

Management Plan for the Mormon Metalmark (*Apodemia mormo*) Prairie Population in Canada

Mormon Metalmark butterfly



2021



Government
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For copies of the management plan, or for additional information on species at risk, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Reports, residence descriptions, action plans, and other related recovery documents, please visit the Species at Risk (SAR) Public Registry¹.

Cover illustration: Mormon Metalmark butterfly photo ©Johane Janelle

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¹ <http://sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>

Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996)² agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent minister(s) are responsible for the preparation of management plans for listed species of special concern and are required to report on progress within five years after the publication of the final document on the Species at Risk (SAR) Public Registry.

The Minister of Environment and Climate Change and Minister responsible for the Parks Canada Agency is the competent minister under SARA for the Mormon Metalmark and has prepared this management plan, as per section 65 of SARA. To the extent possible, it has been prepared in cooperation with the Province of Saskatchewan (Ministry of Environment and Ministry of Agriculture) as per section 66(1) of SARA. It was developed in cooperation and consultation with Indigenous groups and other stakeholders.

The Mormon Metalmark was assessed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2003 and listed on Schedule 1 of the SARA. Its status was re-examined by COSEWIC in May 2014 and it was down-listed to Special Concern on Schedule 1 of the SARA in February 2018. The legal requirement of monitoring and reporting on the implementation of Recovery Strategy for the Mormon Metalmark (*Apodemia mormo*) Prairie Population in Canada published in the Species at Risk Public Registry on January 2008, as stated in s.46 and s. 55 of SARA, is no longer applicable. All subsections of sections 58 and 61 and section 63 of SARA no longer apply to the critical habitat identified in any Action Plan where critical habitat was identified for the Mormon Metalmark.

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

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

² <http://registrelep-sararegistry.gc.ca/default.asp?lang=En&n=6B319869-1%20>

Acknowledgments

This Management Plan was written by Shelley Pruss (Parks Canada). The information in this plan is largely based on the Recovery Strategy for the Mormon Metalmark (*Apodemia mormo*) Prairie Population, in Canada (Pruss et al 2008), the Mormon Metalmark COSEWIC Assessment and Status Report (COSEWIC 2014) and the Multi-Species Action Plan for Grasslands National Park of Canada (Parks Canada Agency 2016). Additional comments and assistance in developing the Management Plan were provided by Joanne Tuckwell and Stefano Liccioli (Parks Canada).

Executive Summary

The Mormon Metalmark (*Apodemia mormo*) is a small butterfly (wingspan 25 to 32 mm) that is dorsally dark brown and grey with lighter ventral grey surfaces with prominent white spots tipped with black markings on the wings. The central forewings are orange-gold on both dorsal and ventral surfaces. The larvae are up to 25 mm long, dark purple with yellow spots, reddish pink prolegs, and evenly spaced clumps of black bristles. They are found on eroded hillsides and embankments characterised by sand, gravel, clay or shale soils in the badlands of southern Saskatchewan (Pruss *et al.* 2008).

The Mormon Metalmark was assessed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2003 and listed on schedule 1 of the SARA. Its status was re-examined by COSEWIC in May 2014 and it was down-listed to Special Concern on Schedule 1 of the SARA in February 2018. This status change was largely a result of extensive surveys in Grasslands National Park, Val Marie and Beaver Valley community pastures, as well as private and provincial leased land adjacent to Grasslands National Park. These surveys increased the number of known colonies from eight to over 160 and the number of observations from fewer than 50 to over 1,600.

The majority of the Prairie Population is protected within Grasslands National Park and has no major human-related threats. However, colonies do exist on the former PFRA federal community pasture of Val Marie and private lands in the greater park ecosystem. Overall, habitat loss is not considered a threat to this population. Habitat degradation may occur due to severe localized effects (e.g., trail development, agricultural operations), although the probability of occurrence is low. Additionally, non-native weeds can outcompete host plants at some sites, potentially reducing the Mormon Metalmark food supply and egg-laying locations.

The management objective for the Mormon Metalmark is to ensure its long-term persistence in Canada by maintaining, and potentially increasing, its population distribution and abundance. Parks Canada will lead the monitoring required to measure progress towards this objective, in collaboration with partner agencies and jurisdictions.

The broad strategies outlined in this management plan include population monitoring, preventing and mitigating habitat loss and degradation, providing information and outreach within and beyond Grasslands National Park.

