COSEWIC
Assessment and Status Report

on the

Dakota Skipper
Hesperia dacotae

in Canada

ENDANGERED
2014

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. 2014. COSEWIC assessment and status report on the Dakota Skipper *Hesperia dacotae* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 61 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm).

Previous report(s):

COSEWIC. 2003. COSEWIC assessment and status report on the Dakota skipper *Hesperia dacotae* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 35 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Production note:
COSEWIC would like to acknowledge Nicholai de Silva for writing the status report on the Dakota Skipper, *Hesperia dacotae*, in Canada, prepared under contract with Environment Canada. This report was overseen and edited by Jennifer Heron, 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 Dakota (*Hesperia dacotae*) au Canada.

Cover illustration/photo:
Dakota Skipper — Photo provided by author.

Catalogue No. CW69-14/358-2014E-PDF
ISBN 978-1-100-23935-4

Recycled paper

COSEWIC
Assessment Summary

Assessment Summary – May 2014

Common name
Dakota Skipper

Scientific name
Hesperia dacotae

Status
Endangered

Reason for designation
This butterfly is dependent on tall-grass and mixed-grass prairie habitats, which have suffered > 99% historical losses since the 1850s. The species occurs within fragmented patches of habitat in three population centres in Canada. It has a small home range and is associated with specific prairie plants, making it sensitive to conversion of prairie remnants to cropland, spring and summer haying, overgrazing, controlled burns, drainage of natural sites, and natural disturbances such as floods. The long-term persistence of this butterfly is dependent on appropriate management of its habitat, most of which consists of small fragments.

Occurrence
Saskatchewan, Manitoba

Status history
Designated Threatened in November 2003. Status re-examined and designated Endangered in May 2014.

COSEWIC
Executive Summary

Dakota Skipper
Hesperia dacotae

Wildlife Species Description and Significance

Dakota Skipper (*Hesperia dacotae*) is a small (21-33 mm) butterfly. The dorsal wing surfaces of females vary in colour from grayish-beige to brown, suffused with differing amounts of orange and paler translucent spots on the forewing. Wing undersides are greyish-brown with obscure pale spots on the hindwing, and are considered diagnostic for the species. Male dorsal wing surfaces are tawny orange with narrow, diffuse brownish borders and a distinct dark marking on the forewing. The underside of males is often a dull yellowish-orange with poorly developed pale spots.

Dakota Skipper is one of a small group of habitat specialist butterflies that ranges in native tall-grass and mixed-grass prairie habitats that remain in small isolated pockets in Canada. The loss of this skipper from Canada would represent the loss of a significant species of this endangered prairie ecosystem.

Distribution

Dakota Skipper is closely associated with native tall-grass and upland dry mixed-prairie ecosystems, and historically ranged throughout central North America from southern Illinois, Iowa, North and South Dakotas and western Minnesota into southern Canada within Manitoba and extreme Saskatchewan. As of 2012, there are three extant and five extirpated population centres in Canada. The three extant population centres are: 1) Interlake Region surrounding Lundar, Manitoba; 2) Oak Lake Region near Griswold, southwestern Manitoba; and 3) Souris River Region, from Bienfait to Glen Ewen in southeastern Saskatchewan.

Habitat

Dakota Skipper is an obligate native tall-grass and upland dry mixed-prairie specialist. This species' habitat is categorized into one of two habitat types. In Manitoba the species inhabits wet-mesic tall grass prairie distinguished by topographically low relief (<1m), more sandy gravel-free soils, and high water tables prone to intermittent flooding. This habitat type is associated with bluestem grasses and four predominant flowers, almost always present and in bloom during Dakota Skipper flight season: Black-eyed Susan, Common Harebell, Mountain Death Camas, and Wood Lily.

In Saskatchewan Dakota Skipper inhabits upland dry mixed prairie habitat associated with glacial landscapes characterized by rolling terrain with relatively higher relief. Within this habitat, Bluestem and Needle Grasses are dominant. Wood Lily and Common Harebell are present; however, Common Gaillardia and especially Narrow-leaved Prairie Coneflower are important nectar sources.

Biology

Dakota Skipper has one generation per year. Individual adults live up to three weeks, but populations are active for a three- to five-week period during late June to mid-July. Adult females mate within one or two days following emergence and immediately begin laying eggs. Eggs are typically laid individually on the undersides of leaves of the larval host plants.

Population Sizes and Trends

There has been substantial search effort for Dakota Skipper in Canada. As of 2012, the species occurs within three population centres: two in Manitoba and one in Saskatchewan. In 2012, Dakota Skipper population size in Canada is estimated to be 14,000 individuals: Oak Lake, southwest Manitoba 7,670 adults; Interlake Manitoba 5,450 adults; and Saskatchewan 890 adults. In 2002, Dakota Skipper population size was estimated between 28,500 - 40,500 individuals in only three or four populations.

Numerous sites in Manitoba have been affected by flooding or grazing regimes inappropriate for Dakota Skipper, which has contributed to the population decline over the past 10 years. It appears that much of the suitable habitat in Saskatchewan remains intact. Estimates of available habitat per site are uncertain as these sites are not nearly as clearly defined as in Manitoba.

Threats and Limiting Factors

The predominant threat to Dakota Skipper is increased frequency and severity of flooding that partially affects parts of this low-relief habitat at all three population centres. Historically, prairie ecosystems experienced periodic natural flooding; however, the present-day remaining habitat patches are no longer interconnected, preventing recolonization between these periodically flooded sites. This factor, combined with the cumulative threats that include conversion of habitat to non-grassland farming (e.g., agricultural intensification), overgrazing, haying, mining operations, native and non-native vegetative succession, wildfires and fire suppression and pest control, is causing further declines.

Protection, Status, and Ranks

In Canada Dakota Skipper was assessed as Threatened in 2003 by COSEWIC and listed under the *Species at Risk Act* (SARA) in 2005. Provincially, the species is listed as threatened in Manitoba under the Manitoba *Endangered Species Act.*

TECHNICAL SUMMARY

Dakota Skipper — Hespérie du Dakota
Hesperia dacotae
Range of occurrence in Canada: Manitoba and Saskatchewan

Demographic Information

Generation time	One generation per year.
Is there an [observed, inferred, or projected] continuing decline in number of mature individuals? • Inferred, based on cumulative threats to habitat quality at all sites. • Observed, based on lower abundance data when 2002, 2007, 2010 and 2012 survey results are compared.	Yes.
Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations] • Inferred, based on cumulative threats to habitat quality at all sites. • Decline at three population centres are difficult to compare across years because survey techniques varied. • Some evidence of decline: Interlake (Manitoba) – 2007 (N/A), 2010 (9 adults in 11 sites), 2012 (11 adults in 4 sites); Oak Lake (Manitoba) – 2007 (47 adults in 2 sites), 2010 (36 adults in 14 sites); 2012 (61 adults in 8 sites); Souris River (Saskatchewan) – 2007 (25 adults in 3 sites), 2010 (0 adults in 6 sites); 2012 (15 adults in 6 sites).	Unknown.
[Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations]. • Suspected reduction based on survey information from 2002 – 2012.	Unknown.
[Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations]. • Suspected reduction based on survey information from 2002 – 2012.	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. • Suspected reduction based on survey information from 2002 – 2012.	Unknown.
Are the causes of the decline clearly reversible and understood and ceased? • Causes of decline have not ceased. Habitat quality declines (all sites) and increased flooding frequency and severity (Manitoba sites) but the rate of habitat loss may have slowed at all sites.	No.
Are there extreme fluctuations in number of mature individuals?	No.

Extent and Occupancy Information

Estimated extent of occurrence	26,300 km²

Index of area of occupancy (IAO)	248 km² total (Interlake 132 km²; Oak Lake 60 km²; Souris River 56 km²)
Is the population severely fragmented? • Mixing between three population centres not likely. Habitat degradation is ongoing within populations.	Yes.
Number of locations* • Based on the threat of flooding at each of the three population centres. One flood may not occur at all sites within a population centre; however, over ten years the threat of floods and cumulative effects of habitat degradation are ongoing.	5 – 7
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence? • Inferred, based on cumulative threats to habitat quality at Interlake (Manitoba) and Oak Lake (Manitoba) population centres. Souris River (Saskatchewan) EO likely stable although recent development may spatially fragment populations.	Yes.
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy? • Inferred, based on cumulative threats to habitat quality. Although flooding is a natural event, frequency and duration appear to have increased.	Yes.
Is there an [observed, inferred, or projected] continuing decline in number of populations? • Inferred, based on habitat loss and cumulative threats to habitat quality.	Yes.
Is there an [observed, inferred, or projected] continuing decline in number of locations*? • Inferred, based on habitat loss and cumulative loss to habitat quality.	Yes.
Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat? • Inferred based on habitat loss and cumulative threats to habitat quality.	Yes.
Are there extreme fluctuations in number of populations?	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 population)

Population	**Mature Individuals**
Interlake, Manitoba	5 450
Southwest, Manitoba	7 670
Saskatchewan	890
Total	**14 250**

*See Definitions and Abbreviations on the COSEWIC website and IUCN 2010 for more information on this term

Quantitative Analysis

Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years].	Unknown

Threats (actual or imminent, to populations or habitats)

The predominant threat to Dakota Skipper is increased frequency and severity of flooding that partially affects parts of this low-relief habitat at all three population centres. Historically, prairie ecosystems experienced periodic flooding; however, present-day remaining habitat patches are no longer interconnected, preventing recolonization between these periodically flooded sites. This factor, combined with the cumulative threats that include conversion of habitat to non-grassland farming (e.g., agricultural intensification), overgrazing, haying, mining operations, native and non-native vegetative succession, wildfires and fire suppression and pest control are causing further declines.

Rescue Effect (immigration from outside Canada)

Status of outside population(s)? • Populations are declining within extant sites in the United States.	Declining
Is immigration known or possible? • Populations in the United States are at least 100 km from the closest site in Canada.	Not possible.
Would immigrants be adapted to survive in Canada?	Yes
Is there sufficient habitat for immigrants in Canada?	Unknown.
Is rescue from outside populations likely?	No

Data-Sensitive Species

Is this a data-sensitive species? • Some sites are on private land.	Yes

Status History

COSEWIC: Designated Threatened in November 2003. Status re-examined and designated Endangered in May 2014.

Status and Reasons for Designation:

Status:	**Alpha-numeric code:**
Endangered	B2ab(i,ii,iii,iv,v)

Reasons for designation:
This butterfly is dependent on tall-grass and mixed-grass prairie habitats, which have suffered > 99% historical losses since the 1850s. The species occurs within fragmented patches of habitat in three population centres in Canada. It has a small home range and is associated with specific prairie plants, making it sensitive to conversion of prairie remnants to cropland, spring and summer haying, overgrazing, controlled burns, drainage of natural sites, and natural disturbances such as floods. The long-term persistence of this butterfly is dependent on appropriate management of its habitat, most of which consists of small fragments.

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals):
Not applicable. Possibly meets A criterion; however, decline estimates are not believed to be sufficiently reliable.

Criterion B (Small Distribution Range and Decline or Fluctuation):
Meets Endangered B2ab(i,ii,iii,iv,v) since the IAO is less than 500 km² (268 km²), it is (a) severely fragmented, there is (b) continuing decline in (i) the extent of occurrence, in (ii) the index of area of occupancy, in (iii) the area, extent and quality of habitat and in (v) the number of mature individuals.

Criterion C (Small and Declining Number of Mature Individuals): Not applicable. The population is above the threshold (estimated at 14,000 individuals) and there are no estimated rates of decline.
Criterion D (Very Small or Restricted Total Population): Not applicable. There are more than 5 locations and the population is too large.
Criterion E (Quantitative Analysis): Not applicable.

PREFACE

Dakota Skipper was assessed by COSEWIC in 2003 as Threatened and listed as such under the federal *Species at Risk Act* in 2005. Since the initial status report, there has been substantial search effort and information gathered by numerous researchers at the University of Manitoba, Environment Canada and during the preparation of this status report.

The butterfly relies on small fragments of native prairie, a habitat that has experienced more than 99% loss in the past 200 years. Current threats include wildfire, severe flooding, grazing regimes that do not favour Dakota Skipper populations, the spread of non-native species, and the natural succession of native species. These cumulative threats led to the decline in the overall habitat quality and have impacted a number of sites where Dakota Skipper has previously been recorded.

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
(2014)

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 Canada / Environnement Canada
Canadian Wildlife Service / Service canadien de la faune
Canada

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

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Hesperia dacotae

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2014

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WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Class - Insecta (insects)

Order - Lepidoptera (butterflies and moths)

Family - Hesperiidae (skippers)

Subfamily - Hesperiinae (grass or branded skippers)

Genus - *Hesperia*

Specific Name - *dacotae*

Species - Hesperia dacotae

English Common Name - Dakota Skipper

French Common Name - Hespérie du Dakota

Dakota Skipper (*Hesperia dacotae* Skinner 1911) was once considered a subspecies of the more widespread *Hesperia sassacus* (Harris 1862), which ranges from south-central parts of Manitoba, eastward to the Maritimes and the eastern United States) (Layberry *et al.* 1998). Slight genetic differences have been noted between populations of Dakota Skipper in Manitoba compared to those in Minnesota and South Dakota (Britten and Glasford 2002) but no subspecies are currently recognized.

Morphological Description

Dakota Skipper has four life stages: egg, larvae, pupa and adult. Adult males are tawny orange with narrow diffuse brownish borders on the upper side of the wing surfaces and a distinct dark marking (stigma) on the forewing. There is individual variation in the intensity and extent of the brownish wing border. The forewing stigma has a black interior felt patch that contains specialized androconial scales that produce a pheromone involved in courtship. The underside of males is often a dull brownish to yellowish-orange with a poorly developed semicircle of slightly lighter spots (macular band) on the hindwing. In some individuals these spots are completely obscured (Figure 1).

Figure 1. Male Dakota Skipper dorsal (left) and ventral (right) surfaces. Specimen housed at the Canadian National Collection of Insects, Arachnids and Nematodes. Photos: Nick de Silva.

Adult females have variable colouration and are more difficult to identify. Wing undersides are greyish-beige to brown with differing amounts of orange, and suffused spots that vary in size per individual. Unlike males, females do not have a stigma on the forewing. The wing underside is usually greyish-brown with obscure whitish spots on the hindwing, which are often diagnostic (Figure 2). Further information can be found in Layberry et al. 1998.

Figure 2. Female Dakota Skipper showing dorsal (left) and ventral (right) surfaces. Specimen housed at the CNC. Photos: Nick de Silva.

The adult forms of both sexes are confused with Long Dash Skipper (*Polites mystic* Edwards 1863), Tawny-edged Skipper (*Polites themistocles* Latreille 1824), and Plains Skipper (*Hesperia assiniboa* Lyman 1892). Dakota Skipper females have whitish spots on the underside of the hindwing, which are separated (instead of continuous) as in Plains Skipper and Long Dash Skipper, and absent in Tawny-edged Skipper. Males are distinguishable from other species based on stigma shape and angulation.

Dakota Skipper eggs are hemispherical (1-2 mm diameter). Mature larvae (19-22 mm long) have no distinctive colour pattern and are light brown to peach-coloured. Dakota Skipper larvae are distinguished from other *Hesperia* larvae by their pitted ventral head capsule (other *Hesperia* species are unpitted) (McCabe 1981). The prothoracic shield, thoracic legs, and spiracles are black while the remainder of the body is minutely granular. The underside of the seventh and eight abdominal segments of the last instar larvae are covered with white wax (McCabe 1981). Dakota Skipper pupae are not described.

