibly in the long term, >10 yrs)	Applicable to all subpopulations. Climate change is considered a potential, but poorly understood.
11.2	Droughts						Not applicable. The species is at the northern limit of its geographic range, so everywhere else it occurs is always hotter and drier.
11.3	Temperature extremes						Not applicable. Larvae are active in the early spring, and there is the possibility they could be killed by late season frost. Although the species occurs in an area of the province that experiences cold winter temperatures.

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
11.4	Storms & flooding						Not applicable. Areas where the skipper occurs may experience increased run-off, seepage and pooling, although these areas are not likely to experience extreme storm and flooding events outside of the expected norm.

1. Residential & commercial development

1.3 Tourism & recreation areas

Tourism and recreational development is possible within E.C. Manning Provincial Park and within the habitats surrounding Apex Mountain Resort (west of Penticton). Both of these places have thousands of visitors throughout the year and are known as destination recreational areas with accommodation and facilities for both winter tourism (e.g., skiing) and summer recreation (e.g., biking, hiking). The extent of the species` distribution within each of these recreational areas is unknown. However, infrastructure development within E.C. Manning Provincial Park is neither planned nor likely to impact Sonora Skipper habitat. Periodic facility expansion may occur (e.g., trail maintenance, washroom construction) although the impact from these small developments is considered low. Infrastructure development within Apex Mountain Village is ongoing and each year the footprint of this infrastructure increases with additional building construction, parking facilities, and other forms of development. It is unlikely infrastructure development will eliminate all Sonora Skipper habitats, although the area of occupancy or spatial extent of habitats are not fully known.

The potential for tourism and recreational development within remaining Sonora Skipper habitat is considered low. The McBride Creek Sonora Skipper subpopulation (#4) is recorded just outside Cathedral Lakes Provincial Park, and it is unlikely this site would be developed for tourism and recreational purposes. The species has been recorded along provincial forest service roads, where forest recreation sites (e.g., a small recreational site with 5 – 10 camping sites and toilet facilities) are periodically established. However, maintenance of these small and localized recreational sites is considered a low threat.

2. Agriculture & aquaculture

2.1 Annual & perennial non-timber crops

At least one Sonora Skipper subpopulation is within a semi-natural agricultural area where annual or bi-annual haying occurs. This site is on private land and has not been surveyed since 2003 during preparation of the first status report. Regardless, haying is likely to adversely impact Sonora Skipper larvae. The larvae are known to feed at the edges and tips of their host plant grasses, as well as form silken shelters during all stages of their development (James and Nunnallee 2011). Both of these behaviours leave individuals vulnerable to mortality during both hay cutting and hay baling activities.

2.3 Livestock farming and ranching

The level of domestic livestock grazing (mainly cattle) is variable across Sonora Skipper subpopulations. Overgrazing is evident within at least two subpopulations (Knopp and Larkin 2014) although the overall impact of grazing within Sonora Skipper habitat has not been studied and is likely low at these sites. Historically, livestock grazing and ranching has occurred throughout the region for over 150 years.

Impacts vary dramatically with grazing intensity, livestock numbers, and season of use (Fleischner 1994). Overgrazing results in plant and leaf-litter trampling, and adversely impacts host plants for egg laying and larval feeding, leaf litter for larval development, and nectar and perching plants for adults. Livestock often congregate around wetter sites where vegetation is lush during hot and dry summer months – habitats where the Sonora Skipper is also known to occur.

Limiting Factors

Limiting factors are summarized and updated from the Sonora Skipper Management Plan (BC Ministry of Environment 2014).

Host plant specificity

The Sonora Skipper depends on larval host plants and abundant nectar sources, and without these plants the butterfly cannot complete its life cycle (see Life Cycle and Reproduction). Host plant patch size, distribution, and abundance all contribute to butterfly population dynamics. Although host plants are known to be widespread throughout the range of the butterfly, they may still limit the species' presence and dispersal ability between habitat patches. Host plant and nectar source growth, abundance and longevity to senescence contribute to the health and abundance of butterfly populations.

Dispersal ability

The dispersal ability of the Sonora Skipper is likely poor, based on its small size and tendency to remain in localized subpopulations. The butterfly is repeatedly observed in the same habitats year after year (BC Conservation Data Centre 2015; Guppy pers. comm. 2015; Knopp pers. comm. 2015; St John pers. comm. 2015) suggesting a localized and colonial nature. Other endangered skippers, such as Mardon Skipper (*Polites mardon*) also have limited dispersal capabilities (Runquist 2004). Isolation due to dispersal limitations may lead to decreased genetic diversity within a subpopulation, greater genetic differences among locations, inbreeding depression, and no rescue effect.

Short adult life cycle

The Sonora Skipper has a short adult life span. Inclement weather and the premature senescence of host plants (see above), combined with the short flight period and declining habitat quality and quantity, may limit subpopulation growth and dispersal.

Number of Locations

There are at least 28 collection sites for the Sonora Skipper, grouped into 12 extant subpopulations. Each of these 12 subpopulations is composed of one or more interconnecting habitats and sites within likely dispersal distance from one another (BC Conservation Data Centre 2015). Ten subpopulations are on provincial crown land, one subpopulation is on private land, and one is on First Nations land/provincial land. However, there could potentially be many more locations based on the potential for additional sites within the species' geographic range.

