Species at Risk Act
Recovery Strategy Series

Recovery Strategy for the Mormon Metalmark (*Apodemia mormo*) Prairie Population in Canada

Mormon Metalmark

January 2008

Parks Canada Parcs 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 (http://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 (http://www.sararegistry.gc.ca/) and the Web site of the Recovery Secretariat (http://www.speciesatrisk.gc.ca/recovery/default_e.cfm).

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Additional copies:

You can download additional copies from the SARA Public Registry (http://www.sararegistry.gc.ca/)

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DECLARATION

Under the *Accord for the Protection of Species at Risk* (1996), the federal, provincial, and territorial governments agreed to work together on legislation, programs, and policies to protect wildlife species at risk throughout Canada. The *Species at Risk Act* (S.C. 2002, c.29) (SARA) requires that federal competent ministers prepare recovery strategies for listed Extirpated, Endangered and Threatened species.

The Minister of the Environment presents this document as the recovery strategy for the Mormon metalmark (*Apodemia mormo*) as required under SARA. It has been prepared in cooperation with the jurisdictions responsible for the species, as described in the Preface. The Minister invites other jurisdictions and organizations that may be involved in recovering the species to use this recovery strategy as advice to guide their actions.

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 further details regarding measures to be taken to support protection and recovery of the species. Success in the recovery of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the actions identified in this strategy. In the spirit of the *Accord for the Protection of Species at Risk*, all Canadians are invited to join in supporting and implementing this strategy for the benefit of the species and of Canadian society as a whole. The Minister of the Environment will report on progress within five years.

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STRATEGIC ENVIRONMENTAL ASSESSMENT STATEMENT

In accordance with The Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals, 2004, a strategic environmental assessment (SEA) is conducted on all Species at Risk Act (SARA) recovery strategies. 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 results of the SEA by K. Forrestall (2006) are summarized below.

This Mormon metalmark Prairie population recovery strategy will clearly benefit the environment by promoting the recovery of the Mormon metalmark (*Apodemia mormo*) through increasing knowledge of its habitat requirements and the additional conservation efforts for Mormon metalmark habitat. Improved habitat conservation efforts for other species that share some habitat with the Mormon metalmarks, such as the branched umbrella plant (*Eriogonum pauciflorum*), will be a positive residual effect of the recovery strategy. Additional positive effects on other species could include increasing the knowledge of threats to other species, potentially improving knowledge of other species in unsurveyed areas and an overall increase in the conservation of prairie species through comprehensive prairie conservation/endangered species planning initiatives.

The potential for important negative effects on other species or ecological processes is negligible given the highly specialized and localized habitat requirements of Mormon metalmarks as well as the non-destructive nature of the recommended actions. Any sampling of the species for genetic testing will require a permit and be subject to conditions as required under SARA.

Only three privately managed cattle ranches have known Mormon metalmarks on or near them and all are within the proposed Grasslands National Park boundaries. The ranch managers and relevant rural governments, as well as the Province of Saskatchewan (Saskatchewan Environment) were all provided copies of the draft strategy and given opportunity to provide comments. Environment Canada and The Bureau of Land Management, United States Department of Interior, the largest land management agency in the adjacent habitat in the United States, were also given a draft copy of the strategy and provided the opportunity to comment.

The SEA concluded that this recovery strategy would have several positive effects and not cause any significant negative effects. Further project-specific environmental assessments of actions identified as a result of research conducted in this recovery strategy may be required.

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: http://www.sararegistry.gc.ca/plans/residence_e.cfm.

PREFACE

This Recovery Strategy addresses the recovery of the Mormon metalmark, *Apodemia mormo* Prairie population. In Canada, the Prairie population of this species can be found in Saskatchewan within Grasslands National Park of Canada (GNP) and immediately adjacent on privately managed rangelands.

The recovery strategy for the Mormon metalmark Prairie population in Canada was developed by the authors for the Parks Canada Agency on behalf of the competent minister (Minister of the Environment). The strategy was prepared in cooperation with Saskatchewan Environment, Environment Canada, and the British Columbia Ministry of Environment.

EXECUTIVE SUMMARY

The Mormon metalmark is a medium-sized butterfly (wingspan of 25 to 35 mm) of arid regions that is named for white metallic markings covering both of its wings. In Canada, there are two populations of Mormon metalmark. The Southern Mountain population in the Similkameen River Valley of British Columbia is listed as "endangered". This recovery strategy addresses the Prairie population, which was designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Threatened in 2002. The Prairie population is located in southwestern Saskatchewan within the current and proposed Grasslands National Park (GNP) boundaries. However, only two limited metalmark surveys have ever been conducted for the Prairie population (Hooper 2002, Henderson 2006 (unpublished data)); therefore knowledge of habitat requirements for the Canadian Prairie population are extremely limited and most of the current information comes from the United States. Additionally, the number of Prairie colonies is unknown and surveys have never been conducted in Alberta. Recovery is considered feasible; however critical habitat is not defined in this recovery strategy.