Population Spatial Structure and Variability

Prior to European colonization, Dakota Skipper may have formed a single contiguous metapopulation or several large populations within the historical range of tall-grass and mixed-grass prairies in North America (Britten and Glasford 2002; COSEWIC 2003). Manitoba populations of Dakota Skipper are genetically distinct from populations in Minnesota and South Dakota although were likely more connected in the recent past (Britten and Glasford 2002). There have been no genetic studies on Saskatchewan populations.

Designatable Units

One designatable unit occurs in Canada within the Prairie Ecological Area (COSEWIC 2011). There are no population or genetic studies that suggest otherwise.

Special Significance

Dakota Skipper is restricted to native tall-grass and mixed-grass prairie habitats across its range in southern Manitoba and southeastern Saskatchewan. The loss of this skipper from Canada would represent the loss of a significant species of these endangered prairie ecosystems. This butterfly has been the focus recovery efforts through recent workshops and symposiums held specifically to address the range-wide decline of this and other prairie butterflies within the US and Canada.

DISTRIBUTION

Global Range

Dakota Skipper is closely associated with native tall-grass and upland dry mixed-prairie ecosystems that historically occurred throughout central North America. The historic range included southern Iowa, North and South Dakotas and western Minnesota into southern Manitoba and Saskatchewan in Canada (McCabe 1981; Opler and Krizek 1984; Scott 1986; Dana 200 1991; Cochrane and Delphey 2002; Royer and Marrone 1992). The species may have once occurred along the eastern border in Montana (Royer and Marrone 1992).

The present global range of Dakota Skipper includes Manitoba, Saskatchewan, Minnesota, North Dakota and South Dakota (Figure 3). The species is extirpated from Illinois and Iowa (McCabe 1981; Schlicht and Orwig 1998; Cochrane and Delphey 2002). Studies in the US suggest the species is now limited to 56 sites in Minnesota (40 sites within 10 connected complexes), 48 sites in South Dakota (32 sites in 5 connected complexes), and 32 sites in North Dakota (17 within two connected complexes) (Cochrane and Delphey 2002).

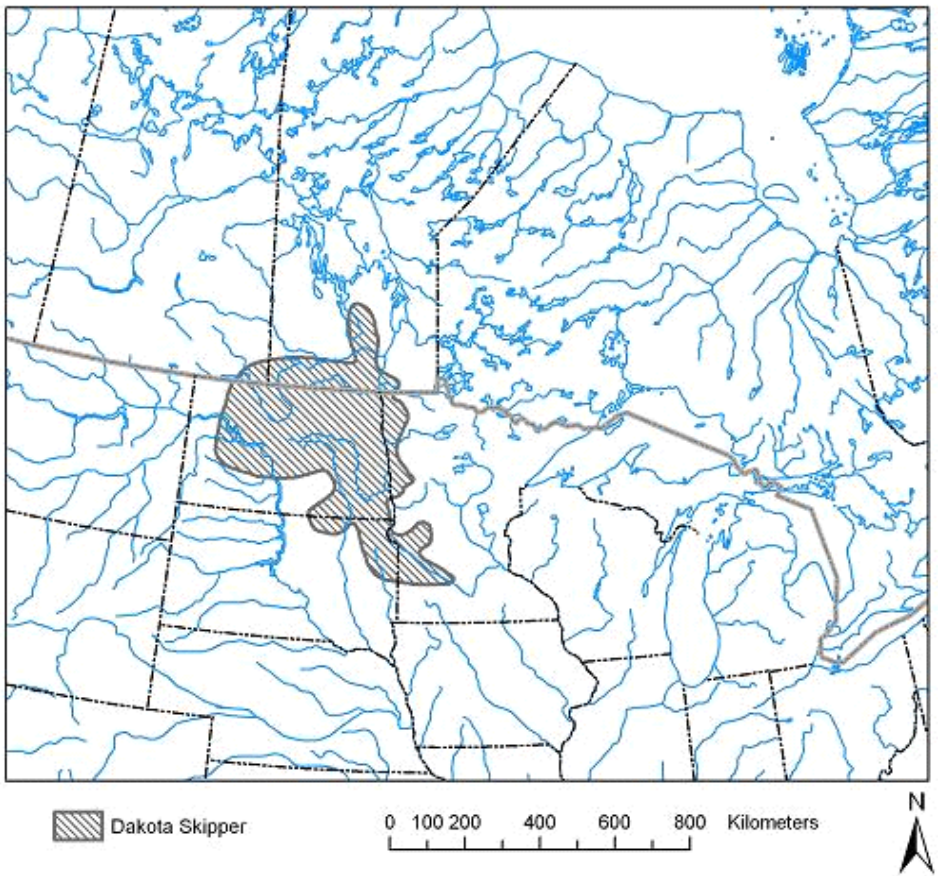

Figure 3. Global range of Dakota Skipper (COSEWIC 2003).

Canadian Range

Dakota Skipper is currently known in Canada from three population centres: 1) Interlake Region surrounding Lundar, Manitoba; 2) Oak Lake Region, southwestern Manitoba; and 3) Souris River Region, from Bienfait to Glen Ewen in southeastern Saskatchewan. Following 2012 surveys (in preparation of this status report), the species was confirmed within 18 sites across these three population centres (Figure 4). The term 'site' in this document is defined as a contiguous and suitable Dakota Skipper habitat polygon that has been searched a minimum of 15 minutes.

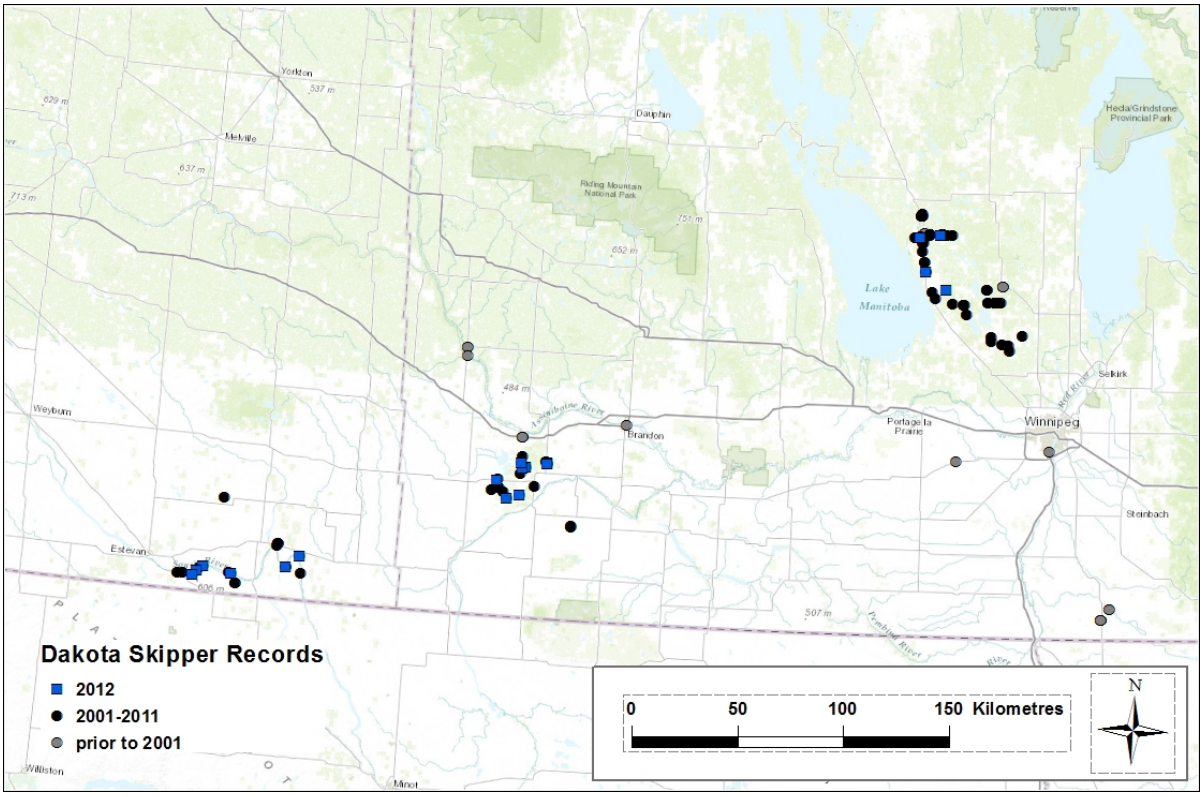

Figure 4. Dakota Skipper sites showing all three population centres in Canada 2001 – 2012: Saskatchewan (left), Oak Lake (middle) and Interlake (right) (see Appendix 1).

Prior to 2001 Dakota Skipper was recorded from 18 sites in Canada (Klassen *et al.* 1989; Layberry *et al.* 1998; COSEWIC 2003) although these sites are not the same sites as recorded in 2012. Since the first status report (COSEWIC 2003) the number of sites increased to nearly 40 new sites within the same three population centres. In 2002, Dakota Skipper was confirmed in 22 sites (17 sites in the Interlake; two in southwest Manitoba; three in Saskatchewan), whereas in 2012 it was recorded in only 18 sites (Table 3).

Extant Populations

Prior to the first status report (COSEWIC 2003) Dakota Skipper was recorded from 19 sites. In 2002, the largest population centre was in the Inter-lake Region between Lake Winnipeg and Lake Manitoba, and Dakota Skipper was recorded from 17 sites (near Eriksdale, Lundar, Inwood, and St. Laurent). In 2012, the skipper was collected at 4 sites within the Interlake Region (Table 3; Figure 5). This area appears to be variable in population abundance (Rigney pers. comm. 2012; Westwood pers. comm. 2012).

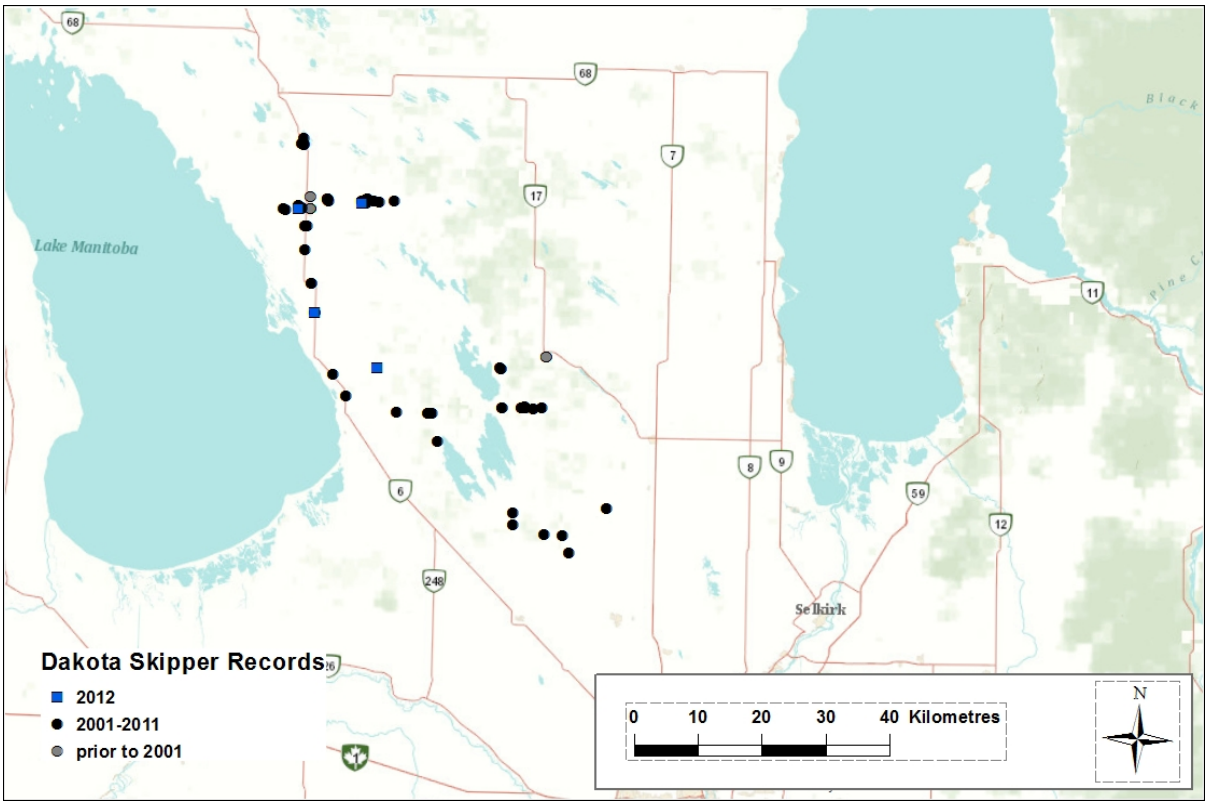

Figure 5. Dakota Skipper sites 2001 – 2012 showing Interlake population centre (Manitoba) (see Appendix 1).

Currently, the largest population centre appears to be in the Oak Lake Region (Griswold), southwestern Manitoba (Figure 6). Near Griswold, the skipper was recorded at 2 sites in 2002 (COSEWIC 2003), 14 sites in 2007 (Environment Canada 2007) and 8 sites in 2012 (Table 3). This population has been studied intensively since 2010 and appears to be the most dependable population for studying Dakota Skipper (Rigney pers. comm. 2012; Westwood pers. comm. 2012).

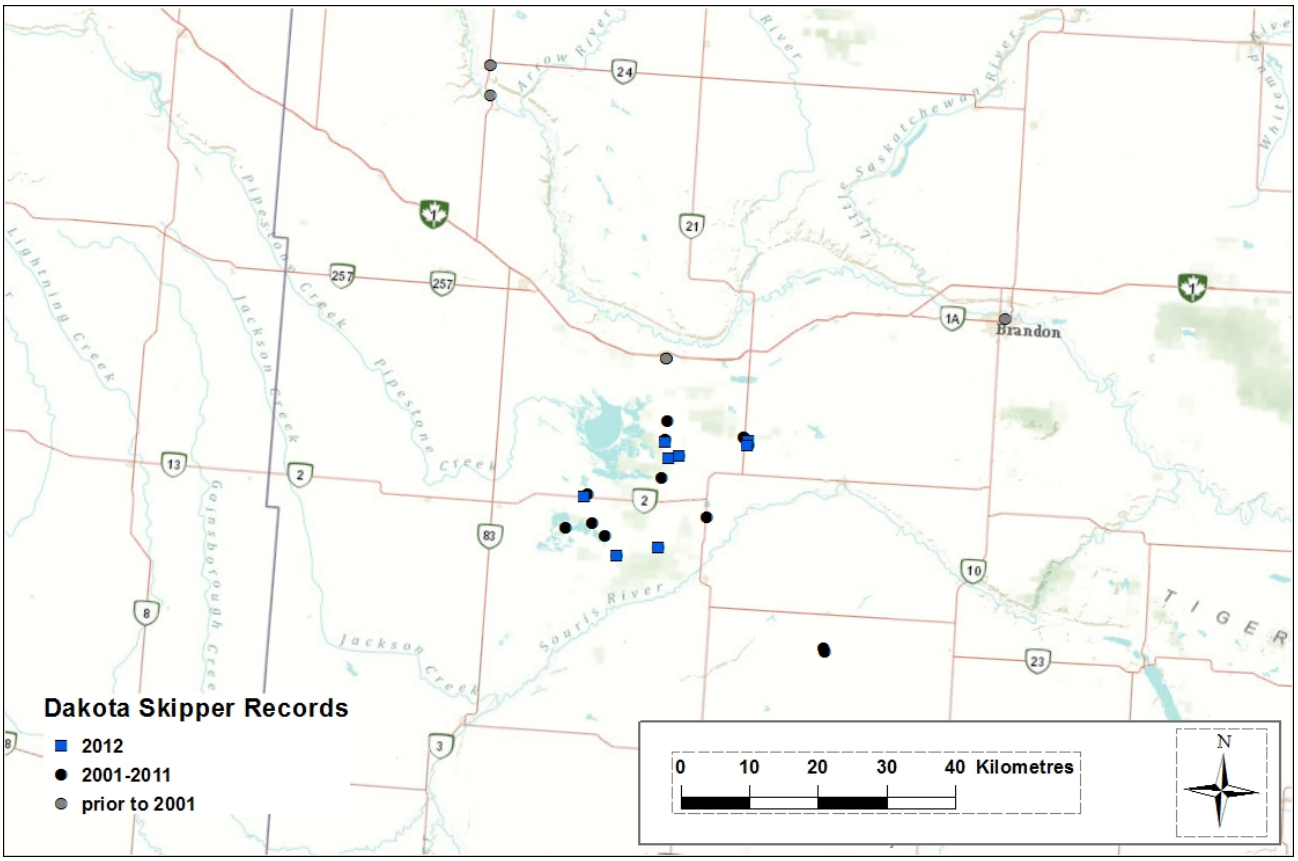

Figure 6. Dakota Skipper sites 2001 – 2012 showing Oak Lake population centre, Manitoba (see Appendix 1).