The legal requirement of monitoring and reporting on the implementation of Recovery Strategy for the Mormon Metalmark (*Apodemia mormo*) Prairie Population in Canada published in the Species at Risk Public Registry on January 2008, as stated in s.46 and s. 55 of SARA, is no longer applicable. All subsections of sections 58 and 61 and section 63 of SARA no longer apply to the critical habitat identified in any Action Plan where critical habitat has been identified for the Mormon Metalmark.

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1. COSEWIC* Species Assessment Information

Date of Assessment: May 2014

Common Name (population): Mormon Metalmark - Prairie population

Scientific Name: *Apodemia mormo*

COSEWIC Status: Special Concern

Reason for Designation: This butterfly occurs in the remote badlands and grassland habitats of Grasslands National Park and adjacent community pastures. Because of extensive surveys in the last decade, the known population of this butterfly is now large enough that it no longer meets the criteria for Threatened. There are few direct threats to the butterfly, although the slow spread of non-native plants that may compete with host plants and overgrazing in areas outside of the park are of concern and may impact habitat quality.

Canadian Occurrence: Saskatchewan

COSEWIC Status History: Designated Threatened in May 2003. Status re-examined and designated Special Concern in May 2014

* COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

2. Species Status Information

Legal designation: the Mormon Metalmark was listed on Schedule 1 of the Species at Risk Act (S.C. 2002, c.29) (SARA) as Special Concern on 21 February 2018.

The species *Apodemia mormo* (with no distinction among designatable units or populations) is globally ranked G5 (Secure)³. The Mormon Metalmark prairie population is nationally ranked N2 (Imperiled) in Canada, and sub-nationally ranked S2 (Imperiled) in Saskatchewan (Table 1). In the United States, *Apodemia mormo* (again with no distinction among populations) is ranked N5 (Secure).

Table 1: List and description of various conservation status ranks for Mormon Metalmark - Prairie Population (NatureServe 2020)

	Global (G) Rank	National (N) Rank	Sub-national (S) Rank	COSEWIC Status	SARA Status
Mormon Metalmark - Prairie Population <i>Apodemia mormo</i>	Secure (G5)	Canada N2 (Imperiled)	Saskatchewan S2 (Imperiled)	Special Concern	Special Concern

³ https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.110498/Apodemia_mormo

3. Species Information

3.1 Species Description

Mormon Metalmark (hereafter referred to as the Metalmark) populations consist of two designatable units in Canada: The Prairie Population in southwestern Saskatchewan and the Southern Mountain Population in south central British Columbia (COSEWIC 2014). This management plan addresses only the Prairie Population.

Metalmarks have a life cycle consisting of four life stages: egg, caterpillar, pupae, and adult. This species has reversed sexual dimorphism with adult wingspan ranging between 25 to 32 mm (Layberry *et al.* 1998, Scott 1986). In Canadian populations, the base colour on the upper wings is brown with multiple black marks amid white spots. The central part of the forewing is golden orange on both the upper and lower surfaces. The underside is gray with white spots and so is the body which has white markings along the sides and between abdominal segments. The long antennae have alternating black and white rings while the eyes are a bright green. For more detail see COSEWIC (2014).

Metalmarks in Saskatchewan exhibit one generation per year with a staggered emergence of adults typically beginning in early August and waning towards the end of the month. However, these butterflies may fly from mid-July into September, depending on weather conditions (Henderson *et al.* 2008, Wick pers. obs.). Flight period and breeding are mostly synchronized with the flowering of *Eriogonum pauciflorum*. Within its approximately 10-day lifespan, the butterfly emerges, mates, and females oviposit their eggs (Pruss *et al.* 2008, Wick pers. obs.).

The peak adult population in Saskatchewan is normally reached in mid-August, but may vary depending on temperature and drought conditions. According to Howe (1975), in other parts of its range, the butterfly overwinters as early instar larvae in the stems of *Eriogonum* spp. or under litter. Currently, in Saskatchewan, it is unknown whether this species overwinters as an egg or as a larval instar.