Although information is limited, it appears that in Saskatchewan Mormon metalmarks typically occur on hillsides, slopes, or embankments on barren clay or heavy clay soil where its host plant, the branched umbrella plant (*Eriogonum pauciflorum)* occurs. In general, the literature suggests that this butterfly is associated with unstable slopes where the natural erosion of the sand or gravel substrate provides habitat for the host plant. Adult metalmarks require mature, robust branched umbrella plants for oviposition and both the flowering branched umbrella plant and the rubber rabbitbrush (*Ericameria nauseosa*) for foraging. Mormon metalmark larvae utilise the branched umbrella plant for feeding and require the woody stems or underlying leaf litter for hibernation. The size of the Prairie population has yet to be determined, but is speculated to be larger than the Southern Mountain population. It is not known whether or not this population is isolated from populations in northern Montana.

The main threats to the species are invasive exotic species, pollution, accidental mortality, potential climate change and habitat loss and degradation due to urban and agricultural development, agricultural practices, all-terrain vehicle traffic, and wild fire.

The recovery goal for the Prairie population of the Mormon metalmark is to:

> Maintain suitable habitat and ecological linkages within the known range of the Prairie population of the Mormon metalmark, which preserves the opportunity for natural processes to shape the population dynamics and the evolution of the species.

The recovery objectives are:

1. By 2009, assess and map all potential Mormon metalmark habitat in the known range of the Prairie population and determine whether it is currently occupied.
2. Determine whether other Mormon metalmark populations exist outside of the known range by 2010.

3. Beginning in 2007, determine the adult population size of all known prairie colonies of Mormon metalmark butterflies.
4. By 2010, identify and begin implementing best management practices and stewardship agreements.
5. By 2012, determine the extent that Canadian Prairie populations of Mormon metalmark are linked by dispersal to each other and to Montana populations.
6. Where appropriate, integrate Mormon metalmark recovery efforts into multi-species recovery and broader conservation programs for grassland species and prairie conservation by 2012.

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1 BACKGROUND

1.1 Species Assessment Information from COSEWIC

Common Name: Mormon metalmark (Prairie population)

Scientific Name: *Apodemia mormo*

Assessment Summary
COSEWIC Status: Threatened

Reason for designation: The Prairie population of the Mormon Metalmark is a small, northern outlier of the species' main ranges in the southwestern US. Known populations are not currently directly threatened by human activities and half the known sites are within the boundaries of a National Park. However, the total population is quite small, likely undergoes extreme fluctuations in size, is a habitat specialist, and occurs in a highly restricted area, making it vulnerable to stochastic events.

Canadian Occurrence: Saskatchewan

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

The Prairie population of Mormon metalmarks (or interchangeably "metalmarks"), *Apodemia mormo*, is part of a northern population that occurs along portions of the Milk and Missouri Rivers and their tributaries in North Dakota, Montana and Saskatchewan. This population is spatially separate from the main range of metalmarks in the southwestern U.S. (Opler 1999). Known sites for the Canadian Prairie population occur along the lower Frenchman River and Rock Creek. Most of these localities are on land managed by the Parks Canada Agency and only three privately managed cattle ranches have known Mormon metalmarks on or near them and all are within the proposed Grasslands National Park boundaries (COSEWIC 2002). To date, neither biology nor population dynamics of the Mormon metalmark Prairie population have been investigated. Only two limited metalmark surveys have ever been conducted for the Prairie population (Hooper 2002, A. Henderson, Grasslands National Park, unpublished data 2006); therefore knowledge of habitat requirements for the Canadian Prairie population are extremely limited and most of the current information comes from the United States. Additionally, no surveys have been conducted in suitable habitat in Alberta so the presence of metalmark butterflies in that province remains unknown (G. Anweiler, University of Alberta Strickland Museum, pers. comm. 2006).

1.2 Description

The Mormon metalmark is the only Canadian representative of the tropical Riodinidae family of butterflies (Layberry *et al.* 1998). COSEWIC (2002) noted that Canadian population morphology has not been studied in detail and used the description of the nominate[1] subspecies *A. m. mormo* which appears to be generally consistent with the appearance of specimens from both British Columbia and Saskatchewan.

The Mormon metalmark is a medium sized butterfly with a 25 to 35 mm wingspan (Figure 1). The common name 'metalmark' for many species in this family refers to the predominance of metallic-like markings on the wings. The upper side has an orange brown background colour with multiple white patches and black marks, while the underside is grey with white spots; the forewings have a reddish-brown area on both the upper and lower surfaces (Layberry *et al.* 1998, Southern Interior Invertebrates Recovery Team 2005). The eyes are green, the body is grey with white markings along the sides, and the antennae have alternating black and white rings (COSEWIC 2002). Metalmark eggs are flattened spheres, pink turning purple, laid in small groups of 2-4 on the larval host plant, the branched umbrella plant, *Eriogonum pauciflorum* (Scott 1986, Pyle 2002). Scott (1986) describes the larvae as "dark violet (lighter beneath), with six rows of clustered cactus-like spines, the dorsal rows black at their bases, the lateral rows ochre." The pupae are usually mottled brown, somewhat stout and hairy, and are found in the plant litter at the base of the host plant (Environment Canada 2006).

Adult male and female metalmarks develop different size and structural characteristics (*i.e.,* sexual dimorphism). Females are larger with broader wings and three pairs of functioning legs; the male's forelegs are not used for walking (COSEWIC 2002). Adult butterflies only live about 10 days. They are typically in flight from mid-August to late September (Guppy and Shepherd 2001) with peak activity from mid-to-late August. In the 2006 survey of GNP, metalmark adults were observed in flight at the end of July until late September (A. Henderson, Grasslands National Park, unpublished data 2006).

