PROPOSED

Species at Risk Act
Management Plan Series
Adopted under Section 69 of SARA

Management Plan for the Sonora Skipper (*Polites sonora*) in Canada

Sonora Skipper

2014

Canada

Recommended citation:

Environment Canada. 2014. Management Plan for the Sonora Skipper (*Polites sonora*) in Canada. *Species at Risk Act* Management Plan Series. Environment Canada, Ottawa. III pages.

For copies of the management plan or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry (www.sararegistry.gc.ca).

Cover illustration: Dennis St. John (private entomologist)

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« Plan de gestion de l'hespérie du Sonora (*Polites sonora*) au Canada [Proposition] »

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MANAGEMENT PLAN FOR THE SONORA SKIPPER (*Polites sonora*) IN CANADA

2014

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

In the spirit of cooperation of the Accord, the Government of British Columbia has given permission to the Government of Canada to adopt the "Management Plan for the Sonora Skipper (*Polites sonora*) in British Columbia" (Part 2) under section 69 of the *Species at Risk Act* (SARA). Environment Canada has included an addition which completes the SARA requirements for this management plan.

The federal management plan for the Sonora Skipper (*Polites sonora*) in Canada consists of two parts:

Part 1 - Federal Addition to the "Management Plan for the Sonora Skipper (*Polites sonora*) in British Columbia", prepared by Environment Canada.

Part 2 - "Management Plan for the Sonora Skipper (*Polites sonora*) in British Columbia", prepared by the B.C. Ministry of Environment.

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Part 1 - Federal Addition to the “Management Plan for the Sonora Skipper (*Polites sonora*) in British Columbia”, prepared by Environment Canada

PREFACE

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of management plans for listed Special Concern species and are required to report on progress within five years.

SARA section 65 requires the competent Minister, which is the federal Minister of the Environment in this case, to prepare a management plan for all listed special concern species. SARA section 69 allows the Minister to adopt all or part of an existing plan for the species if the Minister is of the opinion that an existing plan relating to a wildlife species includes adequate measures for the conservation of the species.

The attached provincial management plan (Part 2 of this document) for the species was provided as science advice to the jurisdictions responsible for managing the species in British Columbia. Environment Canada has prepared this federal addition to meet the requirements of SARA.

Success in the conservation of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this management plan and will not be achieved by Environment Canada, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this plan for the benefit of the Sonora Skipper and Canadian society as a whole.

Implementation of this management plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

ADDITIONS AND MODIFICATIONS TO THE ADOPTED DOCUMENT

The following sections have been included to address specific requirements for federal recovery documents that are not addressed in the "Management Plan for the Sonora Skipper (*Polites sonora*) in British Columbia".

Species Status Information

This section augments the "Species Information" (section 3) provided in the B.C. Ministry of Environment management plan.

It is estimated that the percent of the global range of this species in Canada is less than 1% (COSEWIC 2006).

Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Recovery planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that plans may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts upon non-target species or habitats. The results of the SEA are incorporated directly into the plan itself, but are also summarized below.

Negative impacts to the environment and other species are not anticipated. Actions to conserve and manage habitat for Sonora Skipper (e.g., inventory, education, threat mitigation, habitat conservation) will promote the conservation of other species using those habitats, including other SARA-listed species (e.g., American Badger *jeffersonii* subspecies [*Taxidea taxus jeffersonii*], Great Basin Spadefoot [*Spea intermontana*], Tiger Salamander Southern Mountain population [*Ambystoma mavortium*], Dwarf Woolly-heads [*Psilocarphus brevissimus* var. *brevissimus*], Slender Collomia [*Collomia tenella*], Stoloniferous Pussytoes [*Antennaria flagellaris*]).

REFERENCES

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 pages. <www.sararegistry.gc.ca/status/status_e.cfm> [Accessed March 1, 2013].

Part 2 - “Management Plan for the Sonora Skipper (*Polites sonora*) in British Columbia”, prepared by the B.C. Ministry of Environment

Management Plan for Sonora Skipper (*Polites sonora*) in British Columbia

Prepared by Ministry of Environment

BRITISH COLUMBIA | Ministry of Environment

March 2013

About the British Columbia Management Plan Series

This series presents the management plans that are prepared as advice to the Province of British Columbia. Management plans are prepared in accordance with the priorities and management actions assigned under the British Columbia Conservation Framework. The Province prepares management plans for species that may be at risk of becoming endangered or threatened due to sensitivity to human activities or natural events.

What is a management plan?

A management plan identifies a set of coordinated conservation activities and land use measures needed to ensure, at a minimum, that the target species does not become threatened or endangered. A management plan summarizes the best available science-based information on biology and threats to inform the development of a management framework. Management plans set goals and objectives, and recommend approaches appropriate for species or ecosystem conservation.

What's next?

Direction set in the management plan provides valuable information on threats and direction on conservation measures that may be used by individuals, communities, land users, conservationists, academics, and governments interested in species and ecosystem conservation.

For more information

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

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

Management Plan for Sonora Skipper (*Polites sonora*) in British Columbia

Prepared by the Ministry of Environment

March 2013

Recommended citation

Ministry of Environment. 2013. Management plan for Sonora Skipper (*Polites sonora*) in British Columbia. Prepared for the B.C. Ministry of Environment, Victoria, BC. 23 pp.

Cover illustration/photograph

Leah Ballin (B.C. Conservation Foundation) and Dennis St. John (private entomologist), on contract to B.C. Ministry of Forests, Lands and Natural Resource Operations to complete Sonora Skipper surveys. Photo taken July 30, 2012 at Ashnola River Valley (Site #9).

Additional copies

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

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

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Disclaimer

This management plan has been prepared by Ministry of Environment, as advice to the responsible jurisdictions and organizations that may be involved in managing the species.

This document identifies the management actions that are deemed necessary, based on the best available scientific and traditional information, to prevent Sonora Skipper populations in British Columbia from becoming endangered or threatened. Management actions to achieve the goals and objectives identified herein are subject to the priorities and budgetary constraints of participatory agencies and organizations. These goals, objectives, and management approaches may be modified in the future to accommodate new objectives and findings.

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

Success in the conservation of this species depends on the commitment and cooperation of many different constituencies that may be involved in implementing the directions set out in this management plan. The B.C. Ministry of Environment encourages all British Columbians to participate in the conservation of Sonora Skipper.

ACKNOWLEDGEMENTS

Jennifer Heron (B.C. Ministry of Environment) wrote the draft management plan, with input from Orville Dyer (B.C. Ministry of Forests, Lands and Natural Resource Operations) and Dennis St. John (private entomologist). Leah Westereng (B.C. Ministry of Environment) provided editorial review and guidance. Brenda Costanzo (B.C. Ministry of Environment) provided information about plant communities in the Southern Interior. Thank you to Dennis St. John, Crispin Guppy, and Norbert Kondla, who provided biological information on the species. Thank you to Jared Hobbs, Robert Stewart, Leah Ballin, Laura Werden, Jess Findlay, Dennis Lynch, and Josie Symonds for Sonora Skipper survey information.