3.2 Species Population and Distribution

Global Range

The Metalmark global range spans from northern Mexico through the western United States to extreme southern British Columbia (BC) and southwestern Saskatchewan (Figure 1). Although recorded in 13 US states (COSEWIC 2014), the core of the species' range is in California, Nevada, Arizona, Utah, Colorado and New Mexico (Opler *et al.* 2012). Opler (1999) and Pelham (2012) consider the Mexican Metalmark to be a separate species.

In the west, the species occurs in a series of disjunct populations along the Columbia and Missouri valleys and tributaries (Scott 1986a; Opler *et al.* 2012) and its range extends from northern Washington (WA) into BC along the Similkameen River. The

populations in WA are thought to be the same subspecies as those in BC (Pyle 2002). In the eastern part of its range, the species occurs along the Milk and Missouri Rivers and tributaries in North Dakota, Montana and north into Saskatchewan. This population is spatially separate from the main range of Metalmarks in the southwestern U.S. (Opler 1999); the nearest area where the species has been documented is Valley County, Montana, approximately 40 km south east of the West Block population⁴ in Grasslands National Park. The rescue effect (immigration from outside Canada) is considered possible but unlikely (COSEWIC 2014).



Figure 1. Known North American range of Mormon Metalmark, *Apodemia mormo* (taken from COSEWIC 2002, 2014). Populations in regions shown in grey have been split from *Apodemia mormo* by Opler 1999.

Canadian Range

The Canadian range of Mormon Metalmarks represents the northern limit of this species (Layberry et al. 1998; Guppy and Shepard 2001; Opler et al. 2012) and includes two small, disjunct populations: the Southern Mountain Population in south-central British Columbia and the Prairie Population in southwestern Saskatchewan (Figure 1). Canada has less than 1% of the global range and population (Cannings *et al.* 1998).

Mitochondrial DNA analysis confirms that the two Canadian populations are distinct units (Proshek *et al.* 2013). Surveys for Metalmarks were undertaken in southern Alberta but no butterflies were found (Anweiler 2009). Currently, within Grasslands National Park and the adjacent Val Marie pasture area in southwestern Saskatchewan there are over 1,600 distinct geo-referenced Metalmark butterfly observations and over 160 colonies delineated. These colonies total 4356 ha; of these, 3681 ha were previously identified as critical habitat for the species (Parks Canada Agency 2016, Environment and Climate Change Canada 2016; Figures 2 and 3).

⁴ Montana Natural Heritage Program: <http://FieldGuide.mt.gov/speciesDetail.aspx?elcode=ILLEPH7010>

Prairie Population

Within Grasslands National Park, the Metalmark is primarily located along the clay and eroded hills of the Frenchman River Valley in the West Block (Figure 2), as well as badlands areas in the east side of the East Block (Figure 3). Population surveys were conducted in 2006-2008 to identify colony sites and collect representative samples for genetic analysis. Furthermore, targeted surveys were conducted in 2013-2014 to map the spatial extent of known populations and develop a predictive habitat model. The amount of known habitat occupied has increased since the previous COSEWIC status report, with the index of area of occupancy changing from 44km² in 2002 to 88km² in 2012 (COSEWIC 2002). However, no standardized monitoring of the population occurred to date; thus, fluctuations and trends of the population over time are currently unknown.