There is one population centre in Saskatchewan along the Souris River Region. After years of speculation (Hooper 1973) and surveys, three sites were first recorded in 2001 and 2002 (Hooper 2003) and have since been intensively surveyed over the past 10 years. In total the skipper has been recorded from 16 of 22 sites surveyed near Oxbow, Roche Percee, and Glen Ewen. In 2012, Dakota Skipper was confirmed at 6 of these sites (Table 3; Figure 7).

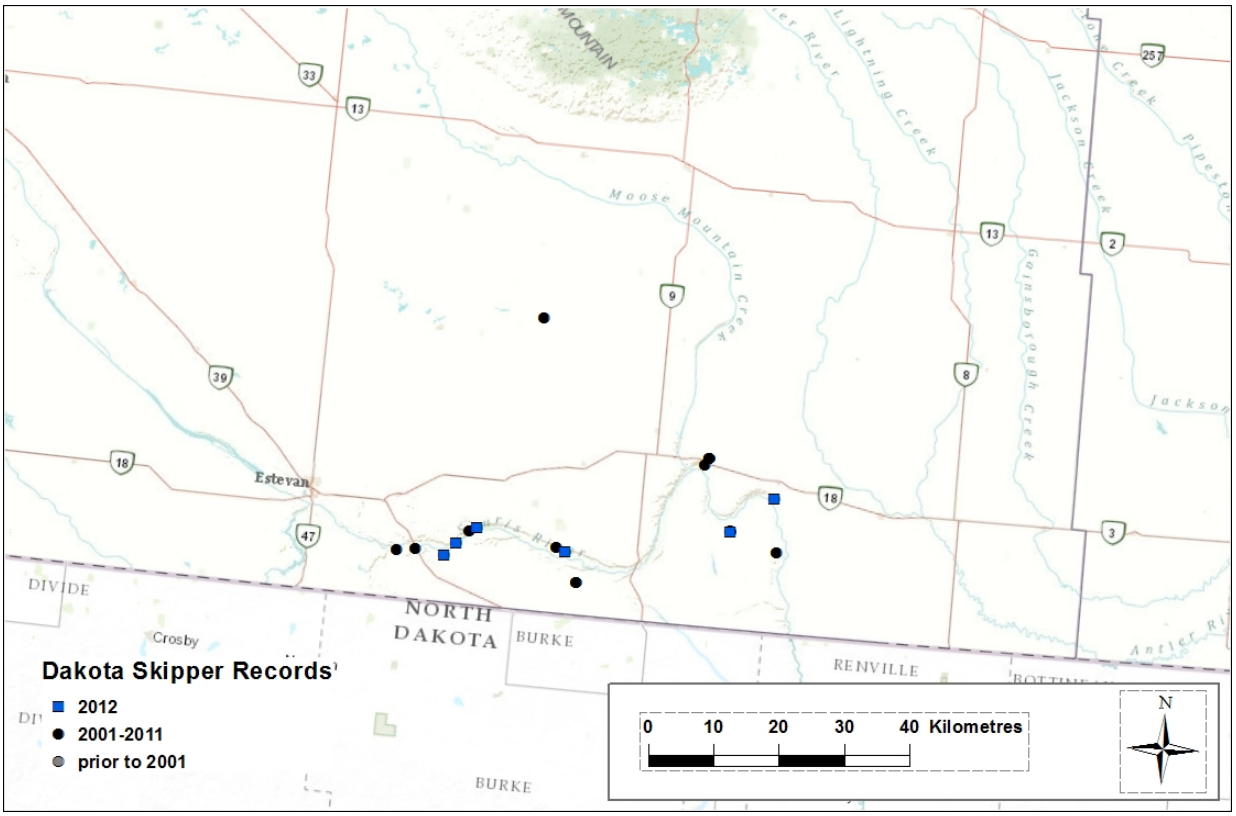

Figure 7. Dakota Skipper sites in Saskatchewan (see Appendix 1).

Historical and Extirpated Populations

In Manitoba, many records prior to 1950 appear to be extirpated or are considered historic. The first is from Winnipeg (from the 1930s, historic) but no recent records are reported. A second, southwest of Winnipeg near Fannystelle (1991, considered extirpated – see Threats), was not detected in 2002 or 2012. A third near Miniota (1944, historic), presumably on prairie hills above the Assiniboine River, is now converted into a “Riparian Forest Centre”, a habitat not known to support the skipper. The fourth was collected near Brandon (1950, historic), but no prairie habitat remains in the Brandon area nor was the species detected in 2002 (COSEWIC 2003) or 2012 (de Silva pers. data 2012) surveys.

The fifth extirpated population was in the Tall Grass Prairie Preserve (TGPP) in Manitoba and includes sites near Tolstoi, Gardenton, and Stuartburn. The last specimens from the TGPP (deposited in the J.B. Wallis Entomological Museum at the University of Manitoba and in the Manitoba Provincial Museum) were collected in 1987. The last confirmed sighting of Dakota Skipper in the TGPP was in 2000; however, voucher specimens were not collected (surveyors cited low abundance) (Britten and Glasford 2002). The site was resurveyed in 2002 (COSEWIC 2003) and 2012; however, Dakota Skipper was not recorded (de Silva pers. data 2012). Yearly surveys in the TGPP that target the Poweshiek Skipper (*Oarisma poweshiek*) have continued at concurrent flight times with Dakota Skipper; however, none of the latter have been recorded (Westwood pers. comm. 2012; Foster pers. comm. 2014; Harris pers. comm. 2014).

Dakota Skipper was recorded from Riding Mountain National Park; however, there are no associated voucher specimens or more recent records. Site visits suggest the habitat is not suitable for Dakota Skipper, and this occurrence is considered dubious (Rigney pers. comm. 2013). A site near Inwood (Interlake Region) also does not have an associated voucher specimen and was not confirmed in 2012. In the past the Inwood site has been subject to flooding and heavy grazing (see Threats).

Extent of Occurrence and Area of Occupancy

Dakota Skipper extent of occurrence is 26,300 km^2 including historical and recent sites. The index of area of occupancy (IAO; historical and recent) is 248 km^2 (2 X 2 km squares over sites in Figure 4). The IAO of the three known population centres separately are: Interlake Region [Manitoba] 132 km^2, Oak Lake Region [Manitoba] 60 km^2 and Souris River Region [Saskatchewan]) 56 km^2.

Search Effort

Since 2000, there has been substantial search effort for Dakota Skipper in Canada. Search effort is not consistent between sites, years, site names and duration. From 2002 – 2012 (Figure 12), a minimum of 264 sites has been searched for Dakota Skipper (some sites have repeated visits): Interlake (Manitoba) 145 sites; Oak Lake (Manitoba) 77 sites and Souris River (Saskatchewan) 42 sites.

Comparable surveys were made in 2002 (COSEWIC 2003), 2006 (Morden 2006; Environment Canada 2007; Webster 2007) and 2007 in the preparation of the species' recovery strategy (Environment Canada 2007; Webster 2007), 2010 (Westwood 2010), 2010 – 2012 (Rigney 2013), 2011 (Murray and Freisen 2012) and 2012 (during status report preparation) (see Tables 1 and 2).

Table 1. Dakota Skipper survey sites 2002 - 2012.

Population Centre	Interlake Region	Oak Lake Region	Souris River Region, Saskatchewan	Reference
Year				
2002	Approximately 50 sites surveyed	16 sites surveyed	18 – 19 sites surveyed.	COSEWIC 2003
	Dakota Skipper recorded at 21 sites (according to Westwood [2010] site numbering system)	47 adults recorded across 2 sites	25 adults recorded across 3 sites	
	436 adults recorded across 17 sites (according to COSEWIC [2003] numbering system)			
2005	24 sites	No surveys.	No surveys.	Morden 2006
2007	N/A	14 of the 16 sites surveyed in COSEWIC 2003	12 of the 18 – 19 sites surveyed in COSEWIC 2003	Environment Canada 2007; Webster 2007
		Dakota Skipper recorded at 14 sites	Dakota Skipper recorded at 14 sites.	
		371 adults recorded across 14 sites	55 adults recorded across 12 sites	
2010	21 of the 50 sites surveyed in COSEWIC 2003	14 of the 16 sites surveyed in COSEWIC 2003	6 of the 18 – 19 sites surveyed in COSEWIC 2003.	Westwood 2010
	Dakota Skipper recorded at 11 sites	Dakota Skipper recorded at 14 sites	0 Dakota Skipper recorded at 6 sites.	
	9 adults total recorded across 11 sites	36 adults total recorded across 14 sites	0 adults total recorded across 6 sites	
2010	4 of the approximately 50 sites surveyed in COSEWIC 2003	4 of the approximately 16 sites surveyed in COSEWIC 2003	N/A	Rigney 2010 (thesis)
	0 adults recorded across 4 sites	20 adults recorded across 4 sites		
2011	4 adults recorded across 4 sites	> 173 adults recorded across 4 sites	N/A	Rigney 2011 (thesis)
2012	7 adults recorded across 4 sites	33 adults recorded across 4 sites	N/A	Rigney 2012 (thesis)

Population Centre	Interlake Region	Oak Lake Region	Souris River Region, Saskatchewan	Reference
Year				
2012	35 of the 50 sites surveyed in COSEWIC 2003	21 sites surveyed, including the 16 sites surveyed in COSEWIC 2003	6 of the 18 – 19 sites surveyed in COSEWIC 2003	de Silva (preparation of this status report) 2012
	Dakota Skipper recorded at 4 sites	Dakota Skipper recorded at 8 sites (no new sites)	Dakota Skipper recorded at 6 sites	
	11 adults recorded across 4 sites	61 adults recorded across 8 sites	15 adults recorded across 6 sites	
Total	Minimum 145 sites (some repeated) from 2002 – 2012	Minimum 77 sites (some repeated) from 2002 – 2012	Minimum 42 sites (some repeated) from 2002 – 2012	

Table 2. Dakota Skipper sites survey sites confirmed during the preparation of this status report (de Silva pers. comm. 2012).

Regional Code	Province	Nearest Town and Site	2012 Date	Time (Start)	Time (End)	Total # of Dakota Skipper
1 - IL	MB	Lundar A	Jul-04	11:30	13:45	1
2 - IL	MB	Lundar B	Jul-12	15:30	17:00	5
3 - IL	MB	Oak Point	Jul-12	12:40	13:15	1
4 - IL	MB	St. Laurent	Jul-04	16:35	17:05	4
5 - OL	MB	Deleau A	Jul-05	14:40	15:45	1
6 - OL	MB	Deleau B	Jul-05	16:30	17:00	9
7 - OL	MB	Deleau C	Jul-05	17:15	18:15	21
8 - OL	MB	Deleau D	Jul-06	11:45	12:45	3
9 - OL	MB	Deleau E	Jul-07	10:30	11:40	4
10 - OL	MB	Deleau F	Jul-07	12:00	13:00	7
11 - OL	MB	Deleau G	Jul-07	13:20	14:10	11
12 - OL	MB	Belleview	Jul-06	15:35	16:30	5
13 - SR	SK	Glen Ewen A	Jul-09	13:10	14:10	2
14 - SR	SK	Glen Ewen B	Jul-09	15:20	15:40	3
15 - SR	SK	North Portal A	Jul-10	10:05	10:55	4
16 - SR	SK	North Portal B	Jul-10	12:05	12:50	4
17 - SR	SK	North Portal C	Jul-10	13:45	14:45	1
18 - SR	SK	Bienfait	Jul-10	15:40	16:45	1

Table 3. The threat classification below is based on the IUCN-CMP (World Conservation Union–Conservation Measures Partnership) unified threats classification system. 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).

Scientific Name	Dakota Skipper (*Hesperia dacotae*)			
Date	28/12/2013			
Assessor(s):	Nick de Silva, Christa Rigney, Richard Westwood and Jennifer Heron			
Overall Threat Impact Calculation Help:			**Level 1 Threat Impact Counts**	
	Threat Impact		**high range**	**low range**
	A	Very High	1	0
	B	High	0	0
	C	Medium	1	2
	D	Low	3	3
		Calculated Overall Threat Impact:	Very High	High
		Overall Threat Comments	Dakota Skipper sites are Interlake Region Manitoba (Site 1: Lundar A; Site 2: Lundar B; Site 3: St. Laurent; Site 4: Oak Point); Oak Lake Region Manitoba (Site 5: Deleau A; Site 6: Deleau B; Site 7: Deleau C; Site 8: Deleau D; Site 9: Deleau E; Site 10: Deleau F; Site 11: Deleau G; Site 12: Belleview); Souris River Region Saskatchewan (Site 13: Glen Ewen A; Site 14: Glen Ewen B; Site 15: North Portal A; Site 16: North Portal B; Site 17: North Portal C; Site 18: Bienfait).	

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%)	Unknown	
1.1	Housing & urban areas	D	Low	Small (1-10%)	Extreme (71-100%)	Unknown	Potential to impact six sites or habitats adjacent to known sites: Site 1 (Lundar A, Manitoba), 3 (St. Laurent, Manitoba; no further development observed), 8 (Deleau D, Manitoba; nearby in adjacent habitats), 11 (Deleau G, Manitoba; nearby in adjacent habitats), 14 (Glen Ewen B, Saskatchewan; ongoing in habitat).
1.2	Commercial & industrial areas	D	Low	Small (1-10%)	Extreme (71-100%)	Unknown	Potential to impact two sites: Site 2 (old airstrip), 3 (site is adjacent to a quarry).
2	Agriculture & aquaculture	D	Low	Restricted (11-30%)	Slight (1-10%)	High (Continuing)	
2.3	Livestock farming & ranching	D	Low	Restricted (11-30%)	Slight (1-10%)	High (Continuing)	Deleau A and Deleau D have livestock grazing in nearby habitats.
3	Energy production & mining		Not a Threat (in the assessed timeframe)	Pervasive (71-100%)	Slight (1-10%)	Low (Possibly in the long term, >10 yrs)	

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
3.1	Oil & gas drilling		Not a Threat (in the assessed timeframe)	Pervasive (71-100%)	Slight (1-10%)	Low (Possibly in the long term, >10 yrs)	Oil and gas drilling is near all sites in Saskatchewan.
3.2	Mining & quarrying		Negligible	Negligible (<1%)	Slight (1-10%)	Low (Possibly in the long term, >10 yrs)	One site is adjacent to a quarry (Site 4: Oak Point).
4	Transportation & service corridors						
5	Biological resource use	D	Low	Large (31-70%)	Slight (1-10%)	Moderate (Possibly in the short term, < 10 yrs)	
5.2	Gathering terrestrial plants	D	Low	Large (31-70%)	Slight (1-10%)	Moderate (Possibly in the short term, < 10 yrs)	Haying
6	Human intrusions & disturbance						
7	Natural system modifications	A C	Very High - Medium	Pervasive (71-100%)	Extreme - Moderate (11-100%)	Unknown	
7.1	Fire & fire suppression	A	Very High	Pervasive (71-100%)	Extreme - Moderate (11-100%)	Unknown	Fire suppression at all sites. Possibility of fire at some sites.
7.3	Other ecosystem modifications	C	Medium	Pervasive (71-100%)	Moderate (11-30%)	Unknown	Wildfires at some sites.
8	Invasive & other problematic species & genes		Not a Threat (in the assessed timeframe)	Pervasive (71-100%)	Slight (1-10%)	Low (Possibly in the long term, >10 yrs)	
8.1	Invasive non-native/alien species		Not a Threat (in the assessed timeframe)	Pervasive (71-100%)	Slight (1-10%)	Low (Possibly in the long term, >10 yrs)	All sites.
8.2	Problematic native species		Not a Threat (in the assessed timeframe)	Pervasive (71-100%)	Slight (1-10%)	Low (Possibly in the long term, >10 yrs)	All sites.
9	Pollution			Large (31-70%)	Unknown	Unknown	
9.3	Agricultural & forestry effluents			Large (31-70%)	Unknown	Unknown	Pesticide application at adjacent habitats.
10	Geological events						
11	Climate change & severe weather	C	Medium	Pervasive (71-100%)	Moderate (11-30%)	High (Continuing)	
11.2	Droughts	C	Medium	Pervasive (71-100%)	Moderate (11-30%)	Moderate (Possibly in the short term, < 10 yrs)	All sites are also subject to drought, which may cause premature plant senescence?

