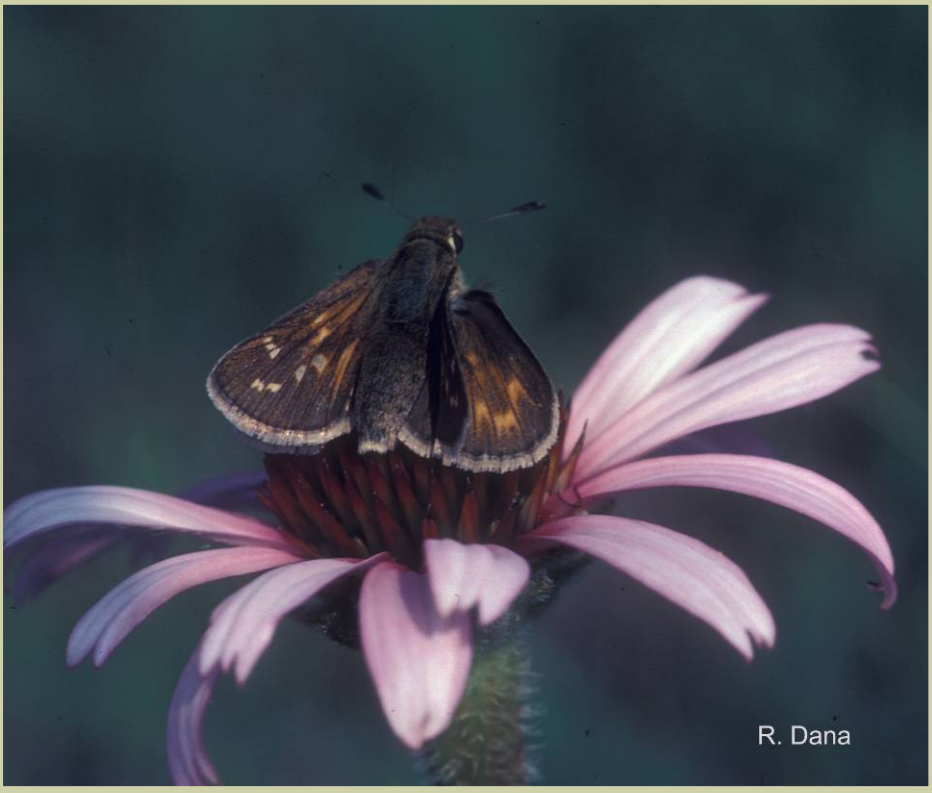
PROPOSED

Species at Risk Act
Recovery Strategy Series

Recovery Strategy for the Dakota Skipper (*Hesperia dacotae*) in Canada

Dakota Skipper



July 2007

Environment Canada Environnement Canada

Canada

About the *Species at Risk Act* Recovery Strategy Series

What is the *Species at Risk Act* (SARA)?

SARA is the Act developed by the federal government as a key contribution to the common national effort to protect and conserve species at risk in Canada. SARA came into force in 2003, and one of its purposes is *"to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity."*

What is recovery?

In the context of species at risk conservation, **recovery** is the process by which the decline of an endangered, threatened, or extirpated species is arrested or reversed, and threats are removed or reduced to improve the likelihood of the species' persistence in the wild. A species will be considered **recovered** when its long-term persistence in the wild has been secured.

What is a recovery strategy?

A recovery strategy is a planning document that identifies what needs to be done to arrest or reverse the decline of a species. It sets goals and objectives and identifies the main areas of activities to be undertaken. Detailed planning is done at the action plan stage.

Recovery strategy development is a commitment of all provinces and territories and of three federal agencies — Environment Canada, Parks Canada Agency, and Fisheries and Oceans Canada — under the Accord for the Protection of Species at Risk. Sections 37–46 of SARA (www.sararegistry.gc.ca/the_act/default_e.cfm) outline both the required content and the process for developing recovery strategies published in this series.

Depending on the status of the species and when it was assessed, a recovery strategy has to be developed within one to two years after the species is added to the List of Wildlife Species at Risk. Three to four years is allowed for those species that were automatically listed when SARA came into force.

What's next?

In most cases, one or more action plans will be developed to define and guide implementation of the recovery strategy. Nevertheless, directions set in the recovery strategy are sufficient to begin involving communities, land users, and conservationists in recovery implementation. Cost-effective measures to prevent the reduction or loss of the species should not be postponed for lack of full scientific certainty.

The series

This series presents the recovery strategies prepared or adopted by the federal government under SARA. New documents will be added regularly as species get listed and as strategies are updated.

To learn more

To learn more about the *Species at Risk Act* and recovery initiatives, please consult the SARA Public Registry (www.sararegistry.gc.ca/) and the Web site of the Recovery Secretariat (www.speciesatrisk.gc.ca/recovery/).

Recovery Strategy for the Dakota Skipper (*Hesperia dacotae*) in Canada [Proposed]

July 2007

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Additional copies:

Additional copies can be downloaded from the SARA Public Registry (www.sararegistry.gc.ca/).

Cover illustration: © Robert P. Dana

Également disponible en français sous le titre
« Programme de rétablissement de l'hespérie du Dakota (*Hesperia dacotae*) au Canada [Proposition] »

ISBN to come
Catalogue no. to come

DECLARATION

This recovery strategy has been prepared in cooperation with the jurisdictions responsible for the Dakota skipper. Environment Canada has reviewed and accepts this document as its recovery strategy for the Dakota skipper as required under the *Species at Risk Act*. This recovery strategy also constitutes advice to other jurisdictions and organizations that may be involved in recovering the species.

The goals, objectives, and recovery approaches identified in the strategy are based on the best existing knowledge and are subject to modifications resulting from new findings and revised objectives.

This recovery strategy will be the basis for one or more action plans that will provide details on specific recovery measures to be taken to support conservation and recovery of the species. The Minister of the Environment will report on progress within five years.

Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this strategy and will not be achieved by Environment Canada or any other jurisdiction alone. In the spirit of the Accord for the Protection of Species at Risk, the Minister of the Environment invites all responsible jurisdictions and Canadians to join Environment Canada in supporting and implementing this strategy for the benefit of the Dakota skipper and Canadian society as a whole.

RESPONSIBLE JURISDICTIONS

Environment Canada
Government of Manitoba
Government of Saskatchewan

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STRATEGIC ENVIRONMENTAL ASSESSMENT

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

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

This recovery strategy will clearly benefit the environment by promoting the recovery of the Dakota skipper. The potential for the strategy to inadvertently lead to adverse effects on other species was considered. The SEA concluded that this strategy will clearly benefit the environment and will not entail any significant adverse effects. The reader should refer to the following sections of the document in particular: Needs of the Dakota Skipper (section 1.5), Broad strategies to implement recovery and address threats (section 2.5.2), and Effects on Other Species (section 2.7).

RESIDENCE

SARA defines residence as: *a dwelling-place, such as a den, nest or other similar area or place, that is occupied or habitually occupied by one or more individuals during all or part of their life cycles, including breeding, rearing, staging, wintering, feeding or hibernating* **[Subsection 2(1)]**.

Residence descriptions, or the rationale for why the residence concept does not apply to a given species, are posted on the SARA public registry: www.sararegistry.gc.ca/plans/residence_e.cfm

PREFACE

The Dakota skipper (*Hesperia dacotae*) was designated Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2003 (COSEWIC 2003) and was officially listed under the *Species at Risk Act* (SARA) in July 2005. SARA (Section 37) requires the competent Minister to prepare a recovery strategy for all listed extirpated, endangered or threatened species. The Canadian Wildlife Service – Prairie and Northern Region, Environment Canada, led the development of this recovery strategy. It was developed in cooperation or consultation with the Governments of Manitoba and Saskatchewan. All responsible jurisdictions reviewed and approved the strategy. The strategy meets SARA requirements in terms of content and process (Sections 39–41).