[1] The nominate subspecies is indicated by the repetition of the specific name (*e.g. Apodemia mormo mormo*)

Figure 1. Picture of a Mormon metalmark butterfly on a branched umbrella plant in Grasslands National Park, Saskatchewan, Canada. (Photo by A. Henderson).

1.3 Populations and Distribution

The Mormon metalmark ranges from northern Mexico, through the western United States to southern British Columbia and Saskatchewan in Canada (Figure 2) (COSEWIC 2002). Globally, NatureServe (2006) has designated this species as G5 which indicates that it is demonstrably widespread, abundant, and secure, although it may be quite rare in parts of its range, especially at the periphery as evidenced in Canada. California has the greatest number of subspecies and the range expands eastward through Nevada, Utah, and Colorado (COSEWIC 2002). Separated populations tend to occur north of these states and Opler (1999) and Pyle (2002) show a cluster of four populations in the Pacific Northwest, which includes the sites in British Columbia, as well as an isolated northeastern population in eastern Montana, western North Dakota and southwestern Saskatchewan (Figure 2). In northwestern North America the Mormon metalmark is found primarily in habitats along the valleys of the Columbia and Missouri rivers and their tributaries (COSEWIC 2002).

Figure 2. Known North American Range of *Apodemia mormo*, the Mormon metalmark butterfly. Populations in regions shown in grey were considered another subspecies and were removed from *A. mormo* range by Opler 1999. Map adapted from Opler 1999 and Pyle 2002 (Taken from COSEWIC 2002).

1.3.1 Canadian distribution

The Canadian range of this species includes two separate populations (COSEWIC 2002). The Prairie population is found within and adjacent to GNP in southwestern Saskatchewan. The Southern Mountain population occurs in southcentral British Columbia near the town of Keremeos in the Lower Similkameen River Valley and is extirpated from the South Okanagan River Valley (Cannings *et al.*1998, Southern Interior Invertebrates Recovery Team 2005). The conservation ranking of this species in both British Columbia and Saskatchewan is S1 (Critically Imperiled, extremely rare).

Only two limited Saskatchewan metalmark surveys have ever been conducted for the Prairie population and none have been conducted in Alberta (Hooper 2002, A. Henderson, Grasslands National Park, unpublished data 2006). A 2002 survey of metalmarks in Saskatchewan identified locations in the East and West Blocks of GNP, in the Killdeer badlands, and along the slopes of the Frenchman River Valley (Hooper 2002). Two weeks of survey work for metalmarks during the summer of 2006 resulted in the discovery of two new metalmark colonies in the West Block of GNP (A. Henderson, Grasslands National Park, 2006 (unpublished data)).

Insufficient information exists to estimate population number, size, or trend. More thorough surveys of Mormon metalmark populations in Canada are planned for 2007.

1.3.2 Percent of Global Distribution and Abundance in Canada

Canada has less than 1% of both the Mormon metalmark's global range and population (Cannings *et al.* 1998). The Canadian population probably varies from year to year, and is currently estimated at less than 250 individuals in the Southern Mountain population and probably less than 1000 in the Prairie population (COSEWIC 2002). It is not unusual for numbers of invertebrates in a population to vary by orders of magnitude from season to season, depending on factors such as weather, predator population sizes, etc. (G. Anweiler, University of Alberta Strickland Museum, pers. comm. 2006).