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
11.4	Storms & flooding	C	Medium	Pervasive (71-100%)	Moderate (11-30%)	High (Continuing)	All sites or portions of sites, are likely to be flooded within a ten-year period.

In 2006 a new site was recorded at the Interlake (Manitoba) region (Environment Canada 2007; Webster 2007).

In 2010, sites visited by Webster in 2002 were resurveyed in the known population centres: 21 sites (of the 50 sites in COSEWIC 2003) in the Interlake Region (Manitoba), 14 sites (of the 16 sites in COSEWIC 2003) in the Oak Lake Region (Manitoba) and six sites (of the 18/19 sites in COSEWIC 2003) in the Souris River Region (Saskatchewan) (Westwood 2010). As well, 20 sites in the Tall Grass Prairie Preserve (extirpated population centre) were surveyed in 2010 but no Dakota Skipper recorded (Westwood 2010).

In 2011, searches were made south of the Oak Lake Region (Murray and Freisen 2012), but specimen identifications have not been confirmed.

In 2012, Dakota Skipper surveys totalled 127 hours during preparation of this status report (Table 1). Field methods were kept consistent with the 2002 (COSEWIC 2003) survey except the minimum survey time per site was increased from 15 to 30 minutes (or sometimes more). In total Dakota Skipper was recorded from 18 sites in 2012 (Figure 4). An additional 68 sites were surveyed in 2012 and no Dakota Skippers were recorded (Appendix 2).

Additional prairie habitats remain to be surveyed in Saskatchewan (Figure 7) (Webster pers. comm. 2012). Estimates are speculative because sites and habitat in Saskatchewan are not as well mapped or defined as those in Manitoba.

Number of Locations

Annual flooding appears to be the greatest threat to Dakota Skipper. Flooding may affect 2 – 3 locations in the Interlake Region, 2 – 3 locations at the Oak Lake region and a minimum of three locations at the Saskatchewan region. The terrain in Saskatchewan is along the Souris River, with sites at various distances from one another. These sites could form one interconnected patch of habitat. The low-lying areas are prone to flooding, but the steeper areas would not likely be flooded. Recent development within the area may have created barriers to dispersal (Rigney pers. comm. 2014). In total, there are likely fewer than ten locations for Dakota Skipper.

Habitat loss and degradation, combined with natural succession, are considered to be mutually exclusive threats simultaneously impacting the three population centres although at different frequency and rates. “Degradation in quality of remaining Dakota Skipper habitat patches may now surpass the outright destruction of prairie as a threat to the species” (USFWS 2011). The cumulative effects of overgrazing, weed control, invasion by non-native species, haying, wildfire, lack of management or disturbance, habitat fragmentation and pest control contribute to habitat degradation. These factors combine to form the case for severe fragmentation when the species’ limiting factors are also considered:

- Low abundance during surveys within a habitat patch.
- Low dispersal capability – home range of about 300m and dispersal less than 1km.
- Inhabits habitat patches in association with four or five prairie plants, which face similar threats to those faced by Dakota Skipper.
- The species likely formed a metapopulation structure within numerous interconnected habitat patches that experienced ongoing natural disturbance, (e.g., wildfire, flooding, natural succession). These natural disturbance events are no longer part of the ecosystem processes.
- Current habitat patches are considered small (1ha to 400ha).
- Habitat where the species occurs includes alternating lower (wetter) and higher (drier) sites that experience natural seasonal flooding, but the intensity and severity of flooding appears to have increased in the past decade.
- Most sites are at least 1.5km apart and others up to 5km apart. In some cases there is marginal habitat in between, whether it be agricultural areas or road corridors. Evidence is inconclusive regarding the ability of the skipper to recolonize areas. However, as habitats become more unsuitable, infrequent Dakota Skipper dispersal events are unlikely to land in suitable habitat.
- In Saskatchewan, the habitat along the Souris River may have at one point been more continuous; however, there has recently been larger-scale oil and gas development that may create barriers to dispersal.
- As of 2012, there are 18 sites recorded. There may be additional sites that were previously occupied but that were flooded during these 2012 surveys, and these are possibly still extant. Flooding occurs to some degree at all sites; it may not occur over the entire site, but it is thought that at most sites there is some kind of flooding event and the duration may span the flight season for Dakota Skippers.
- When additional cumulative threats are considered, extant sites are likely to decline in quality over the next ten years.

HABITAT

Dakota Skipper typically lays its eggs on or near larval host plants (Dana 1991). Studies in the US confirmed oviposition on Little Bluestem (*Andropogon scoparius)*, Big Bluestem (Andropogon *gerardii)*, Sideoats Grama (*Bouteloua curtipendula*), Prairie Dropseed (Sporobolus *heterolepis)*, and Spear Grass (*Stipa spartea*) (Dana 1991). Oviposition has not been studied in Canadian populations.

Dakota Skipper larvae use a variety of grass species as host plants including bunch grasses: Little Bluestem and Prairie Dropseed, Big Bluestem*,* Sideoats Grama, Fall Panicum (*Dichanthelium wilcoxianum*), Kentucky Bluegrass (*Poa Pratensis*) and in rare cases Sun Sedge (*Carex heliophila*) (Dana 1991). Native bunchgrasses remain edible into fall unlike some non-native species such as Kentucky Bluegrass and Bromegrass (*Bromus inermis*), which have a mid-summer senescence or dormancy and make for unsuitable forage (MacNeill 1964).

Dakota Skipper adults nectar on Narrow-leaved Purple Coneflower (Dana 1991; Royer and Marrone 1992), Black-eyed Susan (*Rudbeckia serotina*), Blanketflowers, Dogbane (*Apocynum sp*.), Evening Primrose (*Oenothera serrulata*), Fleabane (*Erigeron spp.),* Gaillardia, Common Harebell (*Campanula rotunifolia*), Long Headed Coneflower (*Ratibida columnifera*) and White Prairie Clover (*Dalea candida*) (McCabe and Post 1977; Royer and Marrone 1992; COSEWIC 2003).

Habitat Requirements

Dakota Skipper is a native tall-grass and upland dry mixed-prairie obligate (Royer and Marrone 1992). The three extant population centres in Canada are characterized by two habitat types: 1) low, wet-mesic tall-grass/blue-stem prairie (also referred to as Type A habitat) in Manitoba or 2) upland dry-mesic mixed-grass/bluestem prairie (also referred to as Type B habitat) in Saskatchewan (Royer and Marrone 1992). In both habitat types bluestem (*Andropogon spp*.) is a dominant grass species.

<u>Manitoba sites</u>

Habitat in Manitoba (Type A, see Royer *et al*. 2008) has topographically low relief (< 1 m), sandy and relatively gravel-free soils, and high water tables that experience natural intermittent spring floods. Despite flooding, these sites have sufficient topographic relief to provide suitable habitat during the larval growth period (Royer *et al*. 2008).

Adults use the higher and drier areas where grasses are shorter (10 -15 cm) (Environment Canada 2007). Dominant grasses include Little Bluestem (*Andropogon scoparius*), Big Bluestem (*Andropogon gerardii*) and Prairie Dropseed (*Sporobolus heterolepis*). Flowering plants almost always present and in bloom during the flight period include Wood Lily (*Lilium philadelphicum*), Common Harebell (*Campanula rotundifolia*), Mountain Death Camas (*Anticlea elegans*) (McCabe 1981), and Black-eyed Susan (*Rudbeckia serotina*).

In 2002, with the exception of the prairies near Tolstoi and Stuartburn, Dakota Skipper was present at all sites where these four plants were present (COSEWIC 2003). In 2012, these four plants were present at all Dakota Skipper sites plus a sub-site where the skipper had not previously been recorded. In North Dakota, McCabe (1981) rarely found Dakota Skipper at sites without Mountain Death Camas and considers this plant a reliable indicator of Dakota Skipper habitat. The flowering period of Mountain Death Camas coincides with the flight season of the skipper yet the life history of Dakota Skipper is completely independent of this plant (McCabe 1981). Additional vegetation includes bluestem grasses.

The size (ha) of Manitoba sites ranges from small (1.0 ha) to large (> 400 ha, especially in southwestern Manitoba) openings among Aspen (*Populus spp.*) or Bur Oak (*Quercus macrocarpa*) groves. These prairie sites are characterized by low relief (1 - 2 m), with alternating wetter (lower) and drier (higher) sections, each with a distinctive plant community. Many sites appear to be on fall haying or late season mowing regimes (de Silva pers. comm. 2012). Larger areas of open prairie exist and are more common in southwest Manitoba yet are parcelled off into smaller sections by aspen groves (de Silva pers. comm. 2012) (Figures 8 and 9), which may be important for mating (COSEWIC 2003).

Figure 8. Dakota Skipper habitat in the Interlake region near St. Laurent, Manitoba. Photo: N. de Silva.

Figure 9. Dakota Skipper habitat in the Interlake region near Lundar, Manitoba, showing aspen groves. Photo: N. de Silva.

In the Oak Lake Region, between Belleview and Souris, 61 adults were recorded in 2012. The prairie in the Oak Lake Region is more similar to the Interlake region and the size of prairie parcels is larger due to less aspen growth (Figures 10 and 11). Flooding in the Oak Lake region and, less so, the Interlake region is of concern (Watkins pers. comm. 2012).

Figure 10. North view of Dakota Skipper habitat along hillsides in the Souris River Region of southeastern Saskatchewan. Photo: N. de Silva.

Figure 11. Dakota Skipper site near Bienfait, Saskatchewan, where mining activity has degraded Dakota Skipper habitat. Photo: N. de Silva.

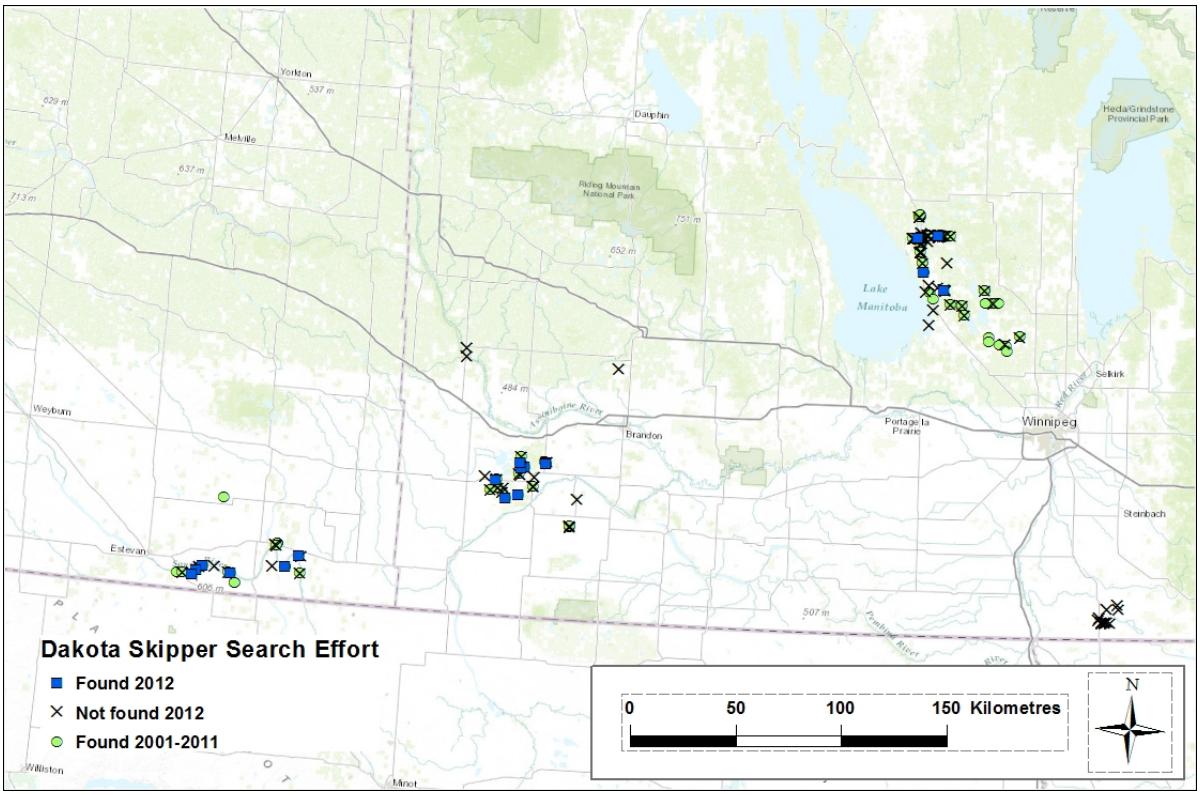

Figure 12. Search effort for Dakota Skipper from 2002- 2012 (see Table 1). Many sites checked in 2012 failed to detect Dakota Skipper.

Saskatchewan habitats

Dakota Skipper habitat in the Souris River Region (Saskatchewan) is upland dry-mesic prairie, spanning less than 75 km east to west (Glen Ewen to Bienfait) along south-facing slopes of the Souris River (Figure 10) (see Royer *et al*. 2008). The habitat is associated with glacial landscapes and characterized by rolling terrain with higher relief. Soils are compact and, with gravel, and variable in moisture and temperature (Royer *et al.* 2008). Bluestem and needle grasses dominate. Wood Lily and Common Harebell are present, yet these habitats also support Upright Prairie Coneflower (*Echinacea angustifolia*) and Common Gaillardia (*Gaillardia aristata*).

These slopes are mostly unsuitable for agriculture and domestic livestock grazing, and aside from oil and gas activity appear in a natural state (see Threats). The inaccessibility of these steep hills and unsuitable agricultural soil are reasons this habitat has remained undeveloped (Royer and Marrone 1992) although this assessment is now more than 20 years old and development has occurred in this region since.

In the US, Dakota Skipper habitat in Minnesota, North Dakota, and South Dakota are a combination of Type A and B, depending on the site. In Minnesota the skipper primarily inhabits dry-mesic prairie with abundant Narrow-leaved Purple Coneflower (*Echinacea angustifolia*) but may also inhabit wet-mesic prairie in low numbers (Dana 1997; Swengel and Swengel 1999). Populations in South Dakota are more common in wet-mesic tall-grass prairies with Wood Lily and Mountain Death Camas than in Minnesota (Skadsen 1997). The habitat in North Dakota is varied (Cochrane and Delphey 2002); however, the wet-mesic habitats in the eastern part of the state appear to support denser populations than the drier habitat in western North Dakota (Royer and Marrone 1992).