EXECUTIVE SUMMARY

The Dakota skipper formerly occurred throughout the dry-mesic mixed-grass and wet-mesic tall-grass prairies in southern Manitoba, North Dakota, eastern South Dakota, western Minnesota, Iowa, northern Illinois, and likely southeastern Saskatchewan, but it is now restricted to prairie remnants throughout its former range. Numerous local populations have been lost, including populations in southeastern Manitoba, and it is extirpated from Illinois and Iowa. In Canada, the Dakota skipper is found in two populations in south-central and southwestern Manitoba and one population in extreme southeastern Saskatchewan. The Dakota skipper was listed as Threatened in Canada under the *Species at Risk Act* in July 2005 and as Threatened in Manitoba in June 2007.

The Dakota skipper has one generation per year. In Canada, the adult flight period occurs from mid-June to late July. Adults live up to 4 weeks, and each female can produce up to 250 eggs in her lifetime. Once the eggs hatch, they go through six larval instars with a winter diapause at the fourth instar.

Dakota skippers may be found in two types of prairie: 1) low, wet-mesic tall-grass/bluestem prairie and 2) upland, dry-mesic mixed-grass/bluestem prairie. In Manitoba, in the wet-mesic tall-grass prairie, the adult Dakota skipper uses mainly black-eyed Susan, wood lily, harebell, and dogbane as nectar sources. In Saskatchewan, it uses mainly narrow-leaved purple coneflower as a nectar source. Dakota skipper larvae feed on a variety of grass species, but the preferred hosts are bunchgrasses, such as little bluestem and prairie dropseed. When not feeding, bunchgrasses provide an ideal structure for larvae to build their shelters due to the dense cluster of grass blades and the mass of persistent basal material; as well, bunchgrasses are a food source for the larvae, remaining edible into fall and in close proximity.

Threats to the Dakota skipper include 1) habitat loss through the conversion of prairie to cultivated land, 2) habitat degradation through burning, overgrazing, and haying, 3) habitat fragmentation, 4) changes in the plant community as a result of succession or invasion of exotic species, 5) the use of insecticides and herbicides to control pests and exotic plants, 6) climate change and natural disasters, and 7) the collection of natural history specimens.

Recovery of the Dakota skipper is deemed to be both biologically and technically feasible.

The overall recovery goal is to achieve a self-sustaining metapopulation of Dakota skippers in secure habitat distributed throughout their historical range in Manitoba and Saskatchewan. The short-term population and distribution objective is to maintain current population numbers and prevent any further loss of populations or distribution of the Dakota skipper in Canada.

The short-term recovery objectives are 1) Establish reliable population estimates for all Dakota skipper populations and assess viability under current conditions, 2) identify, secure, and enhance significant habitat for the Dakota skipper, and 3) increase knowledge of the Dakota skipper in Canada, including distribution, abundance, biology, and management practices.

The broad strategies to implement recovery and address threats include 1) a stewardship approach to secure important habitat, 2) population monitoring to more accurately estimate population sizes, trends, and area of occupancy, 3) habitat management to maintain the plant community required for Dakota skipper survival and reproduction, 4) research to fill gaps in knowledge on life history, and 5) a communication program to increase public awareness.

Critical habitat has not been identified for the Dakota skipper in this recovery strategy, but will be identified in an Action Plan, by the end of December 2010.

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1. BACKGROUND

1.1 Species Assessment Information from COSEWIC

Date of Assessment: November 2003

Common Name (population): Dakota Skipper

Scientific Name: *Hesperia dacotae*

COSEWIC Status: Threatened

Reason for Designation: This butterfly is dependent on native tall-grass and mixed-grass prairie, a habitat that has suffered enormous historic losses, and the butterfly's populations have likely undergone similar declines. Current remnants of native prairie are generally not highly threatened as they are mostly unsuitable for agriculture but some habitat loss and fragmentation continue. The butterfly is very sensitive to conversion of prairie remnants to cropland, spring and summer haying, heavy grazing, controlled burns and increased pressures to drain natural sites. Although the current population of this butterfly numbers 28,500 - 40,500 individuals, these occur in only three or four disjunct populations. The long-term persistence of the butterfly is dependent on appropriate management of its habitat, most of which is privately owned.

Canadian Occurrence: SK MB

COSEWIC Status History: Designated Threatened in November 2003. Assessment based on a new status report.

1.2 Description

The Dakota skipper (*Hesperia dacotae* Skinner) is a member of the Order Lepidoptera (butterflies and moths), Family Hesperidae (skippers), and subfamily Hesperiinae ("branded" skippers).

Figure 1. Male Dakota skipper © *R. Dana*

1.2.1 Adult

The Dakota skipper, like all skippers, has hooked antennae, a short, stout body, and a characteristic rapid, skipping flight (Royer and Marrone 1992) (Figure 1). It is a small to medium-sized butterfly with a wingspan of 2.1–2.9 cm (Layberry et al. 1998). The adult males and females differ in coloration. The dorsal surface of the male wing is tawny-orange to brown, with a diffuse

brownish border and a centrally located elongated dark mark (brand or stigma with specialized scent scales) on the forewing (Figure 2); the ventral surface is dusty yellow-orange. The dorsal surface of the female wing is darker brown, ranging from buff to brown with varying degrees of orange. There are several small, whitish spots on the forewing.

Dakota skippers can be confused with the Long dash skipper (*Polites mystic* W.H. Edwards) due to their similar appearance and overlapping flight period. Other skippers using similar habitats include Ottoe skipper (*Hesperia ottoe* W.H. Edwards), Pawnee skipper (*Hesperia leonardus pawnee* Dodge), and Assiniboine skipper (*Hesperia assiniboia* Lyman).

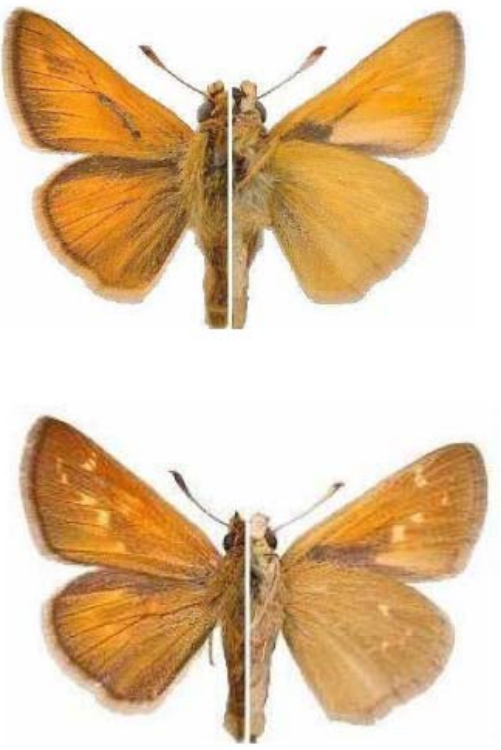

Figure 2. Male (top) and female (bottom) *Hesperia dacotae* showing dorsal (left) and ventral (right) views. © *Chris McQuarrie and R.P. Webster*

1.2.2 Egg and larva

The egg is approximately 1 mm and is semi-translucent white, although it darkens slightly with age (Dana 1991). Mature larvae are 19–22 mm in length and have a light brown to flesh-coloured body. The head, prothoracic shield, and thoracic legs are black. The head is pitted throughout, distinguishing it from other *Hesperia*, whose ventral surface of the head (lower face) is unpitted (McCabe 1981).

1.3 Biology of the Dakota Skipper

The Dakota skipper has one generation per year (Table 1). In Canada, the adults emerge beginning in mid- to late June and have been collected as late as July 29. The majority of collection records are between June 27 and July 8 (COSEWIC 2003). Adults live approximately 2–4 weeks (Dana 1991). Females lay 20–30 eggs daily during the first 2 days of adult emergence; egg production then declines linearly, until they lay a few eggs per day, 2 weeks after emergence (Dana 1991). The estimated potential fecundity of each female is between 180 and 250 eggs in a lifetime (Dana 1991). Eggs are laid singly on the underside of leaves or the upper surface of erect grass blades (Dana 1991). The eggs hatch within 7–20 days (10 days on average), depending on the temperature (McCabe 1981; Dana 1991). Larvae crawl to the base of the plant and form a shelter at or below ground level, where they construct consecutively larger shelters as they grow (Dana 1991). There are likely only six larval instars in Canada and six or seven instars in southern portions of their range. The first three instars last 8–18 days, and the fourth instar lasts between 16 and 35 days (Dana 1991). In Canada, the larvae likely enter an obligatory diapause during their fourth instar (usually in October) (Dana 1991). The next spring,

feeding resumes and the fourth instar (or fifth instar in southern portions of their range) moults. The next two instars (fifth and sixth or sixth and seventh) last 14–19 days and 15–21 days, respectively (Dana 1991). The last instar ceases feeding and enters the pupal stage, which lasts 13–19 days before the pupa emerges into an adult (Dana 1991).