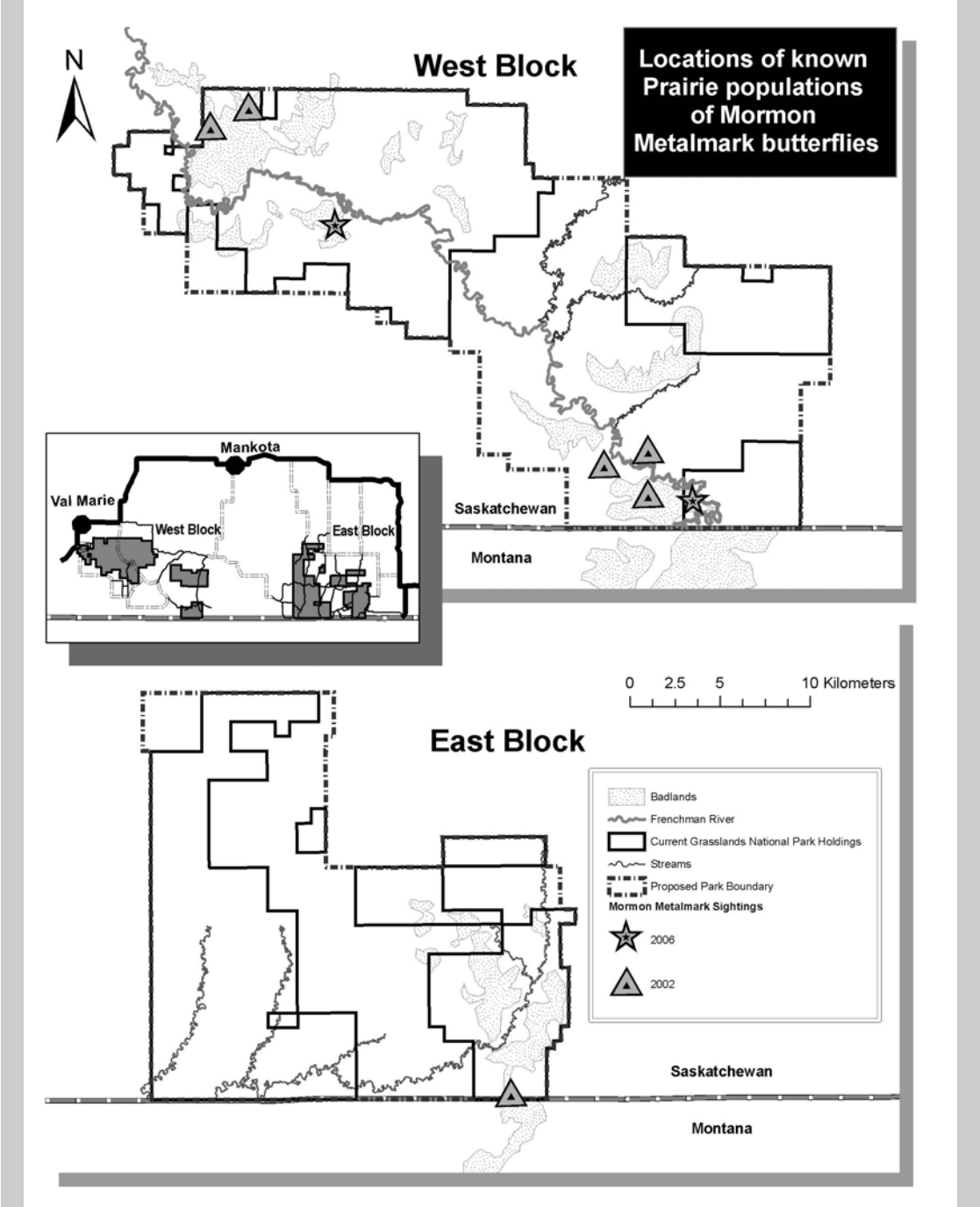

Figure 3. Map of sightings of Mormon metalmarks in Saskatchewan (Hooper 2002 and A. Henderson, Grasslands National Park, unpublished data 2006). Badland habitat has not been systematically searched for Mormon metalmarks. The badland areas on the map indicate regions where future populations might be discovered.

1.4 Needs of the Mormon Metalmark

1.4.1 Habitat and Biological needs

Throughout their range, Mormon metalmark habitat includes hillsides, slopes, and embankments with eroded clay or heavy clay soils and moderate to high densities of branched umbrella plant and rubber rabbitbrush *(Ericameria nauseosus)*(COSEWIC 2002). However, only two limited metalmark surveys have ever been conducted for the Prairie population (Hooper 2002, Henderson 2006 (unpublished data)); therefore knowledge of habitat and requirements for the Canadian Prairie population are extremely limited and most of the current information comes from the United States. Metalmarks produce one generation per year and require branched umbrella plants to complete their life cycle, thus healthy branched umbrella plant populations are critical to metalmark survival. Upon emergence, adults live in colonies and have limited dispersal, reportedly remaining close to their larval host plant (the branched umbrella plant), to feed on its nectar (Arnold and Powell 1983, COSEWIC 2002). Adults use rubber rabbitbrush (COSEWIC 2002) as a secondary nectar source. Though still unclear, the quality of metalmark habitat is likely influenced by the density and quality of both nectar sources.

Mating occurs within three days of adult emergence (COSEWIC 2002). Adults require mature umbrella plants for egg laying and flowering umbrella plants and rabbitbrush for nectaring (COSEWIC 2002). While waiting for females to copulate, males perch on host or nectar plants or nearby shrubs. Females reportedly lay fertilized eggs on leaves at the base of robust branched umbrella plants and eggs are deposited singly or in clusters of two to four (Arnold and Powell 1983). It is not known if eggs hatch in the spring or fall, but a staggered emergence is most likely (COSEWIC 2002). The larvae are known to hibernate in stems, on flower heads, or under leaf litter of their host plants and emerge in the spring to feed (Arnold and Powell 1983). Larvae are nocturnal (Arnold and Powell 1983) and rest during the day in nests made of leaf litter and silk at the base of the branched umbrella plant where they are also thought to pupate (COSEWIC 2002). Healthy populations of branched umbrella plants are critical to metalmark development.

Mormon metalmark habitat in and around GNP is stable and relatively abundant with little threat of disturbance. More detailed surveys of GNP are required to quantify the amount of available and occupied habitat. Studies of both the Southern Mountain and Prairie populations are planned for 2007 to improve the knowledge of metalmark developmental biology, habitat requirements, and dispersal (S. Desjardins, University of British Columbia, pers. comm. 2006).

1.4.2 Limiting Factors

The following are the biologically limiting factors for the Prairie population of Mormon metalmarks, although many of these factors are not yet fully understood:

1) **Food plant specificity**: Adult metalmarks in Saskatchewan reportedly nectar only on branched umbrella plants and rubber rabbitbrush (Hooper 2002). Larvae and pupae depend solely on branched umbrella plants for development (Scott 1986, Pyle 2002). It is

not known whether metalmarks use another plant, *Eriogonum flavum* (*i.e.*, alpine golden buckwheat, Piper's buckwheat, yellow buckwheat)**,** which is closely related to *E. pauciflorum* and is reported to occur in GNP. Even though metalmarks have highly specific host plant requirements, both branched umbrella plants and rubber rabbitbrush are common on eroded clay soils of badlands habitat in GNP, and thus play only a partial role as a limiting factor in the distribution of this species.