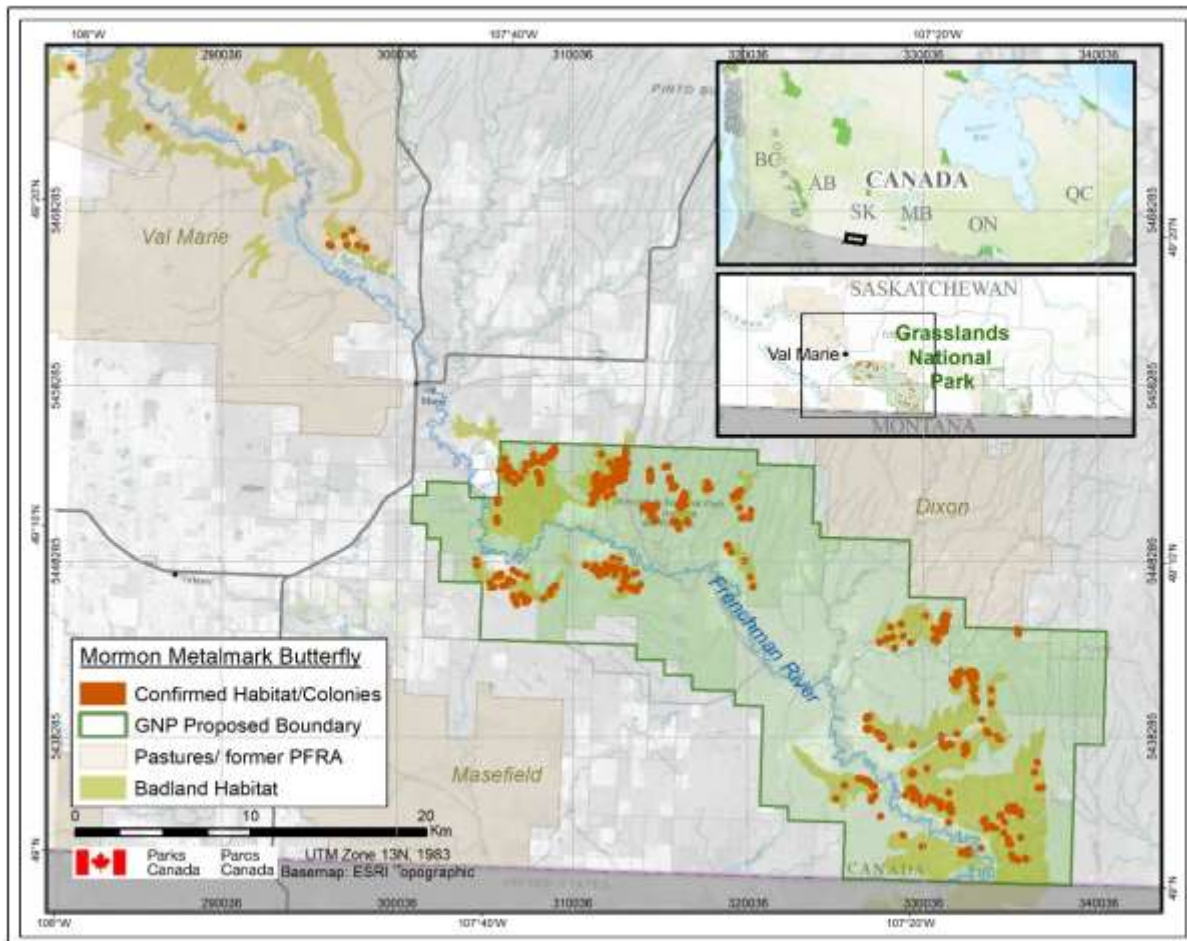


Figure 2. Location and extent of known Mormon Metalmark colonies in the Western part of southern Saskatchewan