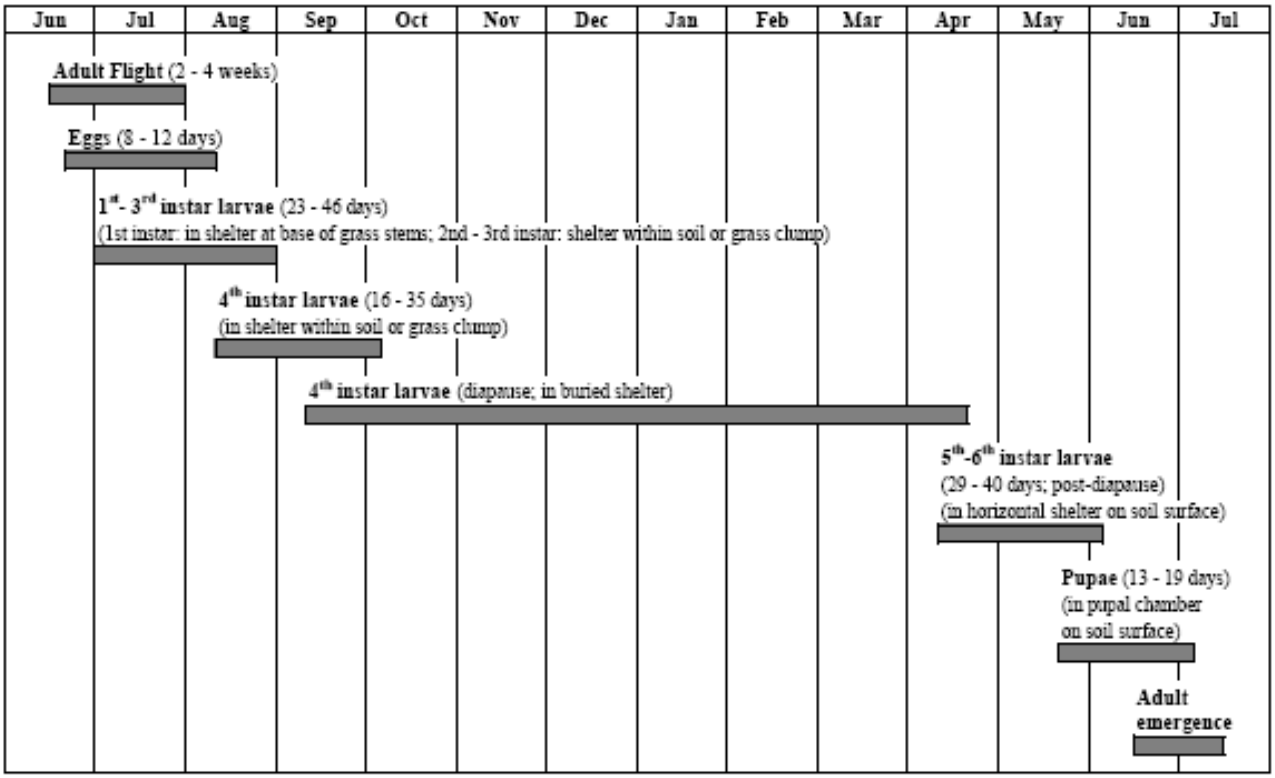

Figure 3. Dakota skipper life history stages and approximate seasonal phenology in Canada (adapted from Dana 1991 and COSEWIC 2003).

1.4 Populations and Distribution

1.4.1 Global range

The Dakota skipper formerly occurred throughout the dry-mesic mixed-grass and wet-mesic tall-grass prairies in southern Manitoba, North Dakota, eastern South Dakota, western Minnesota, Iowa, northern Illinois, and likely southeastern Saskatchewan (McCabe 1981; Royer and Marrone 1992; Cochrane and Delphey 2002; R. Hooper, pers. comm.). The Dakota skipper is now extirpated from Illinois and Iowa, where it was last collected in 1888 (museum specimen) and last sighted in 1992, respectively (McCabe 1981; Schlicht and Orwig 1998; Cochrane and Delphey 2002). The Dakota skipper is currently restricted to prairie remnants throughout its former range (Figure 4), and numerous local populations have been lost, including populations in southeastern Manitoba.

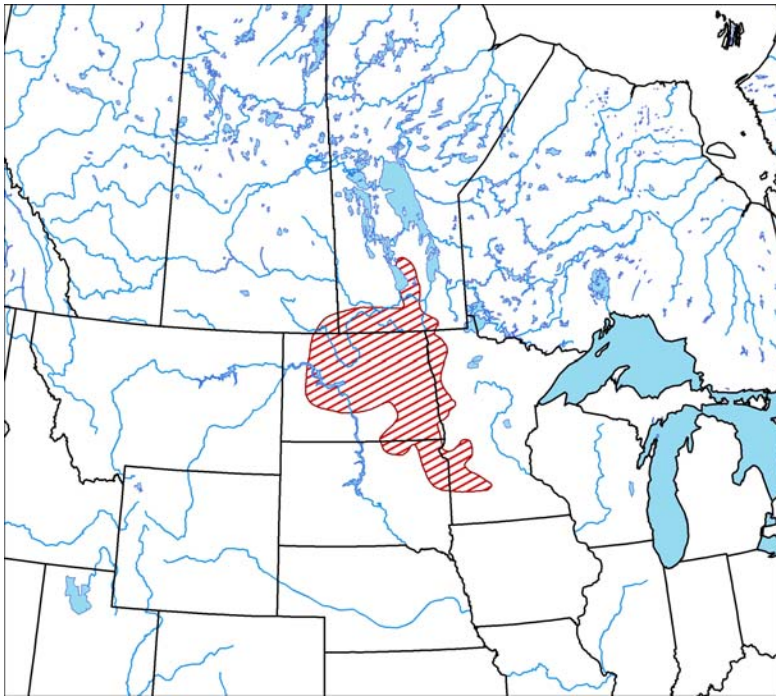

Figure 4. Global range of the Dakota Skipper

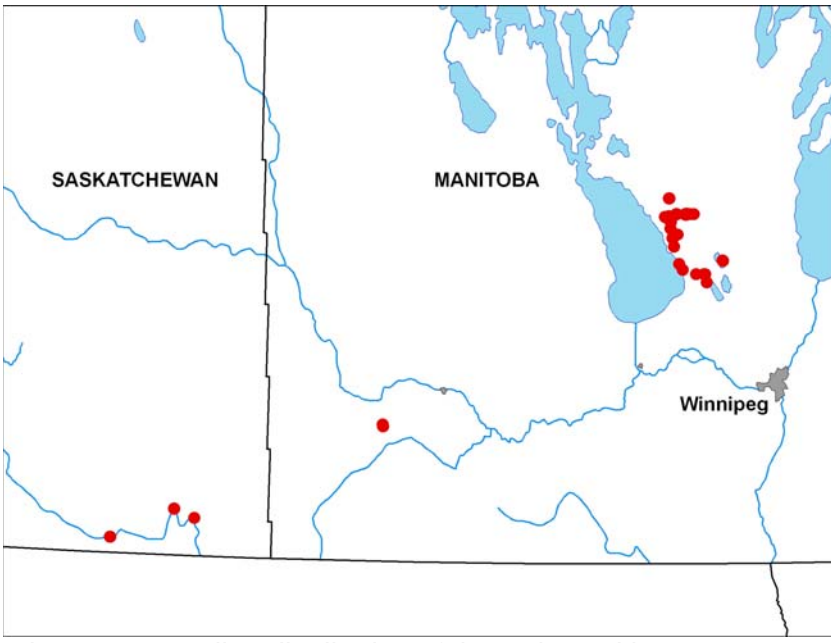

Figure 5. Canadian distribution of the Dakota skipper

1.4.2 Canadian range

In Canada, the Dakota skipper is found in southern Manitoba and extreme southeastern Saskatchewan (Figure 5).