2) **Flowering period of the food plant**: The flowering period of the food plants must coincide with the metalmark flight period to ensure nectar is available. If the timing of flowering is delayed or changed, food plant senescence could impact adult survival and has the potential to cause species extirpation for particular locations. Since the Prairie population of metalmarks is at the northernmost extent of the range for this species (Opler 1999, Pyle 2002), it may be particularly susceptible to changes in climatic factors that influence the blooming period of their nectar plants.

3) **Dispersal capability**: Mormon metalmarks have a short adult lifespan and only one annual flight period, which limit their dispersal potential in the naturally fragmented landscape of GNP (COSEWIC 2002). Most of the habitat that metalmarks occupied in 2002 and 2006 occurred on eroding slopes, which may be limited in distribution or separated by long distances. For this reason, populations may be vulnerable to natural stochastic events and extirpations, and re-colonization probability may be limited (COSEWIC 2002).

4) **Soil, slope and aspect habitat requirements**: Known locations of metalmark colonies appear to occur in host plant patches on hillsides and slopes with exposed, eroding clay soils (Hooper 2002; A. Henderson, Grasslands National Park, unpublished data 2006). These sites are common in GNP and may be important habitat characteristics. Although apparently suitable habitat is available, very few of these locations are occupied by metalmarks. The requirement for these habitat characteristics and details of differences between available but unoccupied and occupied habitat are not well understood and may therefore be limiting.

1.5 Threats

1.5.1 Threat classification

The following factors, (Table 1), may pose a threat to the Mormon metalmark Prairie population but are not well understood. Each will be addressed in the action plan for this species.

Table 1. Threat Classification Table

Identification and ranking of current threats to the survival and habitat of the Mormon metalmark Prairie population (1= severe/widespread, 2= moderate/potentially widespread, 3= limited threat in scope and severity, 4= unknown).

#	Threat	Rank
1	Habitat loss, degradation, and fragmentation	2
2	Invasive exotic species	4
3	Pollution	3
4	Climate change and natural disasters	4

1.5.2 Description of threats

Habitat loss, degradation and fragmentation
As demonstrated for other butterfly species (Franco *et al.* 2006, Schultz and Dlugosch 1999), habitat loss and degradation poses a potential threat to the metalmark Prairie population (COSEWIC 2002). While the probability of it occurring is low, there is the potential for habitat loss and degradation to have a severe localized effect on metalmark colonies. For this reason, it is ranked relatively high.

Examples of human activities that have the potential to destroy or degrade Mormon metalmark habitat include the following:

- Ranching activities such as locating winter-feeding, salt blocks, or calving sites on metalmark habitat could affect Mormon metalmark habitat; and
- The development of a backcountry campground or infrastructure.

The risk of habitat degradation or destruction caused by the above activities is already quite low and could be reduced almost to zero if all the colony locations are documented and made known to land managers.

Similarly, oil and gas exploration and development could cause destruction and degradation of metalmark habitat. However, as part of the Grasslands National Park establishment agreement, all the land within the proposed boundary of Grasslands National Park has had the oil and gas leases extinguished. Oil and gas exploration and development may become a larger issue if future metalmark surveys identify new metalmark locations outside of the proposed boundaries of Grasslands National Park.

Prairie fires are a relatively common and important source of disturbance in the northern mixed-grass ecosystem of Grasslands National Park. The loss of metalmark habitat by prairie fire is, however, unlikely because badland habitat is very sparsely vegetated.

Invasive exotic species
Habitat loss and degradation due to invasive exotic plant species is an important driving force for butterfly population declines (Keeler *et al.* 2006). Yellow sweet clover, *Melilotus officinalis*, is an exotic species that can outcompete native species and has already invaded badland habitat within GNP (Michalsky *et al.* 2005). The presence of yellow sweet clover in known metalmark

habitat has not been confirmed. The potential for yellow sweet clover to alter metalmark habitat suitability by competing with branched umbrella plants or rubber rabbitbrush requires further clarification.

Pollution (*i.e.* agrochemicals)

In studies of other butterfly systems, agrochemical drift has resulted in direct butterfly mortality or overall reduced fitness in adults, larvae, pupae, host plants, and food plants (Davis *et al*. 1991a, Davis *et al*. 1991b, Davis *et al*. 1993, Longley *et al*. 1997). Pollution related to agrochemical drift from nearby agricultural lands, in particular grasshopper control during outbreak years is a potential threat. All metalmark populations on Parks Canada land are safe from direct spraying and privately managed rangelands are rarely sprayed but the direct application of pyrethroids and chlorpyrifos on metalmarks would likely have severe localized affects. The distance that these chemicals can drift and have toxic effects on butterflies is poorly studied but could range from 150 m to 500 m (D. Johnson, Univ. of Lethbridge, pers. comm. 2006). There are agricultural crops within 500 m of some Mormon metalmark colonies located within GNP.

Climate and natural disasters

Climate change, associated with an increase in frequency and intensity of extreme and periodic climatic events such as droughts, may affect species by: shaping species' ranges and distributions; altering competitive interactions; causing resource asynchrony; and inducing phenological[2] changes and extinctions (Easterling *et al.* 2000, Forchhammer *et al.* 1998, Hughes 2000, Lemmen *et al.* 1997, Thomas *et al.* 2001, Stenseth *et al.* 2002). Some obvious conservation planning implications are shifts in species' ranges outside of protected area boundaries as well as maintaining populations of rare and endangered species in cases where climatic conditions for them may be deteriorating (Peters and Darling 1985, Hannah *et al.* 2002 a, b).