PROTECTION, STATUS AND RANKS

Legal Protection and Status

The Sonora Skipper was assessed by COSEWIC as Special Concern in 2006; status was re-examined and designated Not at Risk in November 2016. The species is protected under the federal *Species at Risk Act* (SARA) and was included on Schedule 1 of SARA as *Special Concern* in 2006. A residence description for the Sonora Skipper has not been written. A provincial management plan for the Sonora Skipper was completed in March 2013 and is posted on the BC recovery planning website (BC Ministry of Environment 2014). The federal management plan for the Sonora Skipper was posted on the federal recovery planning website as of December 30, 2015 (Environment Canada 2015).

Sonora Skipper is listed as *Identified Wildlife* under the *BC Forest and Range Practices Act*. Under this Act it is possible to protect known sites and habitat for this species within Wildlife Habitat Areas on provincial Crown land. The Sonora Skipper is similarly protected under the BC *Oil and Gas Activities Act*.

Non-Legal Status and Ranks

The conservation status ranks for Sonora Skipper are:

Global Status:	G4 (Apparently Secure) (last reviewed 2006) (Natureserve 2015).
Canada National Status:	N1N2 (Critically Imperilled to Imperilled) (last reviewed 2009).
BC provincial status:	S2S3 (Imperilled to Vulnerable) (last reviewed 2013) and Red-listed (BC Conservation Data Centre 2015).
United States	Arizona (SNR, status not ranked), California (SNR), Colorado (S4), Idaho (SNR), Montana (S4, apparently secure), Nevada (SNR), Oregon (SNR), Utah (SNR), Washington (S4), Wyoming (SNR) (Natureserve 2015).

Sonora Skipper is a priority one species (highest priority) under goal three (maintain the diversity of native species and ecosystems) of the BC Conservation Framework (2015).

Habitat Protection and Ownership

Specific delineation and identification of habitat for protection is challenging, primarily because the species is not associated with a specific plant community other than a possible correlation with the presence of Fragrant White Rein Orchid. The lack of knowledge on the host plant and the cryptic nature of the skipper further add difficulty to the identification and protection of the Sonora Skipper and its associated habitat.

Nine of the Sonora Skipper subpopulations are recorded from provincial crown forest land with ongoing logging, mining and other resource extraction activities. One subpopulation of Sonora Skipper is entirely within E.C. Manning Provincial Park. One subpopulation (one subpopulation which is part of a larger site) is on First Nations land. Two subpopulations are on private land. There are no Sonora Skipper records from regional or municipal government owned lands.

ACKNOWLEDGEMENTS AND AUTHORITIES CONTACTED

Acknowledgements

The report writer wishes to extend thanks to the British Columbia Ministry of Environment for providing time and resources to complete this report. The following people provided valuable information, advice, and knowledge from their experiences in the field: Dennis St. John, Denis Knopp, Lee Larkin, Orville Dyer, Bryn White, Sara Bunge, Mark Weston, Dawn Marks, Vicky Young, Brenda Costanzo, Cara Dawson, Jeremy Gatten, Dave Fraser, Lea Gelling, Katie Calon and Nick Page. Thanks are extended to Cris Guppy and Norbert Kondla for information on subspecies taxonomy, professional opinion and occurrence information. The report writer is grateful to Ann Potter (Washington Department of Fish and Wildlife) for information about Sonora Skipper in Washington State. Thanks are offered to Claudia Copley (Royal British Columbia Museum, Victoria) and Karen Needham (Spencer Entomological Collection at the Beaty Biodiversity Museum, University of British Columbia) for access to specimens. Paul Grant (Arthropods Specialist Subcommittee [SSC] Co-chair), Angele Cyr (COSEWIC Secretariat), Ruben Boles (Environment and Climate Change Canada – Canadian Wildlife Service – National Capital Region) and the COSEWIC Arthropods SSC are thanked for advice and review comments. Norbert Kondla and Crispin Guppy wrote the first Sonora Skipper status report on contract with Environment Canada.

The cover photograph is by Denis Knopp: Sonora Skipper nectaring on Fragrant White Rein Orchid; photograph taken July 21 2014, at Whipsaw Forest Service Road, BC.

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Jennifer Heron is the provincial invertebrate specialist with the British Columbia Ministry of Environment. She directs and manages the provincial approach to invertebrate conservation, including the development and implementation of provincial legislation, policy, procedures, and standards for the conservation, and recovery of invertebrate species at risk, their habitats and ecosystems, and to keep these species from becoming at risk. She works with other invertebrate specialists to develop recovery-planning approaches and assign conservation status ranks to invertebrate groups. She works with local conservation and stewardship groups to achieve common public outreach goals. Jennifer is the co-chair of the COSEWIC Arthropods Specialist Subcommittee.

COLLECTIONS EXAMINED

Collections examined during preparation of the first Sonora Skipper COSEWIC status report:

Crispin S. Guppy, personal Lepidoptera collection, Whitehorse, YK.

Norbert G. Kondla, personal Lepidoptera collection, Calgary, AB.

Jon H. Shepard, personal Lepidoptera collection, donated to the Oregon State University Entomology Collection, Corvallis, Oregon, USA.

Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, ON.

Royal British Columbia Museum, Victoria, BC.

Spencer Entomological Collection at the Beaty Biodiversity Museum, University of British Columbia, Vancouver, BC.