The Dakota skipper was historically found in seven isolated populations in Manitoba. Surveys in 2002 relocated only two populations: the Interlake region in south-central Manitoba (located between Lake Winnipeg and Lake Manitoba) population and the Griswold population in western Manitoba. The Interlake population near Lundar is the largest population in Canada; it was found at 17 localities in 2002 (COSEWIC 2003), with an additional site found in 2006 (R. Westwood, unpubl. data). There may be additional populations in this region (Webster 2002). The Dakota skipper was historically recorded around Winnipeg (1933), Miniota (1944), Brandon (1950), Fannystelle (1991), and at the Tall Grass Prairie Preserve (2000) (COSEWIC 2003). The Tall Grass Prairie Preserve was surveyed for the Dakota skipper annually between 1996 and 2006 with no Dakota skippers being observed (R. Westwood, unpubl. data 2006). The last specimens collected from the Tall Grass Prairie Preserve can be found in the J.B. Wallis Entomological Museum at the University of Manitoba and in the Manitoba Provincial Museum with specimens collected between 1983 and 1987 by several collectors (Klassen et al. 1989; R. Westwood, pers. comm. 2006). Britten and Glasford 2002 report collecting the Dakota skipper at the Tall Grass Prairie Preserve in 2000 although based on their report they found skippers to be scarce and for this reason did not keep any specimens. Therefore, there are no museum specimens of the Dakota skipper collected from the Tall Grass Prairie Preserve area since the late 1980s.

The Dakota skipper was listed as a hypothetical or expected species in Saskatchewan prior to 2001 (Hooper 1973) and was confirmed at three sites in Saskatchewan from 2001 to 2003 (Hooper 2003). The Dakota skipper probably existed there historically, even though previous searches did not detect them (R. Hooper, pers. comm.). It is unknown if the Saskatchewan sites are connected through dispersal and thus make up one population.

1.4.3 Abundance

In 2002, the Dakota skipper population in Canada was estimated to be between 28 500 and 40 500 individuals (COSEWIC 2003), although this estimate should be viewed with caution because of the considerable variation in density of Dakota skippers within a given prairie and the timing of the 2002 survey (Webster 2003).

The historical distribution and abundance of the Dakota skipper will never be precisely known because of the loss of tall-grass and mixed-grass prairie habitat since the late 1800s (COSEWIC 2003). In Manitoba, 99.9% of the mixed- and tall-grass prairie habitat has been lost, and in Saskatchewan, 81% of the mixed-grass prairie habitat has been lost (Samson and Knopf 1994). The overall population decline of the Dakota skipper is unknown, but it has likely occurred in proportion to the loss of the tall-grass and mixed-grass prairie habitats in Canada.

The Dakota skipper is declining in extent of range, number of sites, and number of individuals (NatureServe 2006). It is less secure than the number of occurrences suggests, because of the low quality of many sites and habitat fragmentation resulting in loss of metapopulation dynamics

(NatureServe 2006). The World Conservation Union (IUCN) classifies the Dakota skipper as vulnerable globally, and NatureServe (2006) lists it as imperilled globally (G2) and nationally (N2). Its provincial rankings are critically imperilled (S1) for Saskatchewan and imperilled to vulnerable (S1S2) for Manitoba (NatureServe 2006).

1.5 Needs of the Dakota Skipper

1.5.1 Habitat and biological needs

General habitat requirements

The Dakota skipper is restricted to native prairie containing a relatively high diversity of native species and forbs (Cochrane and Delphey 2002). They use two types of prairie: 1) low, wet-mesic tall-grass prairie and 2) upland, dry-mesic mixed-grass prairie; in both cases, bluestem (*Andropogon* sp.) is a dominant component of the vegetation. All extant populations of the Dakota skipper in Manitoba were located in the low, wet-mesic tall-grass prairie, whereas in Saskatchewan, they were found in upland, dry-mesic mixed-grass prairie (COSEWIC 2003). A similar pattern is observed in North Dakota, where the wet-mesic habitat predominates in the eastern half of the species' range and the dry-mesic habitat predominates in the western half.

The wet-mesic tall-grass prairie sites used in Manitoba have low relief, although the adults mainly used the slightly higher, drier areas where the grasses were shorter (10–15 cm). The higher, drier areas were dominated by bluestem grasses, such as little bluestem (*Andropogon scoparius*), big bluestem (*Andropogon gerardii*), and prairie dropseed (*Sporobolus heterolepis*), and various forbs, including wood lily (*Lilium philadelphicum*), alkali grass (*Zigadenus elegans*), harebell (*Campanula rotundifolia*), and black-eyed Susan (*Rudbeckia serotina*). Sedges, rushes, and other taller grasses often dominated the lower, wetter areas (COSEWIC 2003).

Indicator plants for the presence of the Dakota skipper in the wet-mesic tall-grass prairie in Manitoba include bluestem grasses, wood lily, alkali grass, harebell, and black-eyed Susan (COSEWIC 2003). In North Dakota, alkali grass is a reliable indicator of Dakota skipper habitat, and its flowering coincides with the flight season of the skipper (McCabe 1981).

Many of the sites in Manitoba with healthy populations of the Dakota skipper are being used as hayfields, but the plant community does not appear to be adversely affected by the mowing. These sites are only hayed once per year, generally from August through September (R. Westwood, pers. comm. 2006, Morden 2006). In fact, haying may be beneficial to the Dakota skipper, as the butterfly was more common on some mowed sites than on idle sites (COSEWIC 2003).

In Saskatchewan, the Dakota skipper was found on upland, dry-mesic mixed-grass prairie dominated by bluestem grasses and needle grasses (*Stipa* spp.). The Dakota skipper was commonly found on ridge tops and hillsides near narrow-leaved purple coneflower (*Echinacea angustifolia*) (COSEWIC 2003).

In the United States, dry-mesic sites typically include bluestem and needle grasses, as well as narrow-leaved purple coneflower, prairie coneflower (*Ratibida columnifera*), blanketflower (*Gaillardia* spp.), and other asters, but they rarely include alkali grass (Royer and Marrone 1992). In dry-mesic habitats, the Dakota skipper's flight period is synchronous with the flowering of narrow-leaved purple coneflower, harebell, and wood lily. In North Dakota, the dry-mesic sites occupied by Dakota skippers were generally restricted to more mesic areas, such as north slopes of river valleys, possibly to mitigate the effect of the more xeric environment (Royer and Marrone 1992). Dakota skipper populations in dry-mesic habitats are typically less dense than those in wet-mesic habitats (Royer and Marrone 1992).

Adult food resources

Nectar is a necessary resource for the adult Dakota skipper; it provides water and energy (Dana 1991). Dakota skippers commonly visit plant species whose nectar resources are accessible only to nectarivores with a slender tubular feeding apparatus of 5 mm or longer (Dana 1991). In Manitoba, in the wet-mesic tall-grass prairie, black-eyed Susan, wood lily, and harebell were the primary nectar sources; dogbane (*Apocynum* sp.) was also commonly used near Lundar. In Saskatchewan, the Dakota skipper mainly uses narrow-leaved purple coneflower as a nectar source (COSEWIC 2003).

Oviposition sites

Eggs are usually laid on or near larval host plants (Dana 1991). In the United States, a wide variety of species have been used for oviposition, including little bluestem, big bluestem, sideoats grama (*Bouteloua curtipendula*), prairie dropseed, and spear grass (*Stipa spartea*) (Dana 1991). It is not known which species of grass and forbs are used in Canada for oviposition.