Single small populations such as the Canadian Mormon metalmark Prairie population are especially vulnerable to extinctions due to random climatic events or loss of representation due to species' range shifts with climate change (Williams and Araujo 2000). Extreme weather events such as hailstorms, severe frost or flooding pose a threat to metalmarks. Although it is difficult to predict with certainty, general circulation model (GCM) simulations suggest that the trend throughout the Northern Great Plains will be decreased precipitation and increased mean annual temperatures (Karl *et al.* 1991, Lemmen *et al.* 1997). Models of climate and vegetation changes by Rizzo and Wiken (1992) suggest that southern Alberta and Saskatchewan will become a semi-desert. Such predicted changes may alter the timing of host plant flowering or cause insufficient moisture for healthy host plant growth or larval development, thereby affecting metalmark populations. Since the Canadian metalmark Prairie population is at the northernmost extent of the range for this species, this area may actually become progressively more important

[2] Relating to periodic biological phenomena, such as flowering, breeding, and migration, in relation to climatic conditions (The American Heritage® Dictionary of the English Language, 2007).

in maintaining the species as the climate changes (Channell and Lomolino 2000) and core ranges potentially shift north.

1.6 Knowledge Gaps

1.6.1 Inventory and Monitoring Gaps

An inventory of available and occupied habitat, population size, and distribution around and within GNP is incomplete and requires additional surveys. To date, only two limited surveys have been completed in Saskatchewan and none have been conducted in Alberta. A monitoring program is required to gather details of population parameters, including changes in population size, immigration, recruitment, persistence, and dispersal distance, which are not yet available. In order to establish a reliable monitoring program, further research is required to determine how counts of adults in flight correlate to actual abundance determined with mark-recapture methodology. Opportunities will be sought, whenever possible, to collaborate with biologists developing monitoring methodology for the Lower Similkameen River Valley population (Southern Interior Invertebrates Recovery Team 2005).

1.6.2 Biological/Ecological Knowledge Gaps

Knowledge of biological characteristics and habitat requirements for the Canadian metalmark Prairie population is extremely limited and most of the current information comes from the United States. Therefore, future research is necessary to improve knowledge of the general biological characteristics and ecological requirements of the metalmark Prairie population. More specifically, studies are required to identify specific metalmark habitat requirements, clarify mortality factors for different life stages and population demographics, and determine why apparently suitable habitat is currently unoccupied.

Very little is also known about the genetics of this species throughout its Canadian range. There is no information on the degree to which the Canadian Prairie population is linked by dispersal to metalmark populations in northern Montana. The proximity of the nearest Montana population is not known. Genetic studies to clarify rates of dispersal among Saskatchewan populations and between Saskatchewan and Montana populations are required to assess connectivity between these sites. COSEWIC (2002) noted that a detailed examination of the nominate subspecies *A. m. mormo* in Canadian populations in comparison to those in the U.S. has not been undertaken and that such a study may well reveal important differences between these populations. In addition to proposed genetic studies, careful observations of adult morphology will be documented during the ongoing surveys to confirm the subspecies' identity.

1.6.3 Threat Clarification

The potential risk to the Prairie populations of metalmark butterflies from agricultural herbicide and insecticide drift needs to be better-understood so best management practices can be

developed. The potential for exotic invasive plants to invade metalmark habitat and the degree that it negatively affects habitat also needs to be assessed.

2 RECOVERY

2.1 Recovery Feasibility

There is little historical information on the distribution of the Prairie population of the Mormon metalmark and none that suggests that this species was ever abundant or widespread (COSEWIC 2002). The recovery of metalmark populations on the prairie is determined to be feasible. Sufficient habitat is available and individuals capable of reproduction are available to support the recovery goal. With the exception of the largely unknown effects of climate change, the immediate and significant threats can be mitigated. Recovery for the Prairie population should focus on securing all existing habitat, threat abatement, and working with Montana land management agencies to ensure that any habitat linkages with northern Montana populations are maintained. These recovery activities are feasible with existing technology and can likely be achieved with relatively minor socio-economic costs.

2.2 Recovery Goal

To maintain suitable habitat and ecological linkages within the known range of the Prairie population of the Mormon metalmark, in order to preserve the opportunity for natural processes to shape the population dynamics and the evolution of the species.

Rationale

This goal is based on the following observations of the Prairie population of the Mormon metalmark butterfly:

- the entire known Canadian habitat is within the proposed boundaries of GNP;
- it is a small northern extension of a much larger population that occurs in northern Montana;
- the species is naturally rare and there is no data that suggests that it was ever more widespread or numerous than it is currently;
- habitat occurs in remote harsh badlands areas that have few competing land uses; and,
- there is no evidence that human activity has had a significant affect on its population dynamics.

Consequently, the recovery goal and the attending recovery actions are focused on mitigating the small potential threats and ensuring that ecological linkages with northern Montana are maintained. No other active management for species recovery appears to be necessary. While explicitly referencing natural processes in a recovery goal is unconventional, we feel it is warranted given the status and recovery context of this species and that this approach is fully consistent with Parks Canada policy (Parks Canada 1994). If any of these assumptions should prove to be incorrect, the recovery goal can be changed in future action plans or iterations of the recovery strategy.