Habitat Trends

Since the 1850s over 99% of the native prairie across North America has been converted to agricultural crops or hay fields, or severely degraded by overgrazing, all of which is unsuitable habitat for Dakota Skipper (Samson and Knopf 1994). Historically, there were approximately 340,000 km^2 of tall-grass prairie in North America (Samson and Knopf 1994). Much of this habitat was lost between 1850 and 1920. Now, only about 500,000 ha remain, a decline of over 99%. Mixed-grass prairies have experienced similar losses (Samson and Knopf 1994).

At one time there was approximately 490,000 km^2 of tall- and mixed-grass prairie across the former range of Dakota Skipper. Now only about 10% of that habitat remains (Biodiversity Conservation Alliance *et al*. 2003). In Manitoba, 600,000 ha of tall-grass prairie once existed (Samson and Knopf 1994). Now, only about 5,000 ha (this includes sites that are under a late fall mowing regime) remain, a decline of 99.5%. An even greater loss of mixed-grass prairies has taken place in Manitoba. In Saskatchewan, nearly 82% of the mixed-grass prairie habitat has been lost (Samson and Knopf 1994).

BIOLOGY

Dakota Skipper has four life stages with each stage having its own resource and microhabitat requirements (Scott 1986).

Life Cycle and Reproduction

Dakota Skipper has one generation per year in Canada (Cochrane and Delphey 2002). Adult skippers emerge in mid-June to early July (McCabe 1979; Dana 1991; Royer and Marrone 1992; Skadsen 1997; Swengel and Swengel 1999; Cochrane and Delphey 2002). Across its global range, adults are active for 3 - 5 weeks at a given site (McCabe 1981; Dana 1991). Individual adults can live up to four weeks (McCabe 1981).

In Canada the flight period is from late June to mid-July (June 23 to July 29) (Klassen *et al.* 1989; Environment Canada 2007; Webster pers. comm. 2012), with most records between June 27 and July 8 (COSEWIC 2003; Appendix 1). Adults live one to three weeks (Dana 1991; Dana 1997). Males emerge earlier than females under field conditions (Dana 1991), unlike previous research that suggested simultaneous emergence of the sexes (McCabe 1981). Emergence delay is due to the duration of post-diapause development being longer in females than males (Dana 1991). This observation was confirmed with 2012 survey data (de Silva pers. comm. 2012).

Emergence dates for the three Canadian population centres vary. During 2012 in the Oak Lake Region (Manitoba), the first adults were observed on June 26 and 27. On July 4, 2012, nearly a week later, four males were recorded in the Interlake Region in Lundar. A single female was also present, but the sex ratio showed more males (4:1). In Souris River Region (Saskatchewan) an equal sex ratio was recorded on July 10, suggesting peak flight period.

Mating occurs throughout the flight period, within a day of emergence (McCabe 1981; Dana 1991) and in the afternoon between 14:00 and 16:00 h (Dana 1991). Both sexes may mate more than once, although based on spermatophore counts females likely mate only once (McCabe 1981; Dana 1991). When a second mating does occur, it most likely takes place shortly after the first mating and before the female becomes refractory (Dana 1991).

There is some data on courtship behaviour (McCabe 1981), mating (see Dana 1991) and oviposition. Males perch (e.g., on vegetation), wait and pursue females from high vantage points such as flower heads (e.g.,Purple Conflower) (McCabe 1981; Dana 1991) and the leeward side of slopes in hilly terrain (McCabe 1981; Layberrry *et al.* 1998) as noted in the Souris River Region (Saskatchewan) (COSEWIC 2003; de Silva pers. data 2012). Adults observed in the Interlake Region (Manitoba) perched on thistle (*Cirsium spp.*). When grasses are short and sparse, males will perch on bare soil or short grasses (COSEWIC 2003).

Females lay eggs shortly after mating and continue to oviposit throughout their life span (McCabe 1981). Females lay 20 - 30 eggs daily then oviposition rates decline to approximately two eggs per day at two weeks after emergence (Dana 1991). Potential maximum lifetime fecundity is 180 to 250 eggs per female (Dana 1991).

In Canada oviposition has not been studied. In US populations, oviposition occurs throughout the day and eggs are laid individually on the underside of leaves or the upper surface of erect grasses, usually one to four centimetres above the soil surface (Dana 1991). Females fly slowly above the grass canopy and land on bare spots before crawling into the grasses.

In the US oviposition occurs on broadleaf plants (McCabe 1981; McCabe and Post 1977) and grasses (in decreasing order) Little Bluestem, Big Bluestem, Sideoats Grama, Prairie Dropseed and spear grass (Dana 1991). Oviposition is typically on or near larval host plants (Dana 1991). Larval hosts include this same suite of plants. Secondary hosts are Fall Panicum, Kentucky Bluegrass and, rarely, Sun Sedge (Dana 1991). In controlled, no-choice experiments, other common grasses such as June Grass (*Koehleria cristata*) and Porcupine Grass (*Stipa spartea*) were consumed (McCabe 1981; Dana 1991).

Dakota Skipper eggs hatch within 7-20 days, depending on temperature (McCabe 1981; Dana 1991). Larvae crawl to the base of a grass plant (Pyle 1981) and construct a silk tunnel at or beneath the ground (McCabe 1981; Dana 1991). From July to September, larvae feed at night and return to their silken shelter during the day (McCabe 1981; Klassen *et al.* 1989). Larvae forage for food outside the silk tunnel, returning with the food to the tunnel to eat (McCabe 1981; Dana 1991). Dakota Skipper has six or seven larval instars; the first three last 8 - 18 days under field conditions; the fourth 16 - 35 days (Dana 1991). Field studies in North Dakota observed larval diapause starting in the fourth instar (McCabe 1981) or fifth instar in Minnesota (Dana 1991) usually in October. Weather likely plays a factor in the life stage diapause starts. Dakota Skipper likely enters diapause in the fourth instar in Manitoba and Saskatchewan. Larvae begin feeding again in the spring. Generally the larvae pupate in early June (Klassen *et al*. 1989) and adults emerge in late June to early July.

Physiology and Adaptability

Dakota Skipper is sensitive to habitat changes, and although adults and larvae can use a variety of plants, the butterfly is rarely found in disturbed prairie habitats (McCabe 1981). Alteration of native plant community results in the loss of critical resources for the skipper, which is unlikely to move to new prairie habitats that are more than one kilometre away from the original habitat (Dana 1991; Royer and Marrone 1992). The poor dispersal capabilities and dependence on a specific suite of host plant species make Dakota Skipper especially susceptible to habitat degradation, particularly when remnant populations are widely separated.

Dispersal and Migration

Dakota Skipper is not migratory. Little information is available on the dispersal of the skipper in Canada or the United States. In a mark-release-recapture experiment at the Hole-in-the-Mountain preserve in Minnesota, marked adults moved across 200 m of unsuitable habitat between two sections of prairie (Dana 1991). Dana (1991) estimated average adult movements of about 300 m over a three to seven day period. Dakota Skipper experts interviewed by Cohrane and Delphey (2002) thought it was unlikely that the skipper would move more than one kilometre across non-native prairie habitat (crop fields or pastureland) to another prairie patch. Royer and Marrone (1992) also suggested that the species was unlikely to disperse far from their native prairie habitats. Unmarked Dakota Skippers from one site were reported as possibly dispersing to an adjoining previously uninhabited site 800 m away (Skadsen 1999). Additional studies are required to examine the potential long-range dispersal capabilities of this species.

Interspecific Interactions

Dakota Skipper is predated upon by Ambush bugs (*Phymata sp*.), flower spiders, (*Misumena vatia* Clerck and *Misumenops carletonicus* Dendale and Redner) and various orb weaver spiders (Araneidae: *Misumenops* spp.) (in Minnesota and North Dakota) (Cochrane and Delphey 2002, McCabe 1981; Dana 1991). These predators were rarely found in Common Harebell in North Dakota (McCabe 1981). Orb weaver spiders were less effective predators of young adult Dakota Skipper, which can break from the webbing. Old, worn adults, however, are less successful in breaking away from the webs (McCabe 1981).

An egg parasitoid, *Ooencyrtus* sp., has been reared from field-collected ova of Dakota Skipper in Minnesota. Ants have been observed seizing wandering larvae (Dana 1991). Other potential predators include robber flies, dragonflies and birds. Small mammals and ground-foraging birds may prey on skippers as observed with other butterfly species (Lederhouse *et al*. 1987).

At most sites in Manitoba and Saskatchewan, Garita Skipper (*Oarisma garita* (Reakirt)) and Long Dash Skipper (*P. mystic*) are also recorded at Dakota Skipper sites. Few interactions between Dakota Skipper and other species of butterflies have been observed. Occasionally, male Dakota Skippers are observed to briefly pursue a skipper of another species. Most interactions observed are Long Dash Skipper, which often occurs in the adjacent wetter sections of the prairies (e.g., next to Dakota Skipper sites). It is unlikely that there is any competition for larval or nectar food resources among these species of butterflies (COSEWIC 2003).

POPULATION SIZES AND TRENDS

Sampling Effort and Methods

The first population estimates in Canada were made in 2002 (fieldwork for the COSEWIC 2003 status report) at most sites where Dakota Skipper was recorded. Dakota Skippers were counted in one to nine 0.5-ha sections of the drier prairie within each prairie site surveyed. Counts were made while walking at a slow pace in a zig-zag path through the entire plot. It usually took about 15-20 minutes to count the adults in a 0.5-ha section of prairie. A basic population estimate was calculated based on the density of adults observed in the drier areas and the estimated proportion of the prairie with this kind of habitat [(mean number of adults per hectare in the 0.5 hectare sections counted) x (estimated proportion of drier prairie) x (estimated size of prairie)]. The size of the prairies was estimated visually with the aid of landmarks and topographic maps.

For the 2012 population estimate, only the total number of skippers observed on the survey date per site was multiplied by the estimated size of suitable habitat (ha)**.**

Abundance

During 2002 (initial status report assessment), 436 adults (339 males, 97 females) of Dakota Skipper were counted at 17 sites (plus 29 sub-sites) in the Inter-lake Region of Manitoba (COSEWIC 2003). The prairies at these sites varied greatly in size from 0.5 ha to 500 ha in some of the larger prairie complexes. The total area occupied by Dakota Skipper in Manitoba was estimated at around 2,700 ha. The estimated number of adults per site varied from 15 individuals at a small one-hectare prairie east of St. Laurent, to 2,000 individuals in a 500-hectare series of prairies south of Lundar. The density of Dakota Skipper also varied within a given prairie. At one 250-hectare prairie east of Lundar, Dakota Skipper was counted in nine sections of the prairie.

The densities of adults in each of the nine sections were 24, 8, 18, 6, 4, 24, 4, 118, and 6 individuals per hectare (average density = 23.5 individuals/ha). No adults were observed in the low, wetter sections of the prairie at this site. The highest density occurred within a two-hectare section of undisturbed prairie containing extensive areas of short bunch grasses.

The total number of Dakota Skipper in the Interlake Region was estimated to be near 12,000 individuals on the dates the survey was done (2002). These estimates need to be viewed with caution. Surveys were not done at peak flight, and the total seasonal population of reproductive adults was likely higher than the one-day estimates. Dana (1991) estimated that only a third to a fifth of adults in a given population are alive simultaneously. Thus, the total seasonal population of this skipper in the inter-lake region may be between 25,000 and 35,000 individuals (COSEWIC 2003).

On July 10, 2002, a total of 25 males and 22 females were counted at the 100- and 200-ha sites near Griswold, Manitoba. The population was estimated at around 1,750 individuals on the date of the survey. The total seasonal adult populations may be between 3,000 and 5,000 individuals although this estimate is viewed with caution (see above) (COSEWIC 2003).

In 2002, Dakota Skipper was known from four sites in Saskatchewan. The prairie near Oxbow covers an area of about 50 ha and the population at this site was estimated to be at least 250 individuals. No estimates are available on the population size and area of the prairies at the other three sites in Saskatchewan (COSEWIC 2003).

In 2002, Dakota skipper population in Canada was estimated from 28,500 - 40,500 (COSEWIC 2003): 1) Interlake Region (25,000 – 30,000 adults); 2) Oak Lake Region (3,000 – 5,000 adults) and 3) Souris River Region (250 adults) (COSEWIC 2003).

Based on results from 2012 surveys and using the same methods described above, the Dakota Skipper population in Canada in 2012 is estimated at 14,000 individuals: 1) Interlake Region (Manitoba) population 5,450 adults; 2) Oak Lake Region (Manitoba) 7,670 adults; and 3) Souris River Region (Bienfait to Glen Ewen) (Saskatchewan) 890 adults. It appears that while there may be more known sites of larger size in the Interlake Region the sites in southwest Manitoba are generally of higher quality of habitat and have greater abundance. The Interlake Region had 70 hours devoted to surveying (11 Dakota skippers were observed), Oak Lake Region had 20 hours of observation time (61 skippers observed) and the Souris Region had a total of 11 hours (15 observed). In 2012 the three highest single counts occurred in the Oak Lake Region, similar to 2007 survey results that recorded 98 and 273 Dakota Skippers in 2 separate sites during two three-and-a-half-hour observation periods.

Similar densities of Dakota Skipper have been observed at a number of other wet-mesic tall-grass to dry-mesic mixed-grass prairies in the United States. Royer and Marrone (1992) reported densities of 40 individuals per hectare in wet-mesic bluestem prairies in North Dakota. In the Hole-in-the-Mountain preserve in Minnesota, Dana (1991) found 25 adults per hectare in a 40 ha area at peak seasonal abundance. He estimated that the total seasonal population was 2,000 - 3,000 adults. These high densities only persist for 7-10 days during the flight season (Dana 1991).

Factors that influence population estimates include the accuracy of estimated habitat size (ha). A site with few observations yet higher quality and quantity of habitat might be estimated to have more skippers present than a smaller (ha) site. In addition, surveys may not have been at peak flight (daily or seasonal), and the total seasonal population of reproductive adults may be higher than the one-day estimates. Dana (1991) estimated that only a third to a fifth of adults in a metapopulation are simultaneously alive.

Fluctuations and Trends

The population structure of Dakota Skipper is unknown, although the species does not appear to have extreme fluctuations. It is not known whether populations were contiguous or comprised of several larger metapopulations throughout the former expanse of tall-grass and mixed-grass prairies in North America (Britten and Glasford 2002). Current populations of the skipper are now highly fragmented and restricted to few remnant prairies (Cochrane and Delphey 2002). Most Dakota Skipper sites in Canada have been recorded since 2000, mainly due to increased search effort.

Rescue Effect

In Canada the three population centres are separated by a minimum of 100 km including populations in the United States. Unless a source population exists within one kilometre (Dana 1991; Royer and Marrone 1992) it is unlikely an extirpated or at-risk population will be re-founded by immigrants (McCabe 1981; Swengel 1998). Within each Canadian population centre, a number of the sites are within dispersal distance (1km) and populations may be interconnected.

THREATS AND LIMITING FACTORS

The International Union for Conservation of Nature-Conservation Measures Partnership (IUCN-CMP) threat calculator (Salafsky *et al.* 2008; Masters *et al.* 2009) was used to classify and list threats to Dakota Skipper. The overall Threat Impact for Dakota Skipper is Very High (Table 3).