Larval resources

Dakota skipper larvae use a variety of grass species, but the preferred hosts are bunchgrasses, such as little bluestem and prairie dropseed. Bunchgrasses provide an ideal structure for larvae to build their shelters due to the dense cluster of grass blades and the mass of persistent basal material; as well, bunchgrasses are a food source for the larvae, remaining edible into fall and in close proximity (MacNeill 1964).

Newly emerged larvae (first instar) build shelters at the soil surface within a clump of bunchgrasses by joining plant materials together with silk (Dana 1991). Second through fifth larval instars construct steeply angled, silk- and grass-lined tubular chambers mostly or entirely within the soil or grass clump (Dana 1991). The larvae build larger shelters as they develop. After diapause, they construct a horizontal shelter on the soil surface, often concealed by the grass clump (Dana 1991). The larvae collect forage outside of their chambers, usually at night, and return to their chambers to feed (Dana 1991). Pupation occurs in newly constructed chambers, similar to the late-instar chambers (Dana 1991).

Mating activity sites

The Dakota skipper uses flowerheads of narrow-leaved purple coneflower as perching platforms for mating (Dana 1991). Adults generally select large patches of short grasses with little or no tall standing (living or dead) grass; these often occur in the drier portions of prairie (COSEWIC 2003).

Sympatric lepidopteran species

During the 2002 surveys for the COSEWIC status report, Webster (2002) found the Dakota skipper to be commonly associated with the Garita skipper (*Oarisma garita*) and the Long dash skipper. It was also found less commonly with other skippers, including Essex skipper (*Thymelicus lineola*), Peck's skipper (*Polites peckius*), and Tawny-edge skipper (*Polites themistocles*). The Dakota skipper is commonly found with the Poweshiek skipperling (*Oarisma poweshiek*) and the Ottoe skipper in North and South Dakota (Royer and Marrone 1992); during the 2002 surveys in Manitoba, however, these species were not found in areas with the Dakota skipper. The Poweshiek skipperling, however, was found in the Tall Grass Prairie Preserve, where the Dakota skipper formerly existed but has been extirpated. During the 2002 surveys, the most commonly encountered butterflies in areas with Dakota skippers were the Northern crescent (*Phyciodes cocyta*), the Silver-bordered fritillary (*Boloria selene*), and the Common ringlet (*Coenonympha tullia*).

1.5.2 Ecological role and importance to humans

Butterflies have captivated the interest of children and naturalists around the world. Their beauty and intricate life cycle have been the basis of many stories, folklore, and Aboriginal dances. Biologists have recognized the importance of butterflies as acting as a model system for expanding our knowledge of ecology, evolutionary biology, animal behaviour, systematics, and conservation biology (Ehrlich 2003). Butterflies function as indicators of habitat condition and can also serve as "umbrella species," which, by their preservation and the protection of certain areas, can conserve other less charismatic organisms (Ehrlich 2003).

The Dakota skipper is an obligate resident of intact tall- to mid-grass bluestem prairie, which is one of North America's most endangered ecosystems. The Dakota skipper is sensitive to changes in the quality of native prairie and therefore may act as an indicator of ecosystem health for the tall- and mid-grass prairie ecosystem (Royer and Marrone 1992; Harding et al. 1995).

1.5.3 Biologically limiting factors

A number of biological factors inherently limit Dakota skipper populations, including their poor dispersal capabilities, their dependence on a specific suite of host plant species, predation, and disease.

Habitat requirements and dependence on host plants

Dakota skippers are restricted to intact native prairie and are dependent on specific plant species for larval development and adult nectar sources. This dependence makes them susceptible to habitat degradation that results in loss or decline of their nectar flowers and host plants.

Dispersal and colonization potential

Poor dispersal capabilities, along with a short adult life span and only one annual flight period, limit the colonization potential of the Dakota skipper in a fragmented landscape. Dana (1991) estimated average adult movements of approximately 300 m over 3–7 days. It is unlikely that the Dakota skipper can disperse 1 km across non-native prairie habitat (Cochrane and Delphey 2002).

Disease, predation, and interspecific competition

Predation, disease, and interspecific competition likely do not play a large role in the population dynamics of the Dakota skipper (Dana 1991; Royer and Marrone 1992). Predators of adult Dakota skippers include ambush bugs (Hemiptera: *Phymata* spp.), robber flies (Diptera: Asilidae), flower spiders or crab spiders (Aranaea: *Misumenops* spp.), and orb weavers (various Araneidae) (McCabe 1979, 1981; Dana 1991; Royer and Marrone 1992). Parasitic wasps (Hymenoptera: *Ooencyrtus* sp.) were found in a few Dakota skipper ova collected from the field, and brown lacewing larvae (Hemerobiidae) and ants (Hymenoptera: *Myrmica americana*) were observed depredating Dakota skipper larvae (Dana 1991). Although there are no recorded predation events by dragonflies or birds (McCabe 1981; Dana 1991), small mammals and ground-foraging birds likely prey on roosting butterflies during cool, cloudy conditions and early or late in the day, as observed with other butterfly species (Lederhouse et al. 1987).

Disease is infrequent in the Dakota skipper (Dana 1991), although other *Hesperia* larvae have been killed by bacteria under humid conditions (MacNeill 1964). No intraspecific competition was observed among Dakota skippers, even in crowded conditions (Dana 1991), and interspecific competition is likely not a threat or limiting factor to Dakota skipper populations, because co-occurring species use different plant species as nectar sources (McCabe 1981).

1.6 Threats

1.6.1 Habitat loss

Conversion of grasslands to cultivated land

Since European settlement, significant portions of native prairie have been lost in North America, including up to 99.9% of the native mixed- and tall-grass prairie in Manitoba and 81% of the mixed-grass prairie in Saskatchewan (Samson and Knopf 1994). Conversion of native prairie for agriculture is one of the greatest threats to the Dakota skipper, because it is irreversible and could quickly destroy entire populations. Although most of the sites with Dakota skippers are on flat terrain, increasing the likelihood of their conversion to row crops, poor soil

conditions of the remnant prairie fragments may lessen this risk (COSEWIC 2003). A population of Dakota skippers that occurred near Fannystelle, Manitoba, in 1991 may have been extirpated when the prairie was cultivated and converted to a flax crop (Webster 2003).

1.6.2 Habitat degradation

Controlled burning

Historically, fire was an important process in maintaining the grassland ecosystem. Land managers continue to use fire today to maintain native grassland structure and species composition. Today's prescribed fires differ from those historical wildfires in timing, intensity, and frequency. Historical wildfires were likely patchy and did not burn the entire habitat occupied by Dakota skippers, allowing adults to recolonize new locations (Swengel 1998a). In today's fragmented landscape, burning most or all of an area can eliminate a population if there is no nearby suitable habitat to allow recolonization. In 2001 and 2002, prescribed burning plus a wildfire on the Tall Grass Prairie Preserve burned more than half of the preserve and may have resulted in the loss of a metapopulation of a few thousand Dakota skippers (Webster 2003). Although, R. Westwood (pers. comm., 2006) did not find Dakota skippers during the 1990s, suggesting that they may not have been present at the time of the burns.

Unburned managed (primarily haying) prairies support larger numbers of specialist butterflies (including the Dakota skipper) than do areas burned rotationally (Swengel 1998a). Early summer burns (June and early July) have the potential to destroy Dakota skipper eggs and cause adults to emigrate, whereas burning at other times of the year may destroy larval stages and could result in the loss of nectar sources (McCabe 1981).

Grazing

Degradation of habitat through changes in vegetation, hydrology, or soil structure may adversely affect one or more life stages of the Dakota skipper (Cochrane and Delphey 2002). Grazing may result in detrimental changes in the plant community, direct removal of nectar sources, soil compaction, changes in soil moisture and condition, and trampling of larvae (McCabe 1981; Dana 1997; Cochrane and Delphey 2002). Even light grazing can eliminate important nectar sources (McCabe 1981).