2.3 Recovery Objectives

1) **By 2009, assess and map all potential Mormon metalmark habitat in the known range of the Prairie population and determine whether it is currently occupied.**
Surveys are required to determine the presence or absence of metalmark colonies in areas of seemingly suitable habitat that have not been surveyed. There is roughly 255.8 km^2 and 35.1 km^2 of badlands in the East and West Block regions of GNP, respectively, that have not been systematically surveyed (Figure 3).

2) **Determine whether other Mormon metalmark populations exist outside of the known range by 2010.**
Large amounts of potential habitat exist immediately upstream of the West Block of GNP, along the Frenchman River Valley, that have never been surveyed for metalmarks. Additionally, systematic surveys have not been conducted in Alberta although habitat that appears to be suitable exists (G. Anweiler, University of Alberta Strickland Museum, pers. comm. 2006).

3) **Beginning in 2007, determine the adult population size of all known prairie colonies of Mormon metalmark butterflies.**
Standardized methodologies need to be developed to determine population size and trend over time.

4) **Identify and begin implementation of best management practices and stewardship agreements by 2010.**
Many of the potential threats to metalmark habitat are due to the accidental destruction of habitat by land managers that are unaware of the presence of the butterfly. Clearly communicating the location of metalmark populations and the activities that could destroy or degrade habitat would greatly reduce the threat of accidental habitat destruction.

5) **By 2012, determine the extent that Canadian Prairie populations of Mormon metalmarks are linked by dispersal to each other and to Montana populations.**
The Mormon metalmark butterfly habitat in both the West and East Blocks of Grasslands National Park is directly linked to badland habitat in adjacent areas in Northern Montana that may contain metalmarks (Figure 3). The proximity of nearest metalmark populations in Montana and the rate of gene flow among the Saskatchewan populations and between Saskatchewan and adjacent northern Montana populations are unknown. Populations linked by dispersal will have a higher probability of being re-colonised in the case of localised extirpations.

6) **Where appropriate, integrate Mormon metalmark recovery efforts into multi-species recovery and broader prairie conservation programs for prairie grassland species and prairie conservation by 2012.**
Land use issues relevant to the management of habitat for metalmarks may be common to other prairie wildlife species. Efforts to protect and possibly enhance populations of

metalmarks should be coordinated with other initiatives or programs relevant to the sustainable management of the prairie ecosystem.

2.4 Approaches Recommended to Meet Recovery Objectives

2.4.1 Recovery Planning

Table 2. Recovery Planning: Summary of recovery objectives and strategies for the Mormon metalmark (MM)

Objectives	Priority	Threat Addressed	General Strategies
1 and 3	Urgent	All	• Survey all potential MM habitat in the current range and integrate into a GIS MM database to be used as a basis for adult MM census. Ensure the MM database is linked to the Saskatchewan Conservation Data Centre.
2 and 3	Beneficial	All	• Identify new occupied sites in unsurveyed areas in Saskatchewan and Alberta where suitable habitat is thought to exist.
3	Necessary	Climate change, pollution, Habitat loss, degradation and fragmentation	• Develop a standardized monitoring protocol to monitor MM population numbers. This is to be implemented annually at first, until population stability is determined, and then intermittently as resources permit. • As part of a research program, correlate adult flight counts with results of population estimates *(e.g.* mark and recapture). Identify attributes of occupied and suitable potential habitat. In addition to contributing to the identification of critical habitat (Table 4), use this information to clarify specific habitat requirements and evaluate threats.
4	Necessary	Habitat loss, degradation and fragmentation, direct mortality.	• Develop best management practices for activities near metalmark colonies. Metalmarks have been observed on three ranches within the GNP proposed boundaries. These BMP would be helpful to the ranchers and to GNP park staff.
5	Necessary	Habitat fragmentation	• Develop genetic markers in order to calculate dispersal rates and degree of relatedness among Northern Great Plains populations. • Identify core habitat areas essential for maintaining ecological linkages and gene flow between MM in Canada and northern Montana and develop and implement strategies for securing them within Canada.

Objectives	Priority	Threat Addressed	General Strategies
6	Beneficial	Habitat loss, degradation and fragmentation, direct mortality.	• Opportunistically integrate MM recovery into more comprehensive prairie conservation/endangered species planning initiatives. • By 2008, coordinate a collaborative forum with recovery teams for other Canadian prairie grassland species at risk to explore landscape scale conservation initiatives that may be beneficial to all species concerned.

2.4.2 Narrative to Support Recovery Planning Table

The Mormon metalmark is known to occur at the northern limit of its range in the Frenchman River and Killdeer badlands of GNP in Saskatchewan (COSEWIC 2002). Only two formal surveys have ever been conducted within this range. To improve our knowledge of metalmark distribution within the current known range, all potential metalmark habitat within GNP will be surveyed and integrated into a GIS database in 2007. Metalmark surveys should also be conducted in Montana where potential rescue populations may exist. Badland habitat that may be suitable for metalmarks continues across the Montana border providing a potential corridor (COSEWIC 2002) (Figure 3).