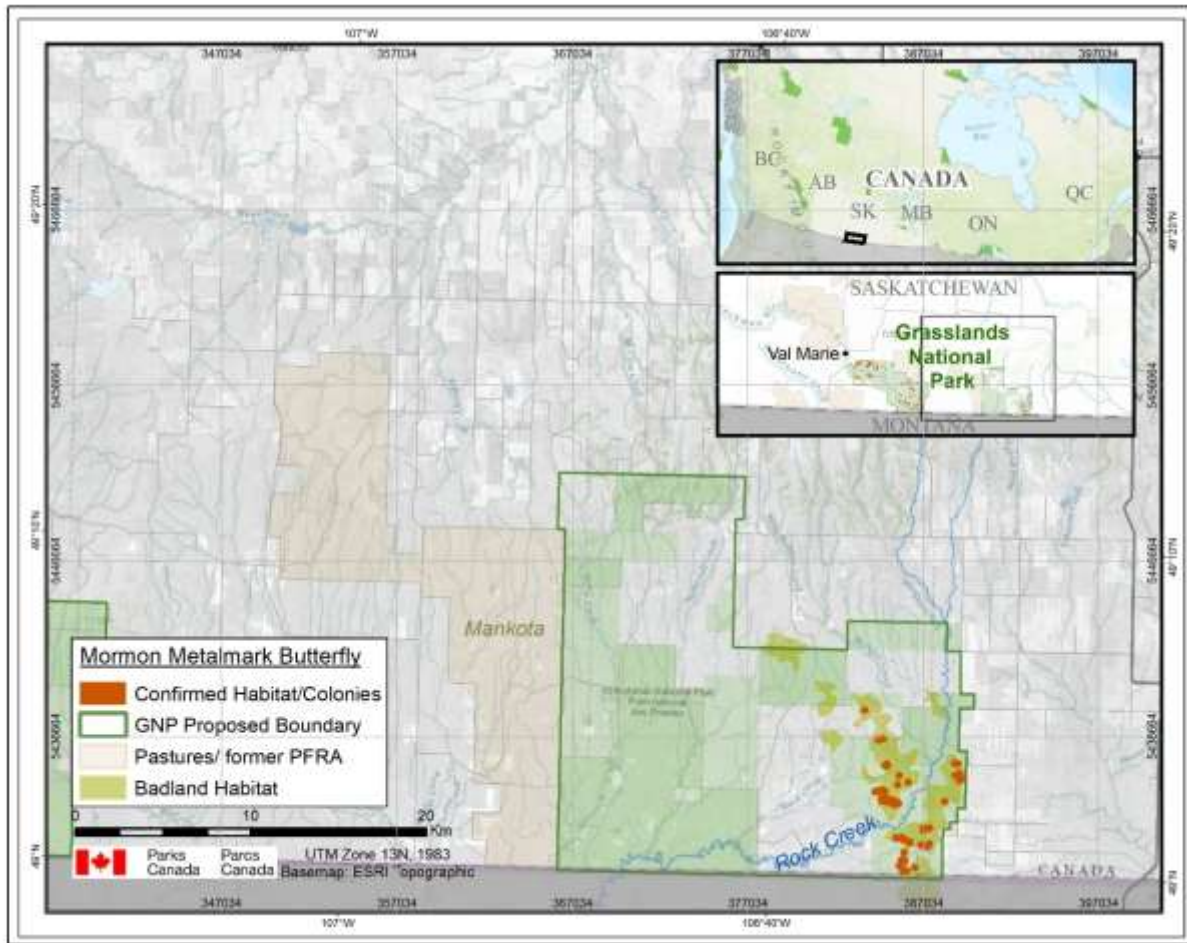


Figure 3. Location and extent of known Mormon Metalmark colonies in the Eastern part of southern Saskatchewan

3.3 Needs of the Mormon Metalmark

Habitat Requirements

The primary habitat requirement for Metalmarks is the host plant, *Eriogonum pauciflorum*, also known as the Branched Umbrella plant or Few-flowered Buckwheat. It is necessary for larval development, and both *E. pauciflorum* and rubber rabbitbrush (*Ericameria nauseosus*) are important nectar sources for adults (Arnold and Powell 1983, COSEWIC 2002).

Typically the host plant is found in badlands habitat on exposed, eroded hillsides, slopes, or embankments on barren clay or heavy clay soils (Hooper 2002, Henderson 2008, COSEWIC 2014); this plant species is listed as S3 (vulnerable) in Saskatchewan. Factors beyond the host plant were investigated by Wick (2013) and Wick *et al.* (2014) concluding that other variables were associated with Metalmark presence. Primarily, sites that had relatively more *E. pauciflorum*, higher pH, lower available N, steeper slope, more bare ground, lower elevation, and a more southerly aspect were associated

with Metalmarks. Further, Illubrun (2015) confirmed some of these results by finding a negative association between the occurrence of both Metalmarks and *E. pauciflorum* and percent vegetation cover. Additionally, there was a positive association between butterfly presence and both the health and spatial heterogeneity of *E. pauciflorum*: that is, more robust host plants distributed in a spatially aggregated manner were associated with Metalmark presence, provided that overall vegetation cover was relatively low. It is likely that high clumped host plant densities with intervening bare areas are important for developing larvae for short distance movements from one host plant to another during their late instar development. This hypothesis is supported by the fact that females in Saskatchewan were observed ovipositing primarily in cracks in the soil or under small rocks versus on host plants (Peterson *et al.* 2010, Wick *et al.* 2012). Generally, Illubrun (2015) found that sites with > 10% *E. pauciflorum* cover but < 50% vegetation overall cover are most suitable for Metalmarks. Sympatric rabbitbrush plants are especially important for adult nectaring, particularly during periods of resource asynchrony.

Limiting Factors

Limiting factors are those processes or attributes of the environment or species that limit growth, abundance, distribution, resilience, or recovery of a population (COSEWIC 2020). They are intrinsic characteristics of a species and generally not human-induced. However, if a species has lost its resilience due to other threats and is thus prone to decline, limiting factors can increase species vulnerability and become threats (COSEWIC 2020).