In the mixed-grass prairies, the Dakota skipper tolerates little to no grazing (Royer and Marrone 1992; Royer and Royer 1998), whereas in tall-grass prairies, the Dakota skipper may be able to coexist with light grazing or light-rotational grazing, because it reduces litter and can maintain mixed-grass vegetation structure (Dana 1991).

Haying

Mowing and/or haying before or during the Dakota skipper's flight period can be detrimental to skipper populations, because they can remove critical nectar sources, can kill adults or cause them to emigrate, and may favour the growth of exotic species such as Kentucky bluegrass (*Poa pratensis*) (McCabe 1981; Royer and Marrone 1992; Dana 1997; Cochrane and Delphey 2002).

Not all haying is detrimental, however (Morden 2006). Late-season haying (September to October) can be an important management tool for maintaining Dakota skipper populations, as it helps to maintain the vegetation structure, prevents or delays succession, and reduces the accumulation of litter on the soil (COSEWIC 2003). Swengel and Swengel (1999) found significantly greater Dakota skipper abundance on hayed tracts compared with idle or burned tracts in Minnesota. Webster (2002) found similar results in Manitoba, where Dakota skippers were more common on hayed lands than on idle lands. The hayed sites were characterized by absence of standing dead vegetation, low numbers of shrubs, extensive areas with shorter bunchgrasses, and abundant nectar flowers (COSEWIC 2003).

1.6.3 Habitat fragmentation

Before widespread habitat destruction in the 19th century, the Dakota skipper may have existed as a single metapopulation or several large metapopulations with dispersal between local populations (Cochrane and Delphey 2002). Genetic evidence suggests that even in recent history, extant populations in Minnesota and South Dakota were connected (Britten and Glasford 2002). Habitat destruction results in not only the loss of habitat, but also the fragmentation of remaining habitat patches and subsequently the isolation of populations. Small populations are susceptible to extinction through demographic, environmental, and genetic stochasticity (Gilpin and Soulé 1986; Hanski 2003). In addition, edge effects are proportionally greater in small patches; edge effects increase the likelihood of invasion by non-native plants as well as the probability that a butterfly will fly out of suitable habitat by chance and end up in unsuitable habitat (Crone and Schultz 2003).

Genetic evaluation of the Dakota skipper suggests that the populations in Canada are somewhat distinct from the more southerly populations in the United States, reflecting the geographic and temporal separation (Britten and Glasford 2002); Britten and Glasford (2002) suggest that Dakota skipper populations should be managed as isolated units, with management efforts aimed at maximizing population size to decrease the effects of genetic drift, while maintaining potential connectivity among sites.

1.6.4 Changes in plant community

Succession

Prairies that lack periodic disturbances undergo succession to woody shrubs, accumulate litter, may have reduced densities of nectar flowers, and may face increased risk of exotic species invasion. Late-season haying can prevent or reduce prairie succession, similar to burning, but with less detrimental impact on the Dakota skipper population (Royer and Marrone 1992).

Exotic or invasive species

The invasion of exotic plant species such as leafy spurge (*Euphorbia esula*), Kentucky bluegrass, and smooth brome (*Bromus inermis*) threatens the Dakota skipper. Once these plant species invade an area, they often become dominant and replace native forbs and grasses used by adult and larval Dakota skippers. Smooth brome is likely too tall for efficient feeding by Dakota

skipper larvae, and it senesces before late summer, making it unpalatable for larvae in the fall (Cochrane and Delphey 2002). Furthermore, smooth brome does not have a dense base; therefore, it is unlikely to provide effective protection as a larval shelter (Dana 1991).

1.6.5 Pest control

Spraying of insecticides to control agricultural pest species, such as grasshoppers, can indirectly kill the Dakota skipper (Royer and Marrone 1992). In addition, the use of herbicides to control exotic plant species can eliminate native forbs and Dakota skipper nectar sources (Royer and Marrone 1992), thus threatening the survival of the Dakota skipper.

1.6.6 Climate and natural disasters

Because the Dakota skipper is generally restricted to small populations, it is vulnerable to adverse catastrophic events, such as severe storms, flooding, drought, or fire, that could wipe out an entire population. In addition, changes in weather and climate could potentially cause shifts in plant communities and phenology, which in turn could affect the skipper's survival and reproduction if nectar sources are not available during the adult flight period.

1.6.7 Collection of specimens

The collection of individual Dakota skippers by naturalists and the collection of narrow-leaved purple coneflowers by herbalists are likely not primary threats to the survival of populations of the Dakota skipper, but would result in some individual mortality.

1.6.8 Other threats

Another possible threat is the application of liquid hog manure to native prairies in Manitoba, which could alter plant species composition and possibly affect the Dakota skipper if changes occur to their host plants.

1.7 Actions Already Completed or Under Way

- R. Webster conducted Dakota skipper surveys in Manitoba and Saskatchewan for the 2003 COSEWIC status report.
- Morden (2006) compared the habitat of the Tall Grass Prairie Preserve and the Interlake region in Manitoba to assess the suitability of reintroducing Dakota skippers to the preserve. He concluded that reintroduction into the Tall Grass Prairie Preserve was not feasible at this time due to the lack of suitable habitat and low density of larval and adult host plants.
- R. Westwood (University of Winnipeg) and W. Watkins (Manitoba Conservation) conducted surveys for the Dakota skipper in the Interlake region of Manitoba in 2006 and discovered a new site with Dakota skippers (R. Westwood, pers. comm.).

1.8 Knowledge Gaps

- There is an incomplete inventory of potential habitat, especially in southeastern Saskatchewan, southwestern Manitoba, and the Interlake region of Manitoba.
- Additional survey effort is required to estimate population sizes and trends and area of occupancy of the Dakota skipper in Canada.
- The specific habitat requirements of the Dakota skipper need to be more accurately quantified, including the importance of soil, climate, and physiographic factors for the vegetation community.
- Critical habitat for the Dakota skipper needs to be identified.
- Additional research is needed to assess survival, reproductive success, and population viability.
- Research is needed on the mobility and dispersal capabilities of the Dakota skipper and the potential impacts of population isolation. The mechanisms of dispersal and colonization and the role of habitat features and population characteristics in maintaining or promoting mobility need to be understood (Shreeve 1995).
- Further research is needed to evaluate the degree of genetic isolation among populations in Canada and the United States.
- More research is required to assess the effects of haying, grazing, burning, pesticides, and herbicides on the Dakota skipper and its habitat. Specifically, in Manitoba, it will be important to assess the consequences of a second-cut hay harvest in wet years and the effects of grazing and other farm-related activities.

1.9 Existing Protection

The Dakota skipper was listed as Threatened by COSEWIC in 2003 and was officially listed federally under the *Species at Risk Act* in July 2005. Although the Dakota skipper met the COSEWIC listing criteria for an "Endangered" species based on its small area of occupancy, its occurrence at fewer than five locations, and a predicted continued decline based on extent of occurrence and quality of habitat, it was listed as "Threatened" because it was not deemed to be in imminent danger of extirpation.

The Dakota skipper is currently listed as Endangered by the province of Manitoba under its *Endangered Species Act* (CanLII 2006). Under this Act, it is illegal to 1) kill, injure, possess, disturb, or interfere with an endangered species, 2) destroy, disturb, or interfere with the habitat of an endangered species, or 3) damage, destroy, obstruct, or remove a natural resource on which an endangered species depends for its life and propagation. The Dakota skipper was only recently recognized as a species that occurs in Saskatchewan (Hooper 2003).

The Dakota skipper is listed as Endangered in Iowa, Threatened in Minnesota, and extirpated from Illinois (NatureServe 2006). It has no legal protection in North or South Dakota and has no federal protection in the United States under the *Endangered Species Act*, although it is considered a candidate for listing (USFWS 2006).

2. RECOVERY

2.1 Recovery Feasibility

Recovery of the Dakota skipper is considered biologically and technically feasible based on four criteria (Environment Canada 2005).

First, there are currently three populations (22 sites) of the Dakota skipper in Canada, which contain an estimated 28 500–40 500 individuals. The Dakota skipper has demonstrated the ability to persist at these locations, showing that they are capable of reproduction, although it is unknown if these populations are at or below carrying capacity.