All metalmark surveys will be conducted using a standardized monitoring protocol and habitat evaluation. To date, most monitoring has involved counting adults in flight at a particular site. Further research is required to determine how these counts correlate to actual abundance determined with mark-recapture methodology. Opportunities will be sought to collaborate with biologists developing monitoring methodology for the Lower Similkameen River Valley population (Southern Interior Invertebrates Recovery Team 2005). In addition to standardizing approaches to metalmark monitoring across the species' range, this collaboration could also foster development of genetic markers in order to better identify dispersal rates and genetic relatedness among Great Plains populations.

Three of the known populations of metalmarks occur on privately managed provincial lease land within the proposed boundaries of GNP. Land for GNP is acquired on a "willing seller-willing buyer" basis so the timing of the completion of the park is open-ended. Most private land managers neighbouring GNP are not yet familiar with the Mormon metalmark. GNP staff will work to increase awareness of metalmark colony locations with neighbouring land managers and park staff and identify potentially harmful land management practices to affected land managers. It is expected that the impact on agricultural practices will be so minimal that formal stewardship agreements will not be required.

2.5 Performance Measures

Table 3: Performance Measures to meet Recovery Objectives

Recovery Objective	Performance Measures
By 2009, assess and map all potential Mormon metalmark habitat in the known range of the Prairie population and determine whether it is currently occupied.	Development of a GIS database that can produce maps of occupied and unoccupied habitat. Survey of all potential habitat in the current range is completed and mapped from a GIS database by 2010 and used as a basis for an adult metalmark census. Ensure the MM database is linked to the Saskatchewan Conservation Data Centre.
Determine whether other Mormon metalmark populations exist outside of the known range by 2010.	Systematic surveys of suitable habitat completed. Partial or full identification of critical habitat to the extent possible for the Mormon metalmark by June 2010. Action Plan with critical habitat identified posted on the SARA Public registry in 2011.

Recovery Objective	Performance Measures
Conduct a census to determine and monitor the adult population size of all known prairie colonies of Mormon metalmarks.	Trend data generated using a standardized survey methodology. Assess the number of adults required to support a viable population.
By 2012, determine the extent that Canadian Prairie populations of Mormon metalmarks are linked by dispersal to each other and to Montana populations.	Rates of dispersal calculated and important habitat corridors identified. Assess the threat of invasive plants at these sites and if appropriate implement option for control.
Where appropriate, identify and implement best management practices and stewardship agreements by 2010.	All affected landowners have been informed of the presence of Mormon metalmarks on their land and have adopted best management practices.
Support ecosystem-level conservation efforts where appropriate.	Recovery actions for the Mormon metalmark are considered and integrated into other recovery strategies and ecosystem conservation plans for the Northern Great Plains. Maintain regular communication with BC MM recovery team/experts.

2.6 Critical Habitat

No critical habitat, as defined under the federal *Species at Risk Act*, is proposed for identification at this time.

There is some knowledge regarding metalmark habitat needs, but more work must be completed before critical habitat can be reasonably designated (Table 4). Only two limited surveys have ever been conducted for the Prairie population and it is unknown whether sites that were occupied during those surveys are habitually occupied or whether there is spatial and temporal movement of metalmark populations. In fact, most of the information regarding Prairie metalmark habitat and biology has been taken from work done in the United States. In 2006, a small amount of search effort revealed two new colonies. Surveys of available habitat within and surrounding GNP have not been completed and future surveys will undoubtedly reveal more habitat in addition to specific habitat requirements. Furthermore, known occupied Mormon metalmark sites exist on federally protected land within GNP or on privately managed ranches within the proposed boundaries of GNP, thereby lessening the conservation urgency to identify critical habitat at this time. It is expected that critical habitat will be identified within the recovery action plan following: 1) Surveys of known potential habitat and at least one adult census conducted; 2) Consultation and development of effective stewardship options with potentially affected landowners or organizations; and 3) Quantification of specific habitat and area requirements for this species.

Table 4: Schedule of Studies

Action	Timeline
Develop an ecological definition of critical habitat. Specifically, conduct research to quantify habitat requirements and use. This would include quantification of dispersal distance, nectaring, egg-laying and dispersal habitats, optimal patch size and habitat connectivity requirements. Determine why apparently suitable habitat is unoccupied.	2007 - 2010
Inventory and monitor species distribution, abundance, occupied habitat and potential habitat. Determine the locations of potentially new MM colonies in SK and AB. Map the areas of occupied habitat and the potential habitat that contributes to maintaining ecological linkages with habitat in northern Montana and amongst Canadian colonies.	2007 - 2010
Determine land ownership of all potential new MM colonies and consult with and develop effective stewardship options with potentially affected landowners or jurisdictions.	2007 to November 2009
Complete all consultation and approvals and post the action plan on the SARA public registry.	Action plan by Jan 2011 that includes partial or full designation of critical habitat

2.7 Effects On Other Species

Please refer to the Strategic Environmental Assessment Statement section in this document. Potential impacts on other species or ecological processes are not known but thought to be negligible given the highly specialized and localized habitat requirements of metalmarks as well as the benign nature of the proposed actions. Permits and permitting conditions will be met before any sampling for genetic testing is conducted.

2.8 Statement on Action Plans

An action plan for the Mormon metalmark will be completed by January 2011 that will include partial or full designation of critical habitat based on occurrences. Consideration will be given to incorporating this action plan into a multi-species action plan for Grasslands National Park of Canada.

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