EXECUTIVE SUMMARY

Sonora Skipper (*Polites sonora*) is listed as Special Concern in Canada on Schedule 1 of the *Species at Risk Act* (SARA) and designated as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). In British Columbia, the conservation status rank of Sonora Skipper is S1S2 (imperiled) and the species is on the provincial Red list. The B.C. Conservation Framework ranks Sonora Skipper as a priority 1 under goal 3 (maintain the diversity of native species and ecosystems). It is also listed as a species which requires special management attention to address the impacts of forest and range activities under the *Forest and Range Practices Act* (FRPA) and/or the impacts of oil and gas activities under the *Oil and Gas Activities Act* (OGAA) on crown land (as described in the Identified Wildlife Management Strategy).

Sonora Skipper is a small butterfly with a 2.5–3.0 cm wingspan. The dorsal wing surfaces are a mottled rusty orange and brown and have black wing margins. The ventral wing surfaces are tawny and pale, with olive-green margins. The flight period is from late June through mid-August with one generation per year. The flight period is correlated with the flowering period of larval and nectar host plants, which are unconfirmed in B.C.

Within Canada, Sonora Skipper habitats include moist, mesic grassy openings, including forest openings, recent clearcuts and logged areas, grassy roadside areas, and similar habitats within a small area of southern B.C. In total, there are nine locations within Canada, all within a small range that includes Princeton (north), Skagit Valley and Manning Provincial Park (west), and Keremeos (east). The area of occurrence is approximately 2092 km^2. There may be additional locations for the species within unchecked grassland habitats within this range.

In B.C., threats to Sonora Skipper are speculative as there is very little information on specific threats. The impact on habitat due to domestic livestock grazing is considered a concern for Sonora Skipper. The impacts of several other threats are thought to be negligible or are unknown at this time.

The management goal is to ensure the persistence of Sonora Skipper at all known (and new) locations throughout the species' range in B.C.

The management objectives are:

1. To ensure the protection for the known sites (and new sites) and habitats of Sonora Skipper;
2. To assess, confirm, and mitigate the extent of threats at all locations in B.C.; and
3. To address knowledge gaps (e.g., habitat requirements, range extent) for Sonora Skipper.

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1 COSEWIC* SPECIES ASSESSMENT INFORMATION

Date of Assessment: April 2006
Common Name (population): Sonora Skipper
Scientific Name: *Polites sonora*
COSEWIC Status: Special Concern
Reason for Designation: This skipper occurs in some moist grassy openings in a forested landscape. It is known from only six locations in a small, restricted area of Canada where its distribution is very patchy and it does not occupy all apparently suitable available habitats. The ability of Canadian populations to benefit from immigration from other Canadian populations or from populations in adjacent Washington State is likely limited at best. The skipper is threatened by intensive grazing and habitat loss due to natural habitat change and road construction. However, it shows some ability to make use of some man-made habitats, such as grassy roadside areas, agricultural meadows and small clearcuts, but only if these habitats are moist or mesic.
Canadian Occurrence: B.C.
COSEWIC Status History: Assessment based on new status report.

*Committee on the Status of Endangered Wildlife in Canada.

2 SPECIES STATUS INFORMATION

Sonora Skipper[a]		
Legal Designation		
FRPA:[b] Species at Risk OGAA:[b] Species at Risk	B.C. *Wildlife Act*:[c] Schedule A	SARA: Schedule 1- Special Concern (2007)
Conservation Status[d]		
B.C. List: Red	B.C. Rank: S1S2 (November 2006)	National Rank: NR Global Rank: G4 (May 2006)
B.C. Conservation Framework[e]		
Goal 1: Contribute to global efforts for species and ecosystem conservation.		Priority:[f] 3 (2009)
Goal 2: Prevent species and ecosystems from becoming at risk.		Priority: 6 (2009)
Goal 3: Maintain the diversity of native species and ecosystems.		Priority: 1 (2009)
CF Action Groups:[e]	Compile Status Report, List under *Wildlife Act*, Send to COSEWIC, Planning, Habitat Protection, Habitat Restoration, Private Land Stewardship	

[a] Data source: B.C. Conservation Data Centre (2012) unless otherwise noted.
[b] Species at Risk = a listed species that requires special management attention to address the impacts of forest and range activities under the FRPA (Province of British Columbia 2002) and/or the impacts of oil and gas activities under the OGAA (Province of British Columbia 2008) on crown land (as described in the Identified Wildlife Management Strategy; Province of British Columbia 2004).
[c] Schedule A = designated as wildlife under the B.C. *Wildlife Act*, which offers it protection from direct persecution and mortality (Province of British Columbia 1982).
[d] S = subnational; N = national; G = global; T = refers to the subspecies level; B = breeding; X = presumed extirpated; H = possibly extirpated; 1 = critically imperiled; 2 = imperiled; 3 = special concern, vulnerable to extirpation or extinction; 4 = apparently secure; 5 = demonstrably widespread, abundant, and secure; NA = not applicable; NR = unranked; U = unrankable.
[e] Data source: Ministry of Environment (2010).
[f] Six-level scale: Priority 1 (highest priority) through to Priority 6 (lowest priority).

3 SPECIES INFORMATION

3.1 Species Description

Sonora Skipper (*Polites sonora*) (Scudder 1872) is a small (wingspan 25–30 mm) skipper in the family Hesperiidae (Opler and Warren 2005; Pelham 2008). The dorsal wing surfaces are rusty orange-brown with black margins. The ventral forewing surfaces are tawny-brown in the middle, a black basal patch, and olive-green marginal areas that are pronounced at the apex of the wing. Ventral hindwing surfaces are an overall olive-green with a pale spots that form a distinct semicircular band, and one linear pale spot at the wing base (Layberry *et al*. 1998; Guppy and Shepard 2001; COSEWIC 2006). Males and females are similar in appearance, although males have an elongated black stigma on the forewing. For additional photographs and illustrations, see Layberry *et al.* (1998), Guppy and Shepard (2001), Kondla (2003), and COSEWIC (2006).

There is debate surrounding the subspecific status of B.C. populations (see COSEWIC 2006). Regardless, until further taxonomic and/or genetic studies confirm otherwise, all Sonora Skipper in Canada are considered a single species.

A general description of the immature life stages of Sonora Skipper is detailed in Newcomer (1967) and Scott (1992). The egg (1.0 mm diameter and 0.7 mm height) is light green, spherical with small flattened base, not flanged, finely reticulate (Newcomer 1967) and pale green when first laid, turning orangish as the egg ages (Scott 1992). The first instar larvae (0.6 mm shiny black head capsule; 1.75 mm long larvae) are yellow-cream with a light orange-brown neck and a dark brown collar and head (Scott 1992), a few setae on last two segments, and a black cervical shield (Newcomer 1967). The second instar larvae (0.75 mm black head capsule and 3–5 mm larvae) are greenish, covered with numerous minute brown dots, cervical shield black to yellow-cream with a light orange-brown neck, and a dark brown collar and head (Scott 1992). The third instar larvae (1.0 mm, solid black, punctate, and 5 mm long larvae) are greyish green with many fine black setae and a few longer ones on posterior segment. The pupae are similar to Long Dash Skipper (*Polites mystic*) (W.H. Edwards 1863) (Scott 1992).