Second, there appears to be sufficient habitat to maintain the Dakota skipper at its current population level, at least in the short-term. Additional suitable habitat will, however, be necessary to recover the Dakota skipper in Canada. Although the Dakota skipper has specific habitat requirements for intact native prairie, it may be possible to attain and enhance suitable habitat, either adjacent to known populations or at extirpated sites, such as the Tall Grass Prairie Preserve.

Third, the main threats to the Dakota skipper, including habitat loss and degradation, can be mitigated through recovery actions. Because almost all current populations are located on private land, it will require the cooperation of landowners to ensure that these populations persist. The Dakota skipper is typically found on lands with late-season haying, thus, maintaining this land use is the first step to conserving the habitat for the Dakota skipper.

Fourth, the main recovery technique will be the use of stewardship agreements to conserve Dakota skipper habitat. Stewardship agreements have been used for a number of other conservation projects and have been successful in securing habitat for species at risk. Some habitat modification may be required at certain sites.

2.2 Recovery Goal

The overall recovery goal is to achieve a self-sustaining metapopulation of Dakota skippers in secure habitat distributed throughout their historical range in Manitoba and Saskatchewan.

Suitable information to quantify long-term population and habitat targets is not available. Addressing knowledge gaps identified in the recovery strategy will help refine the recovery goal for this species.

2.3 Population and Distribution Objective (2007–2012)

The short-term population and distribution objective is:

Maintain current population numbers[1] and prevent any further loss of populations or distribution[2] of the Dakota skipper in Canada.

2.4 Recovery Objectives (2007–2012)

1. Establish reliable population estimates for all Dakota skipper populations and assess viability under current conditions.
2. Identify, secure, and enhance significant habitat for the Dakota skipper.
3. Increase knowledge of the Dakota skipper in Canada, including distribution, abundance, biology, and management practices.

2.5 Approaches Recommended to Meet Recovery Objectives

2.5.1 Recovery planning

Table 1. Recovery planning table

Priority	Threats addressed	Broad strategy to address threats	Recommended approaches to meet recovery objectives
Objective 1. Establish reliable population estimates for all Dakota skipper populations and assess viability under current conditions.			
High	All	Inventory and monitoring	• Survey known locations of the Dakota skipper annually during their flight period.
High			• Survey historic locations of the Dakota skipper biannually until the population is confirmed extirpated (no sightings in 6 years).
High			• Monitor population sizes and distribution at known sites.
High			• Establish reliable population estimates for all populations.
High			• Develop a monitoring scheme and gather complete demographic data on the Dakota skipper, including data on survival, fecundity, and dispersal.
High		Population modelling	• Assess population viability under current conditions.

[1] Estimated to be approximately 12 000–35 000 adults in the Interlake area, 1700–5000 in Griswold, and >250 in southeastern Saskatchewan.
[2] The three current population centres are the Interlake area, Manitoba, Griswold, Manitoba, and southeastern Saskatchewan.

Priority	Threats addressed	Broad strategy to address threats	Recommended approaches to meet recovery objectives
Objective 2. Identify, secure, and enhance significant habitat for the Dakota skipper.			
High	Habitat loss, habitat degradation	Habitat inventory, habitat modelling	• Identify important habitat characteristics for the Dakota skipper.
High			• Define, identify, and map all habitat used by the Dakota skipper.
High			• Identify potential habitats to survey
Medium			• Determine the amount of habitat needed to support self-sustaining populations in the future.
High	Habitat loss, habitat degradation	Stewardship, habitat management	• Prioritize list of occupied sites for stewardship.
High			• Identify threats, best management practices, and effective protection of habitat at each location.
High			• Initiate or maintain landowner contact and encourage stewardship at occupied sites.
Medium			• Identify suitable habitat adjacent to or nearby existing populations and implement stewardship at these sites.
Medium	Habitat degradation	Habitat restoration, stewardship	• Identify historically used habitat that has been degraded.
Medium			• Assess feasibility of restoring habitat.
Medium			• Implement conservation initiatives and stewardship at designated locations.
Medium	Habitat fragmentation	Stewardship	• Identify which populations are isolated and which populations are connected through dispersal.
High			• Identify habitat areas essential for maintaining ecological linkages among populations.
Medium	All	Population reintroduction	• Identify unoccupied habitats that may be suitable for population reintroductions.
Low	All	Communication/ education/outreach	• Develop communication products aimed at landowners and general public to highlight the needs of the Dakota skipper including the importance of habitat and the effects of different management practices.
Objective 3. Increase knowledge of the Dakota skipper in Canada, including distribution, abundance, biology, and management practices.			
High	All	Research	• Examine the response of Dakota skipper host plants to different management regimes.
Medium			• Initiate a study to assess factors that influence survival at larval and adult stages.
High			• Assess the feasibility of re-establishing a population of Dakota skippers at the Tall Grass Prairie Preserve, including assessing the number of founding individuals to prevent a founder effect and loss of genetic diversity.
Medium			• Collaborate with the United States on Dakota skipper research.
Medium			• Initiate a study to examine individual ranges and dispersal distances.
Low			• Undertake genetic studies to assess isolation of populations.

2.5.2 Broad strategies to implement recovery and address threats

Stewardship

Almost all extant populations of Dakota skippers in Canada are found on private land; thus, habitat protection for this species will require a stewardship approach that engages the voluntary cooperation of landowners and managers. This may include implementing stewardship agreements, conservation easements, or land covenants and following best management practices. Once habitats are identified and prioritized, best management guidelines will be developed to address all potential threats to the habitat. These may include guidelines on timing of haying, use of burning, domestic grazing, and pesticide use (see habitat management section below). In many instances, landowners are already using good management practices compatible with the Dakota skipper; otherwise, the species would not be present on their land.

A metapopulation approach to habitat conservation, where occupied habitat as well as unoccupied habitat that could be used by dispersing skippers is conserved, should be used. For example, some studies have suggested that managing roadsides for native vegetation can benefit butterfly communities by allowing them to disperse between suitable habitats (e.g., Ries et al. 2001). Priority habitats for securement will be those currently occupied by the Dakota skipper and those adjacent to existing populations. Areas that historically supported the Dakota skipper could also be conserved for potential reintroductions, once the reason for their extirpation has been determined and addressed.

Inventory and monitoring

Additional survey effort is required to estimate population sizes and trends and area of occupancy of the Dakota skipper in Canada. There is an incomplete inventory of potential habitat, especially in southeastern Saskatchewan, southwestern Manitoba, and the Interlake region of Manitoba. In the Interlake region, most areas surveyed were adjacent to major roads and highways; additional populations likely exist away from these roads (COSEWIC 2003). Suitable Dakota skipper habitat was also found near Baldur in southwestern Manitoba, although no Dakota skippers were present; the presence of this prairie habitat suggests that additional sites may exist (COSEWIC 2003).

Reliable population estimates need to be determined for the Dakota skipper at all known sites. In addition, there is a need to collect complete demographic data, including information on survival, fecundity, immigration/emigration, residence time in patch, dispersal distances, and density dependence. A monitoring scheme should be developed with the help of a population biologist to ensure complete data collection. Collaboration with researchers in the United States would be beneficial.

Population modelling

Population viability analysis could be used to assess persistence under current conditions, and the addition of complete demographic as well as landscape and dispersal data could be used in a spatially explicit population viability analysis to assess the number, size, and location of habitat

patches that are required to support a self-sustaining population of Dakota skipper well into the future. These analyses will allow further refinement of the recovery goal.

Habitat management / habitat restoration

Best management practices will need to be developed for each Dakota skipper site. Some conservation guidelines have been developed for the Dakota skipper and are summarized in Cochrane and Delphey (2002) and USFWS (2005). These guidelines are briefly discussed below and should generally be followed until new information suggests otherwise. Management practices should be monitored and evaluated as to their effects on the Dakota skipper.