Climate Change and Severe Weather (Threat 11)

Storms and flooding (11.4)

The predominant threat to Dakota Skipper is increased frequency and severity of flooding of the low-relief habitat (see Habitat) within all three population centres. Historically, prairie ecosystems experienced periodic flooding. However, present-day habitat patches are no longer interconnected, preventing recolonization between seasonally flooded sites.

The highest threat to Dakota Skipper during 2012 surveys was habitat loss at known sites due to flooding (de Silva pers. comm. 2012). During the 2012 survey, seven sites were completely submerged and/or inaccessible due to flooding. In the Interlake Region around the Shoal Lakes, three sites were flooded, as they had been the year prior. In southwestern Manitoba an additional four sites where the skipper has been recorded within the last 10 years (COSEWIC 2003; Westwood 2010; Rigney pers. comm. 2012) were inaccessible due to high water levels. Westwood (2010) cites flooding as having a major impact to skipper activity in 2010.

In Saskatchewan, flooding in 2011 partially disturbed the site overlooking Bow Valley Regional Park. Prolonged or excessive flooding has been blamed for the loss of at least one site prior to 2012 in South Dakota (Skadsen 1997). Many of the lower-lying sites in Saskatchewan are within potential flood areas.

Conversely, flooding may have preserved some Dakota Skipper habitat, as this land is generally deemed unsuitable for farming.

Agriculture and Aquaculture (Threat 2)

Annual and perennial non-timber crops (2.1)

Since the 1850s over 99% of the native prairie across North America has been converted to agricultural crops or hay fields (Samson and Knopf 1994). Within Canada there has been a 99.9% decline in the tall-grass prairie habitat within Manitoba and an 81% decline in the mixed-grass prairie in Saskatchewan (Samson and Knopf 1994). Similar declines have been noted in the United States (Samson and Knopf 1994; Cochrane and Delphey 2002).

Dakota Skipper sites in Canada are located on prairie remnants, many adjacent to agricultural land. These prairie remnants remain where the land is unsuitable for agriculture largely due to poor soils, steeper terrain (McCabe 1981; Royer and Marrone 1992) and risk of flooding (especially in Manitoba). Agricultural land conversion is more likely to occur at the flatter Manitoba sites and less so within the steeper slopes within the habitat in Saskatchewan.

Habitat conversion has led to the extirpation of at least two sites since the initial COSEWIC (2003) status report. During 2012 surveys, one known site near Fannystelle (outside Winnipeg), Manitoba, was presumed extirpated due to site conversion in 2002 and one site near Elgin (extant in 2002) had been converted to cropland by 2012.

Livestock farming and ranching (2.3)

Overgrazing appears to adversely impact tall-grass and especially mixed-grass prairies (McCabe and Post 1977; Royer and Marrone 1992; Royer and Royer 1998). Dana (1997) found that cattle grazing reduced skipper numbers in direct proportion to grazing intensity. Grazing may reduce or eliminate adult nectar sources, remove larval host plants (McCabe 1981), and lead to soil compaction and larval mortality from trampling (McCabe 1981; Dana 1997; Cochrane and Delphey 2002). Dakota Skipper abundance declines with degradation of the floral community (Skadsen 2009).

Overgrazing may be detrimental to populations of Dakota Skipper, although moderate or low grazing may benefit the species by creating areas of mixed-grass vegetation structure preferred by the skipper (Dana 1991). Schlicht (1997) found Dakota Skipper to be abundant on prairies with light grazing, but absent on adjacent idle prairies.

Grazing occurs at both Manitoba population centres. In 2002, in the Interlake Region (Manitoba), few nectar sources were observed on grazed prairies, most grasses had been grazed to less than 10 cm height and Dakota Skipper was not recorded in these prairies. In 2012, Dakota Skipper was not present at two previously known sites near Inwood (Interlake Region), Manitoba. This site is within a bison ranch, which has been operational for nearly two decades—it is unknown whether grazing intensity, timing or frequency has increased in recent years. In the Oak Lake region (Manitoba), two sites near Griswold where Dakota Skipper was recorded in 2002 and 2007 has recent cattle grazing (Rigney pers. comm. 2012), and both skipper and indicator plants were absent in 2012.

Studies within grazed sites in Minnesota found exotic grasses increased while native species richness and diversity declined (Dana 1997). In North Dakota, both Dakota Skipper and adult nectar sources were rarely found on overgrazed prairies (McCabe 1981).

Energy Production and Mining (Threat 3)

Mining and quarrying (3.2)

Gravel mining and mine expansion over a 5-year span (Figure 11) may have impacted one site in the Souris River Region (near Bienfait) Saskatchewan. This expansion may have created unsurpassable barriers to movement for Dakota Skipper. Dakota Skipper was recorded in 2007 and 2012 (only one record) yet habitat quality has since declined (N. deSilva pers. comm. 2012).

Within the species' US range, gravel mining in Minnesota has occurred at some Dakota Skipper sites (Dana 1997), and at present a minimum of seven sites are threatened (Minnesota Department of Natural Resources 2006), the most recent being Felton Prairie (USFWS 2011).

Biological Resource Use (Threat 5)

Hunting and collecting terrestrial animals (5.1)

In Manitoba it is illegal to disturb or remove Dakota Skipper without a provincial scientific permit. Dakota Skipper is not collected for commercial purposes and collection of vouchers for scientific purposes is not a likely threat. In recent years, the collection of vouchers from known sites in Manitoba is no longer permitted due to concern for low populations (Watkins pers. comm. 2012). This is not considered a threat.

Gathering terrestrial plants (5.2)

Haying and mowing is a potential threat to Dakota Skipper populations. However, depending on seasonal timing, haying may also benefit Dakota Skipper populations. Late season mowing reduces the adverse effects of mowing early and may benefit Dakota Skipper populations (McCabe 1981; Skadsen 1997; Swengel and Swengel 1999). If habitat is mowed before the flight period, adult nectar sources are eliminated and non-native grasses such as Kentucky bluegrass may outcompete larval and nectar sources (McCabe 1981; Royer and Marrone 1992; Dana 1997).

During 2002 (COSEWIC 2003) and 2012 surveys in Manitoba and Saskatchewan, adults were more commonly recorded from sites with a fall mowing regime, especially in the Lundar area. Plots on late summer or fall mowing regimes, either annually or during alternate years, had mid-height grasses and appeared to have more butterflies (de Silva pers. comm. 2012).

In a systematic survey in three US states, Dakota Skipper was more abundant in fall-hayed prairies than prairies left idle, grazed or burned (Swengel and Swengel 1999). Most Dakota Skipper populations North and South Dakota are found in prairies with a late season mowing regime (McCabe 1981; Skadsen 1997).

Natural System Modifications (Threat 7)

Fire and fire suppression (7.1)

Wildfires are important for sustaining the native prairie species (Bragg 1995). Historic wildfires were generally patchy, less intense, did not burn the entire habitat and thus allowed for butterfly recolonization (Swengel 1998). Fire suppression is ongoing at all population centres, although the rate and severity are unknown.

Other ecosystem modifications (controlled or prescribed burning) (7.3)

Today, fire is an important tool in the conservation and restoration of tallgrass prairie (Vogel *et al*. 2010) and used by land managers to maintain the native grassland structure and floral complexes. Prescribed burns differ from wildfires in that remnant prairies are often burned more frequently, more thoroughly and during seasons when wildfires would not normally occur (Orwig and Schlicht 1999). Prescribed burning of isolated prairies can cause local extirpation of certain insect species, especially habitat specialists such as Dakota Skipper and Poweshiek Skipperling (McCabe 1981; Schlicht and Saunders 1995; Swengel 1996, 1998, 2001; Orwig and Schlicht 1999).

The timing of prescribed burning may affect Dakota Skipper. Early summer burns have the potential to destroy Dakota Skipper eggs (McCabe 1981). Dana (1991) suggested that rotational, controlled, early spring burning might benefit Dakota Skipper by increasing nectar plant density and reducing high levels of litter that might negatively impact development of the immature stages.

The Dakota Skipper population at the Tall Grass Prairie Preserve (TGPP) may have been extirpated from controlled and unmanaged burns (Westwood 2010). Dakota Skipper was reported in the TGPP as recently at 2000 (Britten and Glasford 2002; COSEWIC 2003). Prescribed, rotational, early spring burning has been the major management practice used to prevent growth of woody vegetation and maintain the native prairie flora the TGPP (COSEWIC 2003). In 2001 controlled burning occurred, and in 2002 a wildfire occurred that burned more than half of the preserve. These fires (combined with grazing) may have been the disturbances that led to the extirpation of Dakota Skipper at this site (Westwood 2010).

Habitat fragmentation may also increase the effects of genetic drift (Britten and Glasford 2002), and make the Dakota Skipper more vulnerable to extirpation via natural disturbances such as flood or fire.

In the US, prescribed burning may have caused the extirpation of the last known Dakota Skipper site in Iowa (Orwig and Schlicht 1999). In Minnesota, significantly lower abundances of Dakota Skipper and other habitat specialists were observed at sites that had been burned than at sites that had been hayed (Swengel 1996, 1998; Swengel and Swengel 1999). Two to four years after early-spring burning, the abundance of Dakota Skipper (and several other habitat specialist butterflies) was still lower than pre-burn abundances on several Minnesota reserves (Swengel 1996), showing that burning is a major threat to this species. No known Dakota Skipper sites are currently scheduled for prescribed burning.

Invasive and Other Problematic Species and Genes (Threat 8)

<u>Invasive non-native/alien species (8.1)</u>

Non-native plants such as Leafy Spurge (*Euphorbia esula*), Kentucky Blue Grass and Smooth Brome (bromegrass), are threats to native prairie habitats. Late season invasive plants such as Smooth Brome are unsuitable forage and can potentially out-compete and replace the native plants Dakota Skipper larvae require (Dana 1991). Dakota Skipper has been extirpated from at least one site in North Dakota by Leafy Spurge (Royer and Royer 1998). The extent of these plants at Dakota Skipper sites in Manitoba and Saskatchewan is unknown.

Problematic native species (8.2)

Natural succession and the expansion of woody plant species, growth of shrubs and grasses, subsequent reduction in nectar sources, and litter accumulation contribute to the decline in quality of Dakota Skipper habitat (McCabe 1981; Dana 1997; Skadsen 2003). Periodic disturbance is needed to sustain the early seral conditions needed for Dakota Skipper host plants. The lack of long-term natural (e.g., fires) or anthropogenic (e.g., livestock grazing, mowing, or prescribed burns) disturbance has led to widespread natural succession in all Dakota Skipper habitats. One particular site near Grand Clariere, Manitoba, is experiencing rapid tall-grasses and shrub growth and may be at greater risk than other Dakota Skipper sites.

Research on Dakota Skipper in other parts of its global range suggests natural succession is necessary for habitat maintenance. In South Dakota overall prairie-dependent butterfly richness declined from natural succession by woody plants and invasive species, when compared to anthropogenically managed sites (Skadsen 2006). Following a prescribed burn, Dakota Skipper returned to a site that previously had ongoing natural succession (Skadsen 2008). Habitats that were not periodically disturbed in the Felton Prairie, Minnesota, had reduced Dakota Skipper abundance (Braker 1985). Significantly lower Dakota Skipper abundance was recorded on unmanaged prairies compared to sites on fall haying regimes (Swengel and Swengel 1999).

Pollution (Threat 9)

Agricultural and forestry effluents (9.3)

The broad application of insecticides for agricultural pest control can indirectly harm or kill Dakota Skipper (Royer and Marrone 1992). The use of herbicides to control non-native plants may impact nectar and larval host plants (Royer and Marrone 1992). Some Dakota Skipper sites in Canada are near agricultural properties, yet the impacts of agricultural pest control on this butterfly is unknown.

Limiting Factors

Dakota Skipper appears to have limited flight and dispersal ability, ranging less than 300 m from occupied sites (Dana 1997).

Nectar and host plant quantity and quality limit oviposition sites and larval development (see Habitat). Wildfire, soil pH, humidity and extreme winter temperatures affect larval survival (McCabe 1979, 1981).

Larvae have natural protection mechanisms against excess moisture (MacNeill 1964) yet high humidity may still pose a risk. Bacterial septicemia (MacNeill 1964) may be a mortality factor for Dakota Skipper (McCabe 1981).

Fully-grown larvae have a white glandular patch on the ventral portions of abdominal segments seven and eight that contains a waxy water-repellent substance. Prior to pupation, the larvae distribute this waxy material throughout the pupal chamber (McCabe 1981; Dana 1991). This substance may protect the larvae from the effects of high humidity, which may be a limiting factor to survival (MacNeill 1964) especially during flooding.

Predation, disease, and interspecific competition are not considered detrimental to Dakota Skipper populations (Dana 1991; Royer and Marrone 1992).

PROTECTION, STATUS AND RANKS

Legal Protection and Status

In Canada Dakota Skipper was assessed as threatened by COSEWIC in 2003 and listed under the federal *Species at Risk Act* (SARA) in 2005.

In Manitoba, Dakota Skipper is listed as threatened under the Manitoba *Endangered Species Act* (CanLII 2006). Under this Act it is illegal to; 1) kill, injure, possess, disturb, or interfere with a threatened species, 2) destroy, disturb, or interfere with the habitat of a threatened species, or 3) damage, destroy, obstruct, or remove a natural resource on which a threatened species depends for its life and propagation. Special permits are also required for its study in Manitoba. In Saskatchewan the species is not listed under the provincial *Wildlife Act* (1998) and therefore not afforded protection under this legislation.

Non-Legal Status and Ranks

The native mixed- and tall-grass prairies of North America are considered critically endangered ecosystems (Samson and Knopf 1994; Steinauer and Collins 1994; Stephens *et al*. 2008; Koper *et al.* 2010).

In Canada the subnational conservation status ranks for Dakota Skipper are imperilled (S2) in Manitoba and critically imperilled (S1) in Saskatchewan. The national status rank in both Canada and the United States is imperilled (N2) and globally the species is imperilled (G2) (NatureServe 2013).

In the United States, the subnational conservation status ranks for Dakota Skipper are presumed extirpated (SX) in Illinois, critically imperiled (S1) in Iowa, imperiled (S2) in Minnesota, North Dakota (S2) and South Dakota (S2) (NatureServe 2012). The species is listed as Vulnerable by the International Union for Conservation of Nature (IUCN) under the A criterion; and is imperilled on the Xerces Society Red List (Xerces Society 2012).

Dakota Skipper is a candidate for listing under the United States *Endangered Species Act* due to declining populations as a result of development of native prairie for grazing, urban growth and herbicide use (USFWS 2009).

Habitat Protection and Ownership

In Canada no extant Dakota Skipper sites are recorded from federal or provincial lands. Dakota Skipper was formerly present within the 2,200 ha Tall Grass Prairie Preserve (TGPP); however, this population is likely extirpated as it has not been recorded during surveys in 2002 and 2012 (Westwood pers. comm. 2012).

Almost all Dakota Skipper sites in Manitoba are on privately owned land. These sites are currently not being used for agricultural purposes other than hay production.

Most sites in Saskatchewan appear to be on private lands, with the exception of one site near Oxbow at Bow Valley Regional Park, which is partly on land owned by the regional municipality. Local government land is often considered private by provincial governments.

In the United States, 49% of the 146 sites where Dakota Skipper is presumed extant are privately owned and 27% are state or federally owned.

ACKNOWLEDGEMENTS

Thank you to Canadian Wildlife Service, Environment Canada, for funding this report. Thanks to, in no particular order; Reggie Webster (New Brunswick Museum), Richard Westwood (University of Winnipeg), Robert Dana (MN DNR), Phil Delphey (USFWS), and Dave Larson for sharing their invaluable knowledge on this species, its habitat, and plant identification. A special thank you to Christa Rigney (University of Manitoba) and her team, Derek Eyer and Kathryn Dearborn, for assistance in the field, site access and passing on their experiences and insights on the species.