3.2 Populations and Distribution

The global range of Sonora Skipper is within western North America and is divided into five disjunct geographic populations (Figure 1). The westernmost population unit is the only geographic unit connected to the B.C. population. This population ranges from extreme south-central B.C., from the Thompson Plateau and Cascade Mountains near Princeton, south through eastern Washington and central Oregon, and northern and central California. Sonora Skipper is at the northernmost extent of its global range in B.C.

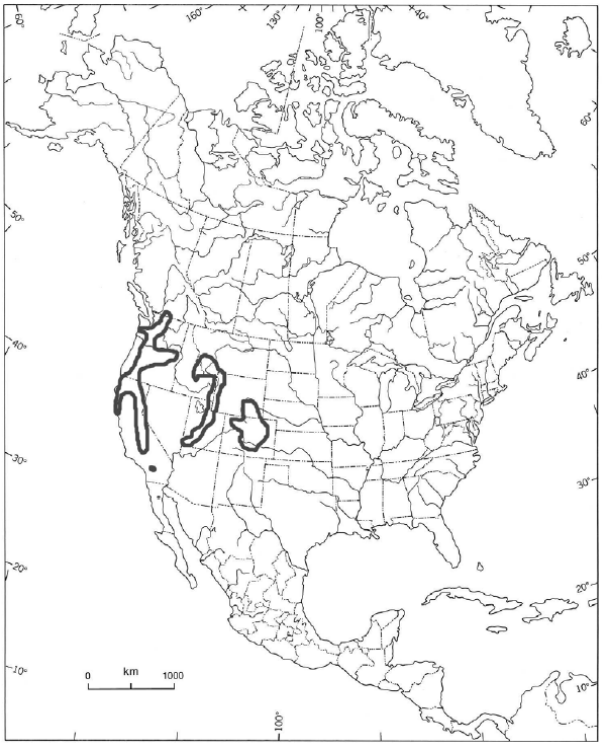

Figure 1. Sonora Skipper distribution in Canada/North America (COSEWIC 2006).

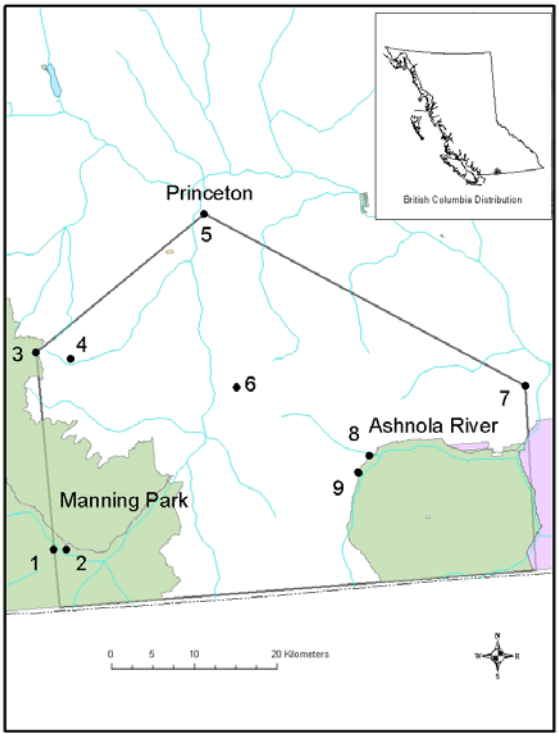

Figure 2. Sonora Skipper range and locations in British Columbia (B.C. Conservation Data Centre 2012).

Records for Sonora Skipper in B.C., which range from 1906 (Hope Mountains) to 2012 (Ashnola River) include 51 specimens collected/observed over this time period (Figure 2; Table 1). Since the initial COSEWIC (2006) report, three additional locations have been recorded bringing the total number to 9 locations.[1] All locations are considered extant, mainly because the habitat within each of these sites is likely intact with few threats. B.C. sites range in elevation from 765 to 1700 m. No population information is available for Sonora Skipper.

Surveys for Sonora Skipper were conducted from 2003 to 2012 (see Section 6.1, Actions Completed or Underway). The species is not commonly observed, with the most number of individuals being recorded from Placer Creek (15 individuals) and Wolfe Creek (15 individuals) (COSEWIC 2006). Estimated distances between populations are 10 to 65 km (COSEWIC 2006).

[1] A location refers to a Sonora Skipper population. A location may be comprised of numerous habitat patches, which are recorded by the presence of one or more individuals. A location is synonymous with the term "element occurrence," used by the B.C. Conservation Data Centre. An element occurrence is a spatial representation of a species at a specific area. An element occurrence generally delineates a species population, and represents the geo-referenced biological feature that is of conservation or management interest.

Table 1. Status and description of Sonora Skipper populations in B.C.

Location # on map	Location name	Year	Land ownership	Number of specimens	Reference
1	Manning Provincial Park [Twenty Minute Lake]	1945	B.C. Crown	2 unknown sex	COSEWIC 2006
2	Manning Provincial Park	2009	B.C. Crown; Provincial Park	N/A	Marks *et al*. 2009
3	Manning Provincial Park (formerly the Cascade Recreational Area)	2006	B.C. Crown; Provincial Park	1 male	Knopp 2006
N/A[a]	Manning Provincial Park	1989	B.C. Crown; Provincial Park	1 unknown sex	COSEWIC 2006
4	Whipsaw Creek, Morris Lake Road	2011	B.C. Crown	5 unknown sex	D. Knopp, pers. comm., 2012
5	Wolfe Creek	2003	Private	2 unknown sex (collected); 15 observed	COSEWIC 2006
6	Placer Creek	2003	B.C. Crown	2 unknown sex (collected); 15 observed	COSEWIC 2006
7	Crater Mountain; Red Bridge Creek, Keremeos	1975	B.C. Crown	2 males	COSEWIC 2006
8	Ashnola River (Ashnola River Road Km 34), outside Keremeos; Riker Mountain	1973	B.C. Crown	1 male; 2 females	COSEWIC 2006
9	Ashnola River	2012	B.C. Crown	2	D. St. John, pers. comm., 2012
N/A[a]	Hope Mountains[a]	1932	Unknown	1 unknown sex	COSEWIC 2006
N/A[a]	Hope Mountains[a]	1906	Unknown	1 unknown sex	COSEWIC 2006

[a] Collection information associated with this record is vague and it is not possible to determine if population is extant.