Habitat loss: To reduce the threat of habitat loss, stewardship agreements, including the possible use of easements, should be put in place where possible to prevent conversion of prairie for agriculture. Stewardship agreements adjacent to or near occupied Dakota skipper habitat are also beneficial for providing dispersal corridors or potentially buffering occupied sites from external threats such as pesticide drift.

Haying: Haying may be the best method for maintaining Dakota skipper populations. Haying in late fall (September–October) should be encouraged. Late-season haying occurs after the skipper's flight season is finished, the eggs have hatched, and the larvae have moved to shelters close to the ground. This timing also ensures that plants have senesced and set seed. If possible, deferred haying in alternate years or rotational haying to leave some portions unmowed each year is advisable. To provide habitat for overwintering larvae, at least 20 cm of stubble should be left. In mesic tall-grass prairies, midsummer haying may benefit the Dakota skipper, because it removes the bulk and height of warm-season grasses that can suppress forb flowering (Dana 1991; Swengel 1998b).

Grazing: The intensity and duration of grazing should be limited on sites with the Dakota skipper. In general, dry-mesic prairies should not be grazed, whereas wet-mesic prairies could be lightly grazed in spring, to avoid removing floral nectar sources and to maintain vegetation for egg deposition and larval food.

Prescribed fire: Burning is not recommended on sites with the Dakota skipper. Alternative methods such as haying, grazing, and brush cutting should be considered. If burning is deemed necessary, then it should be done sparingly (Moffat and McPhillips 1993). The habitat should be divided into as many burn units as feasible; within each unit, fires should be burned in a patchy pattern. Prescribed fires should not be used if the smallest feasible burn unit would burn most of the habitat or the entire habitat in 1 year. The maximum length of fire return interval should be used, allowing at least 3–4 years before reburning, and adjacent units should not be burned in consecutive years. Spring burns should be conducted as early as possible to limit larval mortality (before they emerge from their buried shelters). Late-spring and fall burns should be avoided. Late-spring burns may delay flowering and emergence of nectar sources, whereas fall burns typically have higher soil temperatures, which result in greater larval mortality (Dana 1983). As well, fall burns may result in greater fluctuations in winter temperature, affecting larval overwinter survival (Cochrane and Delphey 2002). Prior

to a spring burn, fuel levels could be reduced by haying in the fall. Fires should be directed away from the previous season's main oviposition sites if they are known (McCabe 1981).

Habitat fragmentation: Habitat should be managed to maximize genetically effective population sizes by conserving large patches and maintaining potential connections between sites/locations. Roadsides managed for native vegetation may benefit butterfly communities by allowing individuals to disperse (Ries et al. 2001). When it is not possible or feasible to connect isolated populations, management plans will need to be developed to ensure the persistence of these populations in the absence of immigration of new individuals.

Control of weeds and invasive species: Broadcast applications of pesticides or herbicides should be avoided, and sites should be managed to minimize the likelihood of invasion by exotic species. Biological control, spot herbicide application, and spot brushing could be used to control weeds or invasive species.

Research

There are a number of gaps in knowledge on the life history of the Dakota skipper. Some key areas for future research include estimating survival rates (adults and larvae), fecundity rates, dispersal distances, and the average time that adults spend in patch, assessing the isolation of populations, estimating the exchange of individuals among locations, important habitat characteristics (see section 2.6.2 below), determining which environmental factors influence survival, and potential effects of various land uses. Whenever possible, Canadian researchers should collaborate with researchers in the United States.

Population reintroduction

Population reintroductions may be considered in historical locations with suitable habitat; however, reintroductions should be considered only secondarily after maintaining existing habitat and maintaining or restoring connectivity between habitat patches (Thomas 1995).

Communication/outreach/education

A communication plan should be developed to increase landowner and public awareness of this species. Such an outreach program could be developed with other lepidopterans in mind as well, to use resources more effectively.

2.6 Critical Habitat

2.6.1 Identification of the species' critical habitat

Critical habitat has not been identified for the Dakota skipper in this recovery strategy, but will be identified in an Action Plan by the end of December 2010.

Although there is some knowledge regarding Dakota skipper habitat needs, more work is necessary before critical habitat can be reasonably identified. Most of the information regarding

the Dakota skipper biology and habitat use has been taken from work done in the United States. Critical habitat cannot be identified at this time due to incomplete inventory of potential habitat for the Dakota skipper, and a lack of knowledge on the specific habitat requirements of the Dakota skipper. In addition, more research is required on the effects of different management practices in maintaining the Dakota skipper and its habitat.

It is expected that critical habitat will be identified within the recovery action plan following: 1) quantification of specific habitat and area requirements, 2) surveys of potential habitat, and 3) consultation and development of effective stewardship options with potentially affected landowners.

2.6.2 Schedule of studies to identify critical habitat

Table 2. Schedule of studies to identify critical habitat for the Dakota skipper

Description of activity	Outcome/rationale	Timeline
Inventory and monitor occupied habitat.	Identification of species distribution, population size, and persistence. Identification of site-specific habitat threats, movement barriers, and land ownership.	2007–2010
Conduct research to quantify habitat requirements and use.	Identification of habitat requirements for adults, larvae, and host plants. Identification of optimal patch size, and clarification of dispersal capabilities.	2007–2010
Survey similar unoccupied habitat and assess the feasibility of re-establishing populations.	Identification of potential suitable habitat and requirements for reintroduction.	2007–2011
Develop a population viability model.	Identification of options for establishing a network of managed sites to support a viable population over the long term.	2007–2012

2.7 Effects on Other Species

The Dakota skipper is an obligate resident of the tall- and mixed-grass native prairie; as such, the conservation of this species will in turn maintain some remaining remnants of this endangered ecosystem. A number of other lepidopteran species are found in association with the Dakota skipper. A few of these lepidopterans are of conservation concern, including the Ottoe skipper and the Poweshiek skipperling. The Ottoe skipper and the Poweshiek skipperling are listed as Endangered and Threatened, respectively, in Canada under the *Species at Risk Act.*

Plant species that could benefit from Dakota skipper conservation include the western prairie fringed-orchid (*Platanthera praeclara*) and the small white lady's-slipper (*Cypripedium candidum*), both endangered plant species found in tall-grass prairie habitat. These plant species occur in the Tall Grass Prairie Preserve, an area formerly inhabited by the Dakota skipper.

The preferred habitat management strategy for the Dakota skipper is late-season mowing, which will maintain the plant community. This provides the best cover for ground-nesting birds and is beneficial for prairie orchids (McCabe 1981), such as the small white lady's-slipper.

2.8 Recommended Approach for Recovery Implementation

The recovery of the Dakota skipper will likely be a combination of single-species and multispecies approaches to consider the needs of other species, especially small white lady's-slipper and western prairie fringed-orchid where they occur together.

2.9 Performance Measures

The recovery strategy will be evaluated in 5 years, based on new information obtained during the intervening period. Table 3 provides performance measures for each recovery objective.

Table 3. Dakota skipper performance measures

Recovery Objective	Performance Measures
1. Establish reliable population estimates for all Dakota skipper populations and assess viability under current conditions.	• A sampling/monitoring scheme is developed to collect population size and distribution data, and where possible demographic data, including survival, fecundity, and dispersal data, by 2009. • Long-term surveys are established at several known sites, by 2009. • Reliable population estimates are established for the Dakota skipper in Canada by 2012.
2. Identify, secure, and enhance significant habitat for the Dakota skipper.	• Used and available habitat is mapped by 2009. • Critical habitat is identified, by 2010 • Management plans are in development or completed for all used sites by 2012. • Stewardship agreements are in place to reduce threats at all used sites. • A communication strategy aimed at landowners and the general public is developed and its implementation is initiated by 2012.
3. Increase knowledge of the Dakota skipper in Canada, including distribution, abundance, biology, and management practices.	• Demographic data is being collected, and population and habitat viability modeling is in progress by 2012. • Potential areas for reintroduction are identified. • Research is initiated to address knowledge gaps. • Collaborate between Canada and U.S. jurisdictions are ongoing.

2.10 Statement on action plans

An Action Plan for the Dakota skipper will be completed by the end of December 2010.

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