Thanks also go to Bill Watkins and Jessica Elliot (Manitoba Conservation), for securing permits and providing the resources necessary for completing this survey, and to Greg Brown (Manitoba Conservation) for the generous hospitality and invaluable information regarding the Interlake area.

Thank you to COSEWIC Secretariat Science Officers Monique Goit and Angèle Cyr, and Arthropod SSC Co-chairs Jennifer Heron and Laurence Packer, along with the other members of the Arthropods Species Specialist Subcommittee. To Jenny Wu and Alain Filion of the COSEWIC Secretariat, thank you for your assistance in generating maps used in this report.

Also thanks to all those who aided in tracking down collections, specimens and records as well as providing access to these specimens; Don Lafontaine (CNC), Cory Sheffield (Royal Saskatchewan Museum), John M. Burns (Smithsonian Institution National Museum of Natural History) and Andrew Warren (Florida Museum of Natural History).

Reginald P. Webster wrote the first status report for Dakota Skipper (COSEWIC 2003).

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BIOGRAPHICAL SUMMARY OF REPORT WRITER(S)

Nicholai de Silva holds an Honours Bachelor of Science as well as MSc in Biology from York University. He began his entomology career as an undergraduate research assistant helping to curate various graduate student projects in Canada's largest wild bee collection, the Packer Collection at York University. His undergraduate work focused on barcoding the native bee fauna of Thailand in conjunction with a countrywide entomology survey. His MSc work, under the tutelage of Dr. Laurence Packer, was a systematic revision of an interesting group of cleptoparasitic bees (*Coelioxys*) in Canada. Other side projects have included taxonomic work on other genera such as *Systropha,* as well as using trap nests to look at different aspects of native cavity-nesting bees. He has conducted or been involved in a number of inventory surveys including field experience in central and western Canada, and throughout the U.S.A.

COLLECTIONS EXAMINED

Loans of specimens including males and females of *P. mystic*, *P. themistocles*, and *H. assiniboa*, and Dakota Skipper were obtained from the Canadian National Collection, Ottawa, Ontario, as well as the Royal Saskatchewan Museum, Regina, Saskatchewan. Collections held at the University of Winnipeg were also examined. For a complete listing of database specimens held at the Royal Saskatchewan Museum (RSM), the Manitoba Museum previously the Manitoba Museum of Man and Nature (MMNM), and the Canadian National Collection (CNC) see Appendix 1.

Appendix 1. Dakota Skipper specimens and vouchers. RSM = Royal Saskatchewan Museum; MMMN = Manitoba Museum of Man and Nature, Winnipeg, Manitoba; and CNC = Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario.

Site Number	Site Name	Collection	Catalog	Province	Date	Collector
19	Oxbow	RSM	E-645	Saskatchewan	7/19/2001	R. Hooper
19	Oxbow	RSM	E-646	Saskatchewan	7/19/2001	R. Hooper
19	Oxbow	RSM	E-647	Saskatchewan	7/19/2001	R. Hooper
19	Oxbow	RSM	E-648	Saskatchewan	7/27/2001	R. Hooper
20	Roche Percee	RSM	E-649	Saskatchewan	7/29/2002	R. Hooper
21	Miniota	CNC	164991	Manitoba	06/07/1944	
21	Miniota	CNC	164992	Manitoba	/-7-22	
22	Lundar	CNC	164993	Manitoba	29/06/1987	
22	Lundar	CNC	164994	Manitoba	29/06/1987	
22	Lundar	CNC	164995	Manitoba	29/06/1987	
22	Lundar	CNC	164996	Manitoba	29/06/1987	
22	Lundar	CNC	164997	Manitoba	29/06/1987	
22	Lundar	CNC	164998	Manitoba	29/06/1987	
22	Lundar	CNC	164999	Manitoba	29/06/1987	
22	Lundar	CNC	165000	Manitoba	29/06/1987	
22	Lundar	CNC	165001	Manitoba	29/06/1987	
22	Lundar	CNC	165002	Manitoba	29/06/1987	
22	Lundar	CNC	165003	Manitoba	29/06/1987	
22	Lundar	CNC	165004	Manitoba	29/06/1987	
23	Griswold	CNC	439913	Manitoba	10/07/2002	R.P. Webster
24	Coldwell Twnship	CNC	439914	Manitoba	06/07/2002	R.P. Webster
24	Coldwell Twnship	CNC	439915	Manitoba	06/07/2002	R.P. Webster
25	Eriksdale Twnship	CNC	439916	Manitoba	07/07/2002	R.P. Webster
26	Oak Lake Rd.	CNC	439917	Manitoba	07/07/2002	R.P. Webster

Site Number	Site Name	Collection	Catalog	Province	Date	Collector
26	Oak Lake Rd.	CNC	439918	Manitoba	07/07/2002	R.P. Webster
27	St. Laurent Twnship	CNC	439919	Manitoba	08/07/2002	R.P. Webster
28	Coldwell Twnship	CNC	439920	Manitoba	07/07/2002	R.P. Webster
29	Coldwell Twnship	CNC	439921	Manitoba	07/07/2002	R.P. Webster
30	Coldwell Twnship	CNC	439922	Manitoba	08/07/2002	R.P. Webster
31	St. Laurent Twnship	CNC	439923	Manitoba	08/07/2002	R.P. Webster
32	Lundar	CNC	439924	Manitoba	08/07/2002	R.P. Webster
33	St. Laurent Twnship	CNC	439925	Manitoba	08/07/2002	R.P. Webster
34	Coldwell Twnship	CNC	439926	Manitoba	08/07/2002	R.P. Webster
34	Coldwell Twnship	CNC	439927	Manitoba	08/07/2002	R.P. Webster
35	Coldwell Twnship	CNC	439928	Manitoba	02/07/2002	R.P. Webster
36	Lundar	CNC	439929	Manitoba	06/07/2002	R.P. Webster
37	Coldwell Twnship	CNC	439930	Manitoba	08/07/2002	R.P. Webster
38	Coldwell Twnship	CNC	439931	Manitoba	08/07/2002	R.P. Webster
14-SR	Oxbox	CNC	439932	Saskatchewan	11/07/2002	R.P. Webster
39	Inwood	CNC	439933	Manitoba	07/07/2002	R.P. Webster
40	Griswold	CNC	439934	Manitoba	10/07/2002	R.P. Webster
41	Lundar	CNC	439935	Manitoba	02/07/2002	R.P. Webster
42	St. Laurent Twnship	CNC	439936	Manitoba	08/07/2002	R.P. Webster
43	St. Laurent	CNC	439937	Manitoba	08/07/2002	R.P. Webster
22	Lundar	MMMN	225149	Manitoba	08/07/1982	P. Klassen
22	Lundar	MMMN	225150	Manitoba	08/07/1982	P. Klassen
22	Lundar	MMMN	225151	Manitoba	08/07/1982	P. Klassen
22	Lundar	MMMN	225152	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225153	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225154	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225155	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225156	Manitoba	03/07/1984	P. Klassen

Site Number	Site Name	Collection	Catalog	Province	Date	Collector
22	Lundar	MMMN	225157	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225158	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225159	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225160	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225161	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225162	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225163	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225164	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225165	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225166	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225167	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225168	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225169	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225170	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225171	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225172	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225173	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225174	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225175	Manitoba	08/07/1985	P. Klassen
44	Tolstoi	MMMN	225176	Manitoba	27/06/1986	P. Klassen
44	Tolstoi	MMMN	225177	Manitoba	27/06/1986	P. Klassen
44	Tolstoi	MMMN	225178	Manitoba	27/06/1986	P. Klassen
44	Tolstoi	MMMN	225179	Manitoba	27/06/1986	P. Klassen
44	Tolstoi	MMMN	225180	Manitoba	28/06/1986	P. Klassen
44	Tolstoi	MMMN	225181	Manitoba	28/06/1986	P. Klassen
44	Tolstoi	MMMN	225182	Manitoba	28/06/1986	P. Klassen
44	Tolstoi	MMMN	225183	Manitoba	28/06/1986	P. Klassen

Site Number	Site Name	Collection	Catalog	Province	Date	Collector
44	Tolstoi	MMMN	225184	Manitoba	28/06/1986	P. Klassen
44	Tolstoi	MMMN	225185	Manitoba	08/07/1986	P. Klassen
44	Tolstoi	MMMN	225186	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225187	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225188	Manitoba	12/07/1993	P. Klassen
22	Lundar	MMMN	225189	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225190	Manitoba	08/07/1985	P. Klassen
45	Oak Lake	MMMN	225191	Manitoba	03/07/1991	P. Klassen
45	Oak Lake	MMMN	225192	Manitoba	03/07/1991	P. Klassen
46	Stuartburn	MMMN	225193	Manitoba	24/06/1987	P. Klassen
47	Fannystelle	MMMN	225194	Manitoba	24/06/1991	P. Klassen
44	Tolstoi	MMMN	225195	Manitoba	27/06/1986	P. Klassen
44	Tolstoi	MMMN	225196	Manitoba	27/06/1986	P. Klassen
44	Tolstoi	MMMN	225197	Manitoba	27/06/1986	P. Klassen
44	Tolstoi	MMMN	225198	Manitoba	27/06/1986	P. Klassen
44	Tolstoi	MMMN	225199	Manitoba	27/06/1986	P. Klassen
44	Tolstoi	MMMN	225200	Manitoba	07/07/1986	P. Klassen
44	Tolstoi	MMMN	225201	Manitoba	07/07/1986	P. Klassen
44	Tolstoi	MMMN	225202	Manitoba	07/07/1986	P. Klassen
44	Tolstoi	MMMN	225203	Manitoba	07/07/1986	P. Klassen
44	Tolstoi	MMMN	225204	Manitoba	08/07/1986	P. Klassen
44	Tolstoi	MMMN	225205	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225206	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225207	Manitoba	23/06/1987	P. Klassen
22	Lundar	MMMN	225208	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225209	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225210	Manitoba	08/07/1985	P. Klassen

Site Number	Site Name	Collection	Catalog	Province	Date	Collector
22	Lundar	MMMN	225211	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225212	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225213	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225214	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225215	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225216	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225217	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225218	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225219	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225220	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225221	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225222	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225223	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225224	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225225	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225226	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225227	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225228	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225229	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225230	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225231	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225232	Manitoba	08/07/1985	P. Klassen
46	Stuartburn	MMMN	225233	Manitoba	28/06/1986	P. Klassen
45	Oak Lake	MMMN	225234	Manitoba	03/07/1991	P. Klassen
45	Oak Lake	MMMN	225235	Manitoba	03/07/1991	P. Klassen
45	Oak Lake	MMMN	225236	Manitoba	03/07/1991	P. Klassen
22	Lundar	MMMN	225237	Manitoba	08/07/1985	P. Klassen

Site Number	Site Name	Collection	Catalog	Province	Date	Collector
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22	Lundar	MMMN	225239	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225240	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225241	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225242	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225243	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225244	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225245	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225246	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225247	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225248	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225249	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225250	Manitoba	03/07/1984	P. Klassen
22	Lundar	MMMN	225251	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225252	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225253	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225254	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225255	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225256	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225257	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225258	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225259	Manitoba	08/07/1985	P. Klassen
22	Lundar	MMMN	225260	Manitoba	08/07/1985	P. Klassen
44	Tolstoi	MMMN	225261	Manitoba	07/07/1986	P. Klassen
44	Tolstoi	MMMN	225262	Manitoba	07/07/1986	P. Klassen
44	Tolstoi	MMMN	225263	Manitoba	07/07/1986	P. Klassen
44	Tolstoi	MMMN	225264	Manitoba	07/07/1986	P. Klassen

Site Number	Site Name	Collection	Catalog	Province	Date	Collector
44	Tolstoi	MMMN	225265	Manitoba	08/07/1986	P. Klassen
44	Tolstoi	MMMN	225266	Manitoba	08/07/1986	P. Klassen
44	Tolstoi	MMMN	225267	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225268	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225269	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225270	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225271	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225272	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225273	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225274	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225275	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225276	Manitoba	23/06/1987	P. Klassen
44	Tolstoi	MMMN	225277	Manitoba	24/06/1987	P. Klassen
44	Tolstoi	MMMN	225278	Manitoba	24/06/1987	P. Klassen
44	Lundar	MMMN	225279	Manitoba	24/06/1987	P. Klassen
44	Lundar	MMMN	225280	Manitoba	24/06/1987	P. Klassen
48	Inwood	MMMN	225281	Manitoba	29/06/1987	P. Klassen
48	Inwood	MMMN	225282	Manitoba	29/06/1987	P. Klassen
48	Inwood	MMMN	225283	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225284	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225285	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225286	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225287	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225288	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225289	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225290	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225291	Manitoba	29/06/1987	P. Klassen

Site Number	Site Name	Collection	Catalog	Province	Date	Collector
22	Lundar	MMMN	225292	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225293	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225294	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225295	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225296	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225297	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225298	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225299	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225300	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225301	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225302	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225303	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225304	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225305	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225306	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225307	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225308	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225309	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225310	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225311	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225312	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225313	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225314	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225315	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225316	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225317	Manitoba	07/07/1987	P. Klassen
22	Lundar	MMMN	225318	Manitoba	07/07/1987	P. Klassen

Site Number	Site Name	Collection	Catalog	Province	Date	Collector
22	Lundar	MMMN	225319	Manitoba	07/07/1987	P. Klassen
22	Lundar	MMMN	225320	Manitoba	07/07/1987	P. Klassen
22	Lundar	MMMN	225321	Manitoba	07/07/1987	P. Klassen
22	Lundar	MMMN	225322	Manitoba	07/07/1987	P. Klassen
22	Lundar	MMMN	225323	Manitoba	07/07/1987	P. Klassen
44	Tolstoi	MMMN	225324	Manitoba	23/06/1988	P. Klassen
45	Oak Lake	MMMN	225325	Manitoba	03/07/1991	P. Klassen
45	Oak Lake	MMMN	225326	Manitoba	03/07/1991	P. Klassen
45	Oak Lake	MMMN	225327	Manitoba	03/07/1991	P. Klassen
45	Oak Lake	MMMN	225328	Manitoba	03/07/1991	P. Klassen
22	Lundar	MMMN	225329	Manitoba	29/06/1987	P. Klassen
22	Lundar	MMMN	225330	Manitoba	29/06/1987	P. Klassen
49	Winnipeg	MMMN	240864	Manitoba	04/07/1933	
44	Tolstoi	MMMN	240865	Manitoba	29/06/1987	Mckillop
48	Inwood	MMMN	240866	Manitoba	30/07/1987	Mckillop
22	Lundar	MMMN	240867	Manitoba	14/07/1996	Delf
22	Lundar	MMMN	240868	Manitoba	05/07/1996	Delf

Appendix 2. Dakota Skipper sites where no specimens were recorded during 2012 surveys.