3.3 Needs of the Sonora Skipper

3.3.1 Habitat and Biological Needs

The specific habitat requirements for Sonora Skipper are unclear and in need of study (James and Nunnallee 2011). The species has been recorded from a variety of open meadow-like habitats, including dry to wet open meadows and forest openings, prairies, roadsides, logged openings, grassy and flowery openings, stream banks and agricultural fields (Guppy and Shepard 2001; COSEWIC 2006; James and Nunnallee 2011). Habitat includes larval and nectar host plants and

low-lying shrub vegetation for perching or resting (Guppy and Shepard 2001; COSEWIC 2006; James and Nunnallee 2011). Sonora Skipper is known to perch on or near the ground and is commonly observed with the butterfly Greenish Blue (*Plebejus saepiolus*).

In B.C., Sonora Skipper has been observed within an agricultural clearing at Wolfe Creek (location #5); grassy roadside along the upper Ashnola River (location #8; COSEWIC 2006); within large, open moist to mesic natural meadows adjacent to forests at Ashnola River (location # 9; D. St. John, pers. comm., 2012); rich forest opening with grassy plants at Crater Mountain (location #7; COSEWIC 2006); and grassy logged areas at Placer Creek (location #6; COSEWIC 2006).

Sonora Skipper flight period is from mid-June through mid-August, with later dates corresponding to populations at higher elevations. The species has been successfully reared on yellow bristlegrass (*Setaria pumila* ssp. *pumila*) (James and Nunnallee 2011) introduced to B.C. from Eurasia and growing in dry fields, roadsides, and other disturbed habitats. The species is commonly observed in the Southern Interior and throughout the Okanagan. Sonora Skipper has also been reared on Idaho fescue (*Festuca idahoensis*) (Newcomer 1967) and in Colorado on Kentucky bluegrass (*Poa pratensis*) (Scott 1992). Idaho fescue occurs throughout the Southern Interior of B.C. and is a native perennial bunchgrass that grows up to 90 cm high with densely tufted seed heads. The plant grows in dry to moist grasslands to open forests in full to partial sun.

The most recent observations of Sonora Skipper are of two individuals recorded approximately 100 m apart within habitat adjacent to Ashnola Creek Forest Service Road, about 50 km southwest of Keremeos in 2012 (location #9; D. St. John, pers. comm., 2012). This is the most habitat information currently available for any of the Sonora Skipper locations, and thus is used to describe Sonora Skipper habitat in general. The habitat at this location is a combination of semi-natural and partially anthropogenically created. One specimen was observed nectaring on small-flowered penstemon (*Penstemon procerus*), within a naturally disturbed (~15 year) mesic forest clearing. The second specimen was observed nectaring on edible thistle (*Circium edule*) within a small, moist forest meadow (D. St. John, pers. comm., 2012). The general description of location #9 is in a valley bottom, at a level roadside clearing in mesic-moist regenerating forest. The trees surrounding the 0.3-ha (estimate) clearing are approximately 15-year-old densely stocked lodgepole pine and spruce. Flowering vegetation in the habitat included wild strawberry (*Fragaria virginiana*), small-flowered penstemon, white clover (*Trifolium repens)*, pussytoes (*Antennaria* sp.), common timothy (*Phleum pratense*), bluegrass (*Poa* sp., collected), buttercup (*Ranunculus* sp.), black gooseberry (*Ribes lacustre*), Rocky Mountain juniper (*Juniperus scopulorum*), yarrow (*Achillea millefolium*), a yellow mustard, and a few other grasses.

Sonora Skipper is thought to occupy only a portion of what would otherwise appear to be suitable habitat. In Washington State, the species is thought to be colonial and local (COSEWIC 2006).

3.3.2 Ecological Role

Sonora Skipper is not likely an essential pollinator of its larval host plant or adult nectar plants, nor is it known to have other crucial ecological roles such as food-web dynamics. Small mammals, invertebrate predators, and birds likely predate upon the butterfly.

3.3.3 Limiting Factors

***Host plant specificity*:** Sonora Skipper depends on larval host plants and without these plants the butterfly cannot complete its life cycle (see Section 3.3.1, Habitat and Biological Needs). 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. The butterfly likely chooses nectar (adult) host plants opportunistically and preference may appear limited to the few plant species flowering during the flight period and not a specific biological preference by the butterfly. The timing of host plant and nectar source peak growth, plant health, and plant senescence contribute to the health and abundance of butterfly populations.

Dispersal ability: The dispersal ability of Sonora Skipper is likely poor, based on its small size and tendency to remain in localized populations. The butterfly is repeatedly observed in the same habitats year after year (B.C. Ministry of Water, Land and Air Protection 2004). Other endangered skippers, such as Mardon Skipper (*Polites mardon*) have limited dispersal capabilities (Runquist 2004). Isolation due to dispersal limitations may lead to decreased genetic diversity within a population, greater genetic differences among locations, inbreeding depression, and no rescue effect.

Short adult life cycle: Sonora Skipper has a short flight season and 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 growth of the population.

4 THREATS

Threats are defined as the proximate activities or processes that have caused, are causing, or may cause in the future the destruction, degradation, and/or impairment of the entity being assessed (population, species, community, or ecosystem) in the area of interest (global, national, or subnational) (Salafsky *et al.* 2008). For purposes of threat assessment, only present and future threats are considered.[2] Threats presented here do not include biological features of the species or population such as inbreeding depression, small population size, and genetic isolation; or likelihood of regeneration or recolonization for ecosystems, which are considered limiting factors.[3]

[2] Past threats may be recorded but are not used in the calculation of Threat Impact. Effects of past threats (if not continuing) are taken into consideration when determining long-term and/or short-term trend factors (Master *et al.* 2009).

[3] It is important to distinguish between limiting factors and threats. Limiting factors are generally not human induced and include characteristics that make the species or ecosystem less likely to respond to recovery/conservation efforts.

For the most part, threats are related to human activities but may also be natural. The impact from human activity may be direct (e.g., destruction of habitat) or indirect (invasive species introduction, livestock grazing). The effect of natural phenomena (e.g., fire, flooding) may be especially important when the species or ecosystem is concentrated in one site or has few occurrences, which may be a result of human activity (Master *et al.* 2009). As such, natural phenomena are included in the definition of a threat, though should be applied cautiously. These stochastic events should only be considered a threat if a species or habitat is damaged from other threats and has lost its resilience, and is thus vulnerable to the disturbance (Salafsky *et al.* 2008) so that this type of event would have a disproportionately large effect on the population/ecosystem compared to the effect they would have had historically.

4.1 Threat Assessment

The threat classification below is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system and is consistent with methods used by the B.C. Conservation Data Centre and the B.C. Conservation Framework. For a detailed description of the threat classification system, see the CMP website (CMP 2010). Threats may be observed, inferred, or projected to occur in the near term. Threats are characterized here in terms of scope, severity, and timing. Threat "impact" is calculated from scope and severity. For information on how the values are assigned, see Master *et al.* (2009) and table footnotes for details. Threats for the Sonora Skipper were assessed for the entire province (Table 2).

Table 2. Threat classification table for Sonora Skipper.

	Threat	**Impact (calculated)**	**Scope (next 10 yrs)**	**Severity (10 yrs or 3 gen.)**	**Timing**
1	Residential & commercial development	Negligible	Small (1–10%)	Negligible (< 1%)	Low (Possibly in the long term, > 10 yrs)
1.3	Tourism & recreation areas	Negligible	Small (1–10%)	Negligible (< 1%)	Low (Possibly in the long term, > 10 yrs)
2	Agriculture & aquaculture	Low	Restricted (11–30%)	Slight (1–10%)	High (Continuing)
2.1	Annual & perennial non-timber crops	Negligible	Negligible (< 1%)	Unknown	High (Continuing)
2.3	Livestock farming & ranching	Low	Restricted (11–30%)	Slight (1–10%)	High (Continuing)
3	Energy production & mining	Negligible	Negligible (< 1%)	Unknown	Unknown
3.2	Mining & quarrying	Negligible	Negligible (< 1%)	Unknown	Unknown
4	Transportation & service corridors	Negligible	Negligible (< 1%)	Negligible (< 1%)	Insignificant/Negligible
4.1	Roads & railroads	Negligible	Negligible (< 1%)	Negligible (< 1%)	Insignificant/Negligible
5	Biological resource use	Not a Threat	Restricted (11–30%)	Neutral	High (Continuing)
5.3	Logging & wood harvesting	Not a Threat	Restricted (11–30%)	Neutral	High (Continuing)
6	Human intrusions & disturbance	Negligible	Small (1–10%)	Negligible (< 1%)	High (Continuing)
6.1	Recreational activities	Negligible	Small (1–10%)	Negligible (< 1%)	High (Continuing)

	Threat	Impact (calculated)	Scope (next 10 yrs)	Severity (10 yrs or 3 gen.)	Timing
7	Natural system modifications	Not Calculated (outside assessed timeframe)	Pervasive (71–100%)	Extreme (71–100%)	Low (Possibly in the long term, > 10 yrs)
7.1	Fire & fire suppression	Not Calculated (outside assessed timeframe)	Pervasive (71–100%)	Serious (31-70%)	Low (Possibly in the long term, > 10 yrs)
8	Invasive & other problematic species & genes	Unknown	Restricted (11–30%)	Unknown	Low (Possibly in the long term, > 10 yrs)
8.1	Invasive non-native/alien species	Unknown	Restricted (11–30%)	Unknown	High (Continuing)
9	Pollution	Negligible	Negligible (< 1%)	Extreme (71–100%)	Low (Possibly in the long term, > 10 yrs)
9.3	Agricultural & forestry effluents	Negligible	Negligible (< 1%)	Extreme (71–100%)	Low (Possibly in the long term, > 10 yrs)
11	Climate change & severe weather	Unknown	Pervasive (71–100%)	Unknown	Low (Possibly in the long term, > 10 yrs)
11.1	Habitat shifting & alteration	Unknown	Pervasive (71–100%)	Unknown	Low (Possibly in the long term, > 10 yrs)

[a] **Impact** – The degree to which a species is observed, inferred, or suspected to be directly or indirectly threatened in the area of interest. The impact of each stress is based on Severity and Scope rating and considers only present and future threats. Threat impact reflects a reduction of a species population or decline/degradation of the area of an ecosystem. The median rate of population reduction or area decline for each combination of scope and severity corresponds to the following classes of threat impact: Very High (75% declines), High (40%), Medium (15%), and Low (3%). Unknown: used when impact cannot be determined (e.g., if values for either scope or severity are unknown); Not Calculated: impact not calculated as threat is outside the assessment (e.g., timing is insignificant/negligible (past threat) or low (possible threat in long term)); Negligible: when scope or severity is negligible; Not a Threat: when severity is scored as neutral or potential benefit.
[b] **Scope** – Proportion of the species that can reasonably be expected to be affected by the threat within 10 years. Usually measured as a proportion of the species' population in the area of interest. (Pervasive = 71–100%; Large = 31–70%; Restricted = 11–30%; Small = 1–10%; Negligible < 1%).
[c] **Severity** – Within the scope, the level of damage to the species from the threat that can reasonably be expected to be affected by the threat within a 10-year or 3-generation timeframe. Usually measured as the degree of reduction of the species' population. (Extreme = 71–100%; Serious = 31–70%; Moderate = 11–30%; Slight = 1–10%; Negligible < 1%; Neutral or Potential Benefit $\geq$ 0%).
[d] **Timing** – High = continuing; Moderate = only in the future (could happen in the short term [< 10 years or 3 generations]) or now suspended (could come back in the short term); Low = only in the future (could happen in the long term) or now suspended (could come back in the long term); Insignificant/Negligible = only in the past and unlikely to return, or no direct effect but limiting.

4.2 Description of Threats

Threats to Sonora Skipper in B.C. are unknown or thought to have a low impact (Table 2), resulting in an overall threat impact of Low province-wide.[4] All Sonora Skipper locations are presumed extant. The historic and vague locations labeled Hope Mountains are unconfirmed, although many of the threats could apply as the surrounding landscape likely has suitable Sonora Skipper habitat. Details are discussed below under the IUCN level 1 headings.

The threats listed below have been identified as threats based on existing research and threat information from other species at risk within B.C. There is very little information on specific threats to Sonora Skipper.

IUCN #1. Residential & commercial development (1.3 Tourism and recreation areas)

Sonora Skipper is recorded from three locations (four sites) within Manning Provincial Park (locations #1, 2, and 3). Infrastructure development within the park is not likely to impact Sonora Skipper habitat, and although periodic facility expansion may occur (e.g., trail maintenance, washroom construction) the impact from these small developments is likely negligible. The provincial range of Sonora Skipper does not currently fall within an area of B.C. under high residential or commercial pressure.

IUCN #2. Agriculture & aquaculture (2.3 Livestock farming and ranching)

Domestic livestock grazing likely occurs within six locations (#4–9) and has occurred historically within the species range for over 100 years. COSEWIC (2006) identified livestock grazing as a potential threat to Sonora Skipper in B.C.

Grazing leads to changes in plant species and plant community structure due to selective domestic grazers, choosing to forage on some plants and not others. Livestock grazing may alter vegetation through trampling and feeding, and alter leaf litter through trampling. Grazing may impact host plants for egg laying and larval feeding, leaf litter for larval development, and nectar and perching plants for adults. Grazing, whether by livestock or native ungulates, involves defecation and urination, may increase bare soil through repeated trampling or disturbance to vegetation, alters the microbiotic crust, and has the potential to destroy larval and nectar host plants for Sonora Skipper. Grazing regimes alter natural vegetation, potentially increasing the establishment of non-native introduced plants and competition from non-native species. Impacts vary dramatically with grazing intensity, livestock numbers, and season of use (Fleischner 1994).