Nearest Town	2012 date	Site	Time (Start)	Time (End)	Duration	*P. mystic*	*P. themostocles*	*P. peckius*	*O. garita*	*A. logan*	*T. lineola*	Smooth Camas	Tiger Lilly	Black-eyed Susan	Harebell	Purple Coneflower (SK)	Thistle	Surveyor	Notes
Lundar	Jun-29		12:30	14:30	2:00	8	3	0	0	0	>100	none	none	rare	rare	none	rare	N. de Silva	
Lundar	Jun-29	b	18:30	20:00	1:30	2	4	0	0	0	15	none	none	rare	rare	none	rare	N. de Silva	
Lundar	Jun-30	c	9:30	10:30	1:00	3	0	0	0	0	3	rare	rare	none	none	none	rare	N. de Silva	
St. Laurent	Jun-30		11:30	12:30	1:00	4	0	0	0	0	10	rare	rare	none	uncommon	none	abundant	N. de Silva	
Oak Point	Jun-30		12:50	13:20	0:30	0	0	0	0	0	0	none	none	none	none	none	none	N. de Silva	
Oak Point	Jun-30	b	13:50	14:10	0:20	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	original coordinates from CNC in water
Oak Point	Jun-30	c	14:30	15:30	1:00	4	0	0	0	0	0	none	rare	rare	none	none	none	N. de Silva	
Lundar	Jun-30	b	16:05	17:05	1:00	5	0	0	0	0	20	none	rare	uncommon	uncommon	none	rare	N. de Silva	
Lundar	Jun-30	c	17:10	18:10	1:00	2	0	0	0	0	50	none	none	uncommon	uncommon	none	none	N. de Silva	
Balmoral	Jul-01		14:20	15:10	0:50	30	4	0	0	0	40	none	none	common	common	none	none	N. de Silva	27ºC & sunny
Argyle	Jul-01		15:20	16:10	0:50	9	0	4	0	0	5	none	none	none	none	none	none	N. de Silva	
Inwood	Jul-01		16:40	17:10	0:30	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	bison enclosure, unsuitable habitat (heavily grazed)
Inwood	Jul-01		17:20	18:00	0:40	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	marshy but completely flooded
Oak Point	Jul-01		18:45	19:15	0:30	3	2	0	0	0	<100	rare	rare	uncommon	uncommon	none	common	N. de Silva	
Lundar	Jul-02		10:00	10:50	0:50	5	2	0	0	0	<50	none	rare	uncommon	rare	none		N. de Silva	29ºC but feels like 37ºC, overcast some rain

Nearest Town	2012 date	Site	Time (Start)	Time (End)	Duration	*P. mystic*	*P. themostocles*	*P. peckius*	*O. garita*	*A. logan*	*T. lineola*	Smooth Camas	Tiger Lilly	Black-eyed Susan	Harebell	Purple Coneflower (SK)	Thistle	Surveyor	Notes
Lundar	Jul-02	b	10:50	11:35	0:45	0	0	0	0	0	3	uncommon	rare	uncommon	uncommon	none	uncommon	N. de Silva	very marshy, not a lot of flowers in bloom
Lundar	Jul-02	c	11:40	12:10	0:30	2	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	cropland
Lundar	Jul-02	d	12:10	12:35	0:25	0	0	0	0	0	0	none	none	none	none	none	none	N. de Silva	
Lundar	Jul-02	e	12:40	12:55	0:15	2	0	0	0	0	>100	rare	none	common	uncommon	none		N. de Silva	
Lundar	Jul-02	f	13:05	13:40	0:35	8	0	0	0	0	0	rare	uncommon	uncommon	common	none		N. de Silva	
Lundar	Jul-02	g	13:40	14:10	0:30	0	0	0	0	0	0	rare	rare	uncommon	common	none	none	N. de Silva	
Lundar	Jul-02	h	14:30	15:00	0:30	8	2	0	0	0	0	uncommon	uncommon	common	uncommon	none	common	N. de Silva	
Lundar	Jul-02	i	15:00	15:30	0:30	15	1	0	0	0	5	uncommon	uncommon	common	uncommon	none	common	N. de Silva	
Lundar	Jul-02	j	15:30	16:00	0:30	0	0	0	0	0	0	rare	rare	common	common	none	common	N. de Silva	
Lundar	Jul-02	k	16:00	16:30	0:30	0	0	0	0	0	0	none	none	none	none	none	none	N. de Silva	racetrack overgrown, little flowers
Lundar	Jul-02	l	16:30	17:30	1:00	2	0	0	0	0	<100	common	rare	common	common	none	uncommon	N. de Silva	
Lundar	Jul-02	m	17:30	18:00	0:30	4	0	0	0	0	5	rare	rare	rare	rare	none	rare	N. de Silva	lots of trees, not a lot of flowers
Lundar	Jul-02	n	18:05	18:30	0:25	0	0	0	0	0	0	none	rare	none	rare	none	none	N. de Silva	
Narcisse	Jul-02		18:35	19:00	0:25	8	3	2	0	0	0	none	none	common	uncommon	none	uncommon	N. de Silva	
Narcisse	Jul-02	b	19:10	19:55	0:45	2	2	3	0	0	>100	rare	rare	uncommon	common	none	common	N. de Silva	
Lundar	Jul-03		10:40	13:15	2:35	2	0	2	0	0	<50	none	none	common	rare	none		N. de Silva	28ºC & sunny
Lundar	Jul-03	b	10:40	13:15	2:35	6	3	1	0	0	10	rare	rare	rare	rare	none		N. de Silva	
Lundar	Jul-03	c	10:40	13:15	2:35	1	0	0	0	0	10	uncommon	none	common	common	none		N. de Silva	
Lundar	Jul-03	d	10:40	13:15	2:35	0	0	0	0	0	0	none	none	common	common	none		N. de Silva	

Nearest Town	2012 date	Site	Time (Start)	Time (End)	Duration	*P. mystic*	*P. themostocles*	*P. peckius*	*O. garita*	*A. logan*	*T. lineola*	Smooth Camas	Tiger Lilly	Black-eyed Susan	Harebell	Purple Coneflower (SK)	Thistle	Surveyor	Notes
Lundar	Jul-03	e	10:40	13:15	2:35	0	0	0	0	0	0	rare	rare	common	common	none	common	N. de Silva	
Lundar	Jul-03	f	10:40	13:15	2:35	2	2	0	0	0	10	rare	rare	common	common	none	common	N. de Silva	
St. Laurent	Jul-03		14:15	15:00	0:45	4	0	0	0	0	0	uncommon	uncommon	common	uncommon	none	uncommon	N. de Silva	
St. Laurent	Jul-03	b	15:00	15:45	0:45	3	0	0	2	0	0	uncommon	uncommon	common	uncommon	none	uncommon	N. de Silva	
St. Laurent	Jul-03	c	15:50	16:30	0:40	0	0	0	0	0	0	rare	uncommon	common	common	none	rare	N. de Silva	
Lundar	Jul-03	g	17:00	17:30	0:30	6	0	0	0	0	5	common	uncommon	common	common	none		N. de Silva	
Oak Point	Jul-03		17:40	18:15	0:35	4	2	0	0	0	5	rare	none	common	common	none	rare	N. de Silva	
Lundar	Jul-03	h	18:20	19:20	1:00	6	0	3	3	0	5	common	rare	abundant	common	none	uncommon	N. de Silva	
Lundar	Jul-04		11:30	13:45	2:15	10	4	0	0	0	20	rare	none	common	common	none	rare	N. de Silva	25ºC & sunny
Lundar	Jul-04	b	11:30	13:45	2:15	0	0	0	0	0	0	rare	none	uncommon	uncommon	none	rare	N. de Silva	
St. Laurent	Jul-04		14:40	15:20	0:40	5	3	0	0	0	>20	rare	none	uncommon	none	none		N. de Silva	
St. Laurent	Jul-04	b	15:30	16:10	0:40	2	2	1	0	0	>20	rare	none	uncommon	none	none		N. de Silva	
St. Laurent	Jul-04	c	16:15	16:35	0:20	3	1	4	0	0	>20	rare	none	uncommon	none	none		N. de Silva	
Lundar	Jul-04	d	17:40	18:15	0:35	4	0	0	3	0	0	common	rare	abundant	common	none	uncommon	N. de Silva	
Oak Point	Jul-04		18:15	19:00	0:45	2	1	0	3	0	0	rare	none	common	common	none	rare	N. de Silva	
Lundar	Jul-04	e	19:10	19:40	0:30	1	0	0	0	0	0	rare	uncommon	uncommon	common	none		N. de Silva	
Lundar	Jul-04	f	19:40	20:20	0:40	2	0	0	0	0	<10	uncommon	uncommon	common	uncommon	none	common	N. de Silva	
Belleview	Jul-05		13:50	14:30	0:40	10	6	0	0	4	0	rare	uncommon	common	common	none		N. de Silva	
Deleau	Jul-06		10:30	11:15	0:45	1	0	0	0	0	1	common	uncommon	common	common	none		N. de Silva	
Deleau	Jul-06	b	13:00	13:30	0:30	4	1	0	0	0	0	uncommon	uncommon	uncommon	uncommon	none		N. de Silva	
Belleview	Jul-06		13:35	14:05	0:30	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Belleview	Jul-06	b	14:10	14:40	0:30	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	

Nearest Town	2012 date	Site	Time (Start)	Time (End)	Duration	*P. mystic*	*P. themostocles*	*P. peckius*	*O. garita*	*A. logan*	*T. lineola*	Smooth Camas	Tiger Lilly	Black-eyed Susan	Harebell	Purple Coneflower (SK)	Thistle	Surveyor	Notes
Belleview	Jul-06	c	14:50	15:25	0:35	3	5	0	0	0	0	rare	rare	rare	rare	none		N. de Silva	
Belleview	Jul-06	d	15:35	16:30	0:55	4	1	0	0	0	0	uncommon	uncommon	uncommon	uncommon	none		N. de Silva	
Belleview	Jul-06	e	16:50	17:45	0:55	9	1	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Deleau	Jul-06	c	18:00	18:55	0:55	12	2	0	0	0	5	common	uncommon	common	common	none		N. de Silva	
Oak Lake	Jul-07		14:20	15:00	0:40	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Belleview	Jul-07		15:45	16:45	1:00	4	3	0	0	0	0	uncommon	uncommon	uncommon	uncommon	none		N. de Silva	
Griswold	Jul-07		17:30	18:30	1:00	2	3	2	0	0	15	none	none	rare	none	none	none	N. de Silva	
Elgin	Jul-08		9:30	10:00	0:30	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Elgin	Jul-08	b	10:05	10:50	0:45	0	0	0	0	0	>100	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Elgin	Jul-08	c	11:15	12:30	1:15	5	2	0	0	0	30	none	none	rare	none	none	none	N. de Silva	
Rapid City	Jul-08		13:40	13:50	0:10	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Miniota	Jul-08		15:00	15:30	0:30	0	0	0	0	0	10	n/a	n/a	n/a	n/a	n/a		N. de Silva	
Beulah	Jul-08		15:30	15:50	0:20	0	0	0	0	0	12	none	none	none	none	none	none	N. de Silva	
Deleau	Jul-08		17:10	18:00	0:50	0	1	0	0	0	0	common	uncommon	common	common	none		N. de Silva	
Deleau	Jul-08	b	18:10	19:00	0:50	7	0	0	0	4	0	none	none	uncommon	none	none	none	N. de Silva	
Glen Ewen	Jul-09		14:20	14:30	0:10	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Glen Ewen	Jul-09	b	14:50	15:00	0:10	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Oxbow	Jul-09		15:50	16:50	1:00	7	0	0	0	0	0	none	rare	uncommon	uncommon	common		N. de Silva	
Oxbow	Jul-09	b	16:50	17:20	0:30	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Oxbow	Jul-09	c	17:20	18:45	1:25	3	0	0	0	0	0		none	none	uncommon	common	none	N. de Silva	
North Portal	Jul-10		9:15	10:00	0:45	2	0	0	0	0	0	none	none	none	none	common	none	N. de Silva	
North Portal	Jul-10	b	11:20	11:40	0:20	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	

Nearest Town	2012 date	Site	Time (Start)	Time (End)	Duration	*P. mystic*	*P. themostocles*	*P. peckius*	*O. garita*	*A. logan*	*T. lineola*	Smooth Camas	Tiger Lilly	Black-eyed Susan	Harebell	Purple Coneflower (SK)	Thistle	Surveyor	Notes
North Portal	Jul-10	c	12:55	13:40	0:45	0	0	0	0	0	0	none	none	none	rare	common	none	N. de Silva	
Bienfait	Jul-10		15:00	15:20	0:20	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Bienfait	Jul-10	b	17:05	17:30	0:25	0	0	0	0	0	0	none	none	none	none	none	none	N. de Silva	
Tolstoi	Jul-11		10:30	11:15	0:45	1	2	16	0	0	10	none	none	none	none	none	common	N. de Silva	
Tolstoi	Jul-11	b	11:20	11:55	0:35	2	1	30	4	0	0	none	none	rare	none	none	uncommon	N. de Silva	
Tolstoi	Jul-11	c	12:00	12:20	0:20	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Tolstoi	Jul-11	d	12:25	13:00	0:35	0	0	20	18	0	0	none	none	common	common	none	common	N. de Silva	
Tolstoi	Jul-11	e	13:05	13:40	0:35	0	2	15	0	0	0	none	none	uncommon	uncommon	none	common	N. de Silva	
Tolstoi	Jul-11	f	13:45	14:15	0:30	1	3	10	0	0	0	uncommon	rare	common	common	none	uncommon	N. de Silva	
Tolstoi	Jul-11	g	14:15	14:50	0:35	0	0	0	0	0	0	uncommon	rare	common	common	none	uncommon	N. de Silva	
Tolstoi	Jul-11	h	14:55	15:35	0:40	0	0	0	0	0	5	none	uncommon	common	common	none	uncommon	N. de Silva	
Tolstoi	Jul-11	i	15:45	16:25	0:40	1	4	9	0	0	0	none	none	abundant	none	none	uncommon	N. de Silva	
Stuartburn	Jul-11		16:40	17:10	0:30	0	0	0	0	0	0	none	none	none	none	none	none	N. de Silva	
Stuartburn	Jul-11	b	17:15	17:40	0:25	0	0	2	0	0	0	none	none	rare	none	none	rare	N. de Silva	
Stuartburn	Jul-11	c	17:50	18:10	0:20	0	0	0	0	0	0	none	none	none	none	none	none	N. de Silva	
Lundar	Jul-12		9:30	11:00	1:30	6	0	2	0	0	0	common	none	common	common	none	common	N. de Silva	
Lundar	Jul-12	b	9:30	11:00	1:30	5	2	2	0	0	0	rare	none	uncommon	common	none	rare	N. de Silva	
Lundar	Jul-12	c	9:30	11:00	1:30	0	0	1	0	0	0	rare	none	uncommon	uncommon	none	uncommon	N. de Silva	
Narcisse	Jul-12		9:30	11:00	1:30	3	0	0	1	0	<10	rare	none	uncommon	uncommon	none		N. de Silva	
Lundar	Jul-12	d	11:20	11:55	0:35	0	0	0	0	0	2	none	none	uncommon	uncommon	none		N. de Silva	
Lundar	Jul-12	e	11:55	12:25	0:30	0	0	0	0	0	0	none	none	uncommon	uncommon	none	none	N. de Silva	
St. Laurent	Jul-12		13:30	14:00	0:30	3	0	0	0	0	0	none	none	common	common	none	rare	N. de Silva	

Nearest Town	2012 date	Site	Time (Start)	Time (End)	Duration	*P. mystic*	*P. themostocles*	*P. peckius*	*O. garita*	*A. logan*	*T. lineola*	Smooth Camas	Tiger Lilly	Black-eyed Susan	Harebell	Purple Coneflower (SK)	Thistle	Surveyor	Notes
St. Laurent	Jul-12	b	14:05	14:35	0:30	1	0	0	2	0	9	common	none	common	uncommon	none		N. de Silva	
Lake Francis	Jul-12		14:40	14:45	0:05	0	0	0	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	N. de Silva	
Lundar	Jul-13		10:15	12:15	2:00	2	1	0	2	0	0	common	rare	abundant	common	none	uncommon	N. de Silva	
Lundar	Jul-13	b	12:30	14:30	2:00	8	0	0	0	0	0	common	rare	abundant	common	none	uncommon	N. de Silva	
Lundar	Jul-13	c	14:45	15:55	1:10	2	0	0	0	0	0	common	rare	common	common	none	uncommon	N. de Silva	