The overall impact of grazing within Sonora Skipper habitat has not been studied and the resultant impacts are unknown.

IUCN #3. Energy production and mining (3.2 Mining and quarrying)

The Sonora Skipper habitat adjacent to the Ashnola River (site #9) is bordered by talus slope running parallel to the river and is adjacent to the river (and road), and the habitat in between the

[4] The overall threat impact was calculated following Master *et al.* (2009) using the number of Level 1 Threats assigned to this species where Timing = High or Moderate. This includes 0 Very High, 0 High, 0 Medium, and 1 Low (Table 2). The overall threat considers the cumulative impacts of multiple threats.

talus slope and the river. There is also visible fine gravely soil throughout the habitat (D. St John, pers. comm. 2013). The site and adjacent habitats could potentially be used for gravel extraction to maintain the gravel roadway that runs adjacent to the river and Sonora Skipper habitat.

IUCN #4. Transportation and service corridors (4.1 Roads and railroads)
Four locations (#4, 5, 8, and 9) are adjacent to roads. The Ashnola River location (#9) is comprised of various sites including those adjacent to a road right-of-way. Although periodic roadside maintenance activities occur there are no immediate plans for road expansion at any of these locations. The Ashnola River location is within provincial land adjacent to Cathedral Lakes Provincial Park. The Whipsaw Creek location on Morris Valley Road (#4) and the Wolfe Creek location (#5) likely also have periodic roadside maintenance activities, although expansion is unlikely.

IUCN #5. Biological resource use (5.3 Logging and wood harvesting)
Logging and wood harvesting may provide short-term (< 10 years) temporary habitat for Sonora Skipper. The record from Placer Creek (#6) is from a recently logged area and although the location has likely experienced natural succession, there may still be remnant adjacent patches of suitable meadow habitat that remain. Sonora Skipper habitat is within areas where logging and wood harvesting take place, and there are likely other unrecorded locations. Logging activities provide temporary habitat and may allow for corridors with other suitable habitats or isolated populations. The use of machinery during logging and harvesting operations may also impact the soil and subsequent vegetation that grows in the cutblock. Existing compaction policy and regulations under the provincial *Forest and Range Practices Act* are likely to minimize and mitigate this potential threat.

IUCN #6. Human intrusions and disturbance (6.1 Recreational activities)
Recreational activities (e.g., trampling of host plants due to recreational hiking) may impact some Sonora Skipper habitats in Manning Provincial Park (locations #1, 2, and 3). Within Manning Park, location #1 and 2 are zoned Intensive Recreation Areas and similar sites in this zone may experience some trampling of host plants, specifically along trail edges or places with high picnic or recreational games. Future facility development in the Intensive Recreation Zone have the potential to impact Sonora Skipper habitat; however, the B.C. Park impact assessment process provides a mechanism to mitigate and protect known species at risk occurrences, and, potentially, unrecorded populations. Horse use is permitted in Cascade portion of the park (location #3). There is no all-terrain vehicle use within the park (although illegal use could occur, but at present is not a high concern). Some grazing will occur within the park area.
The remaining locations (outside of park boundaries) could experience all-terrain vehicle use, as well as other recreational use, although the specifics of this threat are not known.

IUCN #7. Natural system modifications (7.1 Fire and fire suppression)
Fire suppression by wildfire protection programs within B.C. is a potential threat at all nine Sonora Skipper locations in Canada.

In B.C., tree encroachment, in the absence of regularly occurring fires, may have reduced the size and extent of open meadow plant communities at some sites due to shading and competition. Fire suppression has been ongoing for more than 100 years within the region. Slow natural

succession of pines (*Pinus* spp.) and other native trees into open areas is ongoing due to long-term fire suppression.

IUCN #8. Invasive and other problematic species and genes (8.1 Invasive non-native/alien species)

Introduced species potentially threaten Sonora Skipper habitat and associated ecosystems at all locations in B.C.; however, the severity of this threat at each site is unknown. In B.C., the dominant invasive plants that occur in Sonora Skipper habitats and known locations include cheatgrass (*Bromus tectorum*), sulphur cinquefoil (*Potentilla recta*), Dalmatian toadflax (*Linaria vulgaris*), and diffuse knapweed (*Centaurea diffusa*).

Although unstudied within the ecosystems where Sonora Skipper occurs in B.C., the structure and diversity of plant communities is known to change elsewhere through competition for resources and release of allelopathic compounds by knapweed (e.g., Kelsey and Locken 1987; Tyser and Key 1988). Although knapweed is invasive, Sonora Skipper is known to nectar from this plant (see cover photograph). Other studies suggest increases in soil sedimentation and surface water runoff are linked to knapweed (Lacey *et al.* 1989). Overall, these introduced weeds likely compete with larval and nectar host plants for resources, and change the soil chemistry and invertebrate ground fauna. This threat is widespread throughout B.C.; however, its impact on Sonora Skipper is unknown.

Sonora Skipper larvae have been reared on yellow bristlegrass introduced to B.C. from Eurasia and growing in dry fields, roadsides, and other disturbed habitats. It is unknown if this plant grows within habitats where Sonora Skipper is recorded.

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 tachninid 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.

IUCN #9. Pollution (9.3 Agricultural and forestry effluents)

Herbicide application is possible at roadside locations and within some areas of provincial parks. Herbicides may be used within B.C. parks and protected areas to manage invasive plants if the specific park management plan allows for the application of herbicides. However, this would not likely have an impact as application would be done with consideration of the protection of the ecosystem, and would involve provisions to protect Sonora Skipper occurrences nearby. Chemical control buffers would be established around known sites and habitats as treatment impacts are not fully understood. Treatment timing windows that incorporate life cycle requirements are not well understood and require further study.

A portion of the range of Sonora Skipper is within the potential range of both the native Western Spruce Budworm (*Choristoneura occidentalis*; B.C. Ministry of Forests, Lands and Natural Resource Operations 2012a) and the non-native Gypsy Moth (*Lymantria dispar*; B.C. Ministry of Forests, Lands and Natural Resource Operations 2012b). Should either of these moth defoliator species be found in significant numbers, there is the possibility of ground and aerial spray of Btk (*Bacillus thuringiensis kurstaki*). Btk is a component of commercial pesticide products that uses spores of a naturally occurring pathogenic bacterium to control defoliating caterpillars; however, bacterium also affects most non-target butterfly and moth larvae. Btk is typically applied in early April to early May to specifically target the larval activity period of these defoliators. This time coincides with the larval activity period for Sonora Skipper. At present this is not thought to be a threat as there are no immediate outbreak occurrences of this moth within Sonora Skipper locations.

IUCN #11. Climate change and severe weather (11.1 Habitat shifting and alteration)
Climate change is considered a potential, but poorly understood, threat to Sonora Skipper habitat at all locations in B.C. The Southern Interior areas where Sonora Skipper occurs are some of the warmest climates in the province, and with climate change these areas may experience further drought and a shift in host plant phenology. Leaf and bloom growth on host plants may also be shortened due to increased temperature extremes within the region. This is speculative but possible over the long term. A shift in timing of host plant growth in spring (larval host plant) could result in premature senescence of host plant before larvae reaching a biomass that allows for enough energy for overwintering survival or reduced survival of larvae that reach diapauses (McLaughlin *et al.* 2002).

5 MANAGEMENT GOAL AND OBJECTIVES

5.1 Management Goal

The management goal is to ensure the persistence of Sonora Skipper at all known (and newly recorded) locations throughout the species' range in B.C.

5.2 Rationale for the Population and Distribution Management Goal

Sonora Skipper has a restricted range in B.C. and population/abundance information at all known locations is not available. The overall management goal aims to ensure the status does not decline in B.C. Historical abundance and distribution information for this species show only a few confirmed extant populations and historic museum records and thus historical trend data are minimal. As there is no information to indicate that the species was previously more widespread, an objective to actively increase the number of populations, which may allow the species to be down listed, is not appropriate.

The management goal for Sonora Skipper cannot be quantified due to knowledge gaps, as population size is unknown at each of the Sonora Skipper locations. Sonora Skipper is not commonly found and surveys within known locations usually result in only one or two individuals being recorded (see Appendix 1). The difficulty with estimating populations at low densities, coupled with the difficulty of tagging and monitoring butterflies, makes population estimates labour intensive. The above management goal sets a minimum population objective

(> 1 butterflies) for each location. Thus survival/recovery habitat should be to be identified and protected to ensure the species persists at any given location.

5.3 Management Objectives

1. To secure protection[5] for all known locations (and new locations) and habitats of Sonora Skipper.
2. To assess and mitigate the extent of current threats at all locations in B.C.
3. To address knowledge gaps (e.g., habitat requirements, host plants, range extent within the southern interior) for Sonora Skipper.

6 APPROACHES TO MEET OBJECTIVES

6.1 Actions Already Completed or Underway

Actions listed below have been categorized by the action groups of the B.C. Conservation Framework. Status of the action group for this species is given in brackets.

Compile Status Report (complete)

- COSEWIC report completed (COSEWIC 2006). Update due 2016.

Send to COSEWIC (complete)

- Sonora Skipper designated Special Concern (COSEWIC 2006). Re-assessment due 2016.

Planning (complete)

- BC Management Plan completed (this document, 2013).

Habitat Protection and Land Stewardship (in progress)

- Numerous butterfly inventory surveys have been conducted within the southwestern Interior of B.C., primarily in the Lower Fraser Valley east to the Okanagan Valley. Most of these surveys have taken place within the past 10 years and included habitat for Sonora Skipper but did not specifically target Sonora Skipper.
- Sonora Skipper inventory as part of the preparation of the COSEWIC status report (COSEWIC 2006; Kondla 2006).
- Butterfly survey of the Skagit River watershed (Knopp 2006).
- Sonora skipper and Hoffmann's Checkerspot inventory in the Similkameen drainage of southern B.C. (Marks *et al.* 2009).
- Inventory for Sonora Skipper within the south-central interior (J. Hobbs, pers. comm., 2012; D. St. John, pers. comm., 2012).

[5] Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

- Sonora Skipper is included in the category of "species at risk" under the provincial *Forest and Range Practices Act* (FRPA), which enables habitat management tools as per the Identified Wildlife Management Strategy. Protection measures under the FRPA include the establishment of Wildlife Habitat Areas (WHAs) to help protect the species' habitat from forestry threats on provincial Crown land. To date no WHAs have been created for Sonora Skipper, although work is ongoing (J. Hobbs, pers. comm., 2012).
- Sonora Skipper within Manning Provincial Park is afforded protection through the legal provisions of the B.C. *Park Act*.

6.2 Recommended Management Actions

Table 3. Recommended management actions and suggested implementation schedule for Sonora Skipper.

Actions to meet objectives[a]	Performance measures	Threat[b] or concern addressed	Priority[c]
Objective 1. To secure protection for the known locations (and new locations) and habitats of Sonora Skipper			
1. Determine the area of occupancy of known locations and spatially define the habitat where Sonora Skipper populations occur at each location.	• Known locations and habitat are spatially defined for Sonora Skipper by 2015.	Knowledge gap	Necessary
2. Revise Sonora Skipper Identified Wildlife species account under B.C. *Forest and Range Practices Act* based on new information.	• Sonora Skipper Identified Wildlife species account has been updated by 2016.	2.3, 9.3	Necessary
3. Establish Wildlife Habitat Areas (WHA) for the species on Crown land.	• Establish WHAs for Sonora Skipper on presently occupied Crown land sites by 2018.	1.3, 4.1, 2.3, 6.1, 9.3	Necessary
4. Establish stewardship protection measures on private land (e.g., ranches).	• Attempt contact with private landowners with occupied habitat by 2016.	2.3, 9.3	Necessary
5. Establish protection[d] measures for all locations.	• A detailed habitat protection plan is developed for all known (and any new) Sonora Skipper locations by 2016. • Appropriate protection measures have been initiated for all locations through existing legislative protection (e.g., Protected Areas, WHAs, landscape management plans) and local government bylaws and planning (e.g., official community plans, development permit areas) by 2018.	All threats All threats	Necessary
Objective 2. To assess, confirm, and mitigate the extent of the current threats at all locations in B.C.			
1. When completing inventory, attempt to list, quantify, and rate threats to habitat through standard protocol thereby assessing reasons Sonora Skipper may or may not be present within certain habitats.	• List of threats at each Sonora Skipper location, categorized according to IUCN-CMP threats classification, by 2016.	Knowledge gaps; All threats	Necessary
2. Investigate distribution and habitat use patterns of Sonora Skipper in relation to introduced plants.	• List of introduced plants present at each Sonora Skipper location, and how these plants may impact habitat quality according to abundance, density, etc.	8.1	Beneficial
3. Develop best management practices guidelines for private landowners (e.g., ranches) to assist with stewardship protection measures on private land.	• BMP has been developed for private landowners (e.g., ranches) to assist with stewardship protection measures on private land by 2016.	2.3	Necessary
4. Work with landowners/managers to ensure land use	• Assist landowners with identifying actions that minimize	1.3, 2.3, 4.1,	Necessary

Actions to meet objectives[a]	Performance measures	Threat[b] or concern addressed	Priority[c]
plans include the habitat needs of Sonora Skipper, (e.g., overgrazing by livestock).	primary threats to Sonora Skipper, link with other species at risk (if possible), and identify management actions that allow for multi-species approaches, by 2016.	6.1, 7.1, 8.1, 9.3	
5. In parks and recreational areas, identify site-specific threats within each location to minimize damage to Sonora Skipper habitat caused by destruction of vegetation within occupied habitats: fire management, prevention, or suppression activities; intensive recreational activities use within known occupied habitats; or invasive species removal/management programs.	• Park managers provided with additional information so park management plans consider specific known sites for habitat needs of Sonora Skipper by 2016. (Current planning objective for Manning Park is general "to protect and support recovery of rare, endangered or vulnerable species.")	1.3, 6.1, 7.1, 8.1, 9.3	Necessary
Objective 3. To address knowledge gaps (e.g., habitat requirements, host plants, range extent within the Southern Interior) for Sonora Skipper.			
1. Gather habitat information at each occupied and surveyed location in a consistent manner. Include information on potential host plant(s) and vegetation correlations between sites to assist with habitat suitability rating (e.g., prioritizing sites for protection), identifying potential habitat, and comparing site attributes to determine if Sonora Skipper presence is correlated to a certain suite of habitat attributes.	• A standardized inventory protocol for monitoring presence and habitat assessment of Sonora Skipper is developed by 2014. • Habitat information has been collected at each occupied location by 2015. • Habitat requirements have been used to determine habitat suitability ratings by 2015.	Knowledge gap Knowledge gap Knowledge gap	Necessary
2. Complete spatial mapping of all suitable (potential) Sonora Skipper habitats within the B.C. range. Delineate and label these spatial areas into sites.	• Suitable habitat has been identified for Sonora Skipper by 2016.	Knowledge gap	Necessary
3. From spatial mapping, prioritize sites for Sonora Skipper inventory based on habitat suitability rating and previous/ongoing inventory or known records.	• Suitable habitat prioritized for inventory by 2016. • An inventory schedule has been determined by 2016.	Knowledge gap Knowledge gap	Necessary
4. Inventory potential unsurveyed priority habitats (as determined from #2 above) within the range of Sonora Skipper.	• Attempt contact with private landowners with potential habitat by 2016. • Suitable habitat has been inventoried by 2018. • Sonora Skipper current range extent has been confirmed by 2018.	Knowledge gap Knowledge gap Knowledge gap	Necessary

Actions to meet objectives[a]	Performance measures	Threat[b] or concern addressed	Priority[c]
5. Based on information gained through inventory, develop monitoring program to investigate the habitat components of each known location. This would allow understanding of changes in habitat use and distribution over time due to threats, including the effects of climate change (e.g., more frequent drought).	• Monitoring program developed and initiated. • Determine what timing windows are appropriate for chemical or vegetation management along highways (including invasive species), trails, or other corridors, according to butterfly life cycle requirements.	Knowledge gap Knowledge gap; 9.3	Beneficial

[a] All actions fall under the Habitat Protection and the Land Stewardship action groups.
[b] Threat numbers according to the IUCN-CMP classification (see Table 2 for details).
[c] Essential (urgent and important, needs to start immediately); Necessary (important but not urgent, action can start in 2–5 years); or Beneficial (action is beneficial and could start at any time that was feasible).
[d] Protection can be achieved through various mechanisms including: voluntary stewardship agreements, conservation covenants, sale by willing vendors on private lands, land use designations, and protected areas.

6.3 Narrative to Support Management Actions Table

All recommended actions fall under the Habitat Protection and Land Stewardship action groups of the Conservation Framework.

On Crown land, the establishment of Wildlife Habitat Areas may be an effective way to protect the species' habitat from forestry threats. Work to establish WHAs for Sonora Skipper is ongoing (J. Hobbs, pers. comm., 2012). Although locations of Sonora Skipper within Manning Provincial Park are afforded protection through the legal provisions of the B.C. *Park Act,* work needs to be completed so that the specific locations, habitat needs, and threats are addressed in the planning documents respective to these parks.

At least one location and much potential habitat for Sonora Skipper are on private lands. Stewardship is an essential part of this management plan and will involve engaging landowners and managers in voluntarily protection measures. This stewardship approach will cover many different kinds of activities, including: following guidelines or best management practices to support species at risk; voluntarily protecting important areas of habitat; conservation covenants on property titles; and eco-gifting or sale of property (in whole or in part) to protect certain ecosystems or species at risk. Both government and non-governmental organizations have successfully conserved lands in the province.

Specific research on habitat requirements, clarification of threats, and better information on distribution is needed to address more effective protection measures for Sonora Skipper. This information will allow the development of improved best management practices guidelines.

Inventory for Sonora Skipper within unchecked suitable habitats within the south-central Interior is needed. The first step is to map all potential habitats within the historic range of the species and assess habitat suitability using orthophotos, satellite imagery, forest cover maps, and biophysical mapping. The second step is to generate a prioritized list of locations for inventory based on habitat suitability. The third step is to conduct field surveys at an appropriate time of the year (spring/early summer and fall) and under suitable conditions. Field visits are also required to verify habitat suitability.

Inventory, monitoring, and habitat assessment can be completed through a multi-species approach that includes all butterflies. Inventory for Sonora Skipper can incorporate searches for other butterflies at risk.

Selected habitat features and populations of Sonora Skipper within protected locations (e.g., within parks) need to be monitored to assess effectiveness of management actions.

7 MEASURING PROGRESS

Performance indicators provide a way to define and measure progress toward achieving the management goal and objectives over the next 5 years. Performance measures are listed in Table 3 for each objective.

The successful implementation of recovery actions for Sonora Skipper will be indicated through monitoring of locations and habitat trends through time. Sonora Skipper has an annual life cycle and therefore population sizes may vary from year to year and overall population (on a scale of decades) may vary within areas of suitable habitat. Population monitoring will allow for an indication of possible extirpation at a given location, changes in area of extent at a given location, and whether the number of extant locations is stable or increasing. The management plan will be reviewed in 5 years to assess progress and to identify additional approaches.

8 EFFECTS ON OTHER SPECIES

The ranges of several other plant and animal species at risk overlap the range and habitat of Sonora Skipper. The conservation actions to protect and maintain the open meadow and grassy ecosystems for Sonora Skipper are likely beneficial to all species that rely on these ecosystems. Likewise, conservation actions underway or proposed to protect the other species at risk are likely beneficial to Sonora Skipper. Federally listed species at risk that may overlap with Sonora Skipper habitat in B.C. include American Badger (*Taxidea taxus*), Blotched Tiger Salamander (*Ambystoma mavortium*), and Great Basin Spadefoot (*Spea intermontana*). Within the Princeton area, three plants are at risk: dwarf woolly-heads (*Psilocarphus brevissimus* var. *brevissimus*), slender collomia (*Collomia tenella*), and stoloniferous pussytoes (*Antennaria flagellaris*) for which a multi-species recovery plan has been completed. Manning Provincial Park has numerous species listed within the park, some of which have habitat that overlaps with Sonora Skipper (see Manning Park Ecosystem Management Plan; B.C. Ministry of Environment 2004). The Ashnola River area includes Cathedral Lakes Provincial Park, and numerous species at risk including Brandegee's lomatium (*Lomatium brandegeei*).

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