Limiting factors for Metalmarks include: a preference for specialised, disjunct areas of suitable habitat leading to occupancy of small localized colonies; specificity to one host plant species; high site fidelity; and limited dispersal and colonisation abilities of adults (Pruss *et al.* 2008, COSEWIC 2014). In Wick's 2011 butterfly mark-recapture study (unpubl. data) the median distance moved was 60 m for females and 34 m for males, over a median time frame of 5.2 and 4.0 days, respectively. Given these attributes, re-colonization probability is likely low and Metalmark populations may be vulnerable to natural stochastic events and extirpations (COSEWIC 2002).

Likely reflecting such a low re-colonization probability, existing host plant colonies that appear to be suitable are often not occupied by Metalmarks, suggesting obligate habitat or host plant attributes that are not well understood. Being at the northern extreme of the range, temperature considerations may be limiting. Locational attributes such as lower vegetation cover, steeper, more southerly slopes may be favoured resulting in higher insolation to facilitate egg and larval development (Wick *et al.* 2013, Illubrun 2015). Additionally, host plant quality may also be a limiting factor. *Eriogonum* species contain relatively little nitrogen (N) in their tissues (Garcia-Moya and McKell 1970) but are known to produce N-based defensive alkaloids (Schroeder and Stermitz 1984). Waller and Nowacki (1978) note that although alkaloid production in a plant is primarily a genetic trait, environmental influences can cause significant fluctuations in concentration and amount of alkaloids produced. Thus, site specific alkaloid concentrations may affect palatability for Metalmarks (Illubrun 2015). Multiple factors

likely interact to determine habitat suitability. Alternately, individual factors may influence suitability in multiple ways. For example, soil attributes might directly influence host plant quality and distribution by mediating growth and competitive interactions with other plant species, in turn affecting the extent of vegetation cover, which would interact with slope and aspect to affect ground temperature (Illubrun 2015). However, apart from the species' restricted habitat and host plant requirements, limiting factors are poorly understood.

4. Threats

4.1 Threat Assessment

Threats are defined as the direct activities or processes that have caused, are causing, or may cause the destruction, degradation, and/or impairment of a population, species, community, or ecosystem. Although threats are often related to human activities (directly or indirectly), natural phenomena can also be regarded as threats.

Anthropogenic pressure on species and ecosystems may increase the detrimental effects of natural events (Salafsky et al. 2008) (e.g., drought, flooding), especially when the species is concentrated in one location, has few occurrences (Master et al. 2012) or when it has lost its resilience from other threats, resulting in an observed, projected, or suspected population decline (COSEWIC 2020). In such cases, the effect on the population would be disproportionately large compared to these effects on healthy populations (Salafsky et al. 2008). Limiting factors are not considered during this assessment process. Historical threats, indirect or cumulative effects of the threats, or any other relevant information that would help understand the nature of the threats are presented in the Description of Threats section.

Due to the limited nature of the threats for the prairie population, identified threats were not ranked through a formal COSEWIC threats assessment (COSEWIC 2014).

4.2 Description of Threats

The majority of the Metalmark prairie population is protected within Grasslands National Park and has no major threats (COSEWIC 2014). Specifically, of 4356 ha of habitat identified for the species, 4028.1 ha (92.5%) are located within the Grasslands National Park proposed boundary and protected through the Canada National Park Act or administered by the Parks Canada Agency. Metalmark colonies also exist on the former Prairie Farm Rehabilitation Association federal community pastures (156.4 ha; 3.6% of total habitat) and private lands (171.6 ha; 3.9% of total habitat) in the greater park ecosystem. These federal pastures have been divested to the province of Saskatchewan which could sell these lands to the current Crown lessee, but only with a Crown Conservation Easement. Such a tool protects the land's conservation value, yet allows for specific compatible activities, even if the land changes ownership. Of the Mormon Metalmark habitat located outside Grasslands National Park, 296.5 ha (90.4%) fall within critical habitat identified for other species or the Emergency Order for the protection of the Greater Sage-grouse. The province of Saskatchewan will provide

protection for this habitat using provincial Lands Act legislation and policies, as well as other tools as appropriate (e.g., Wild Species at Risk Regulations). Given these considerations, habitat loss is unlikely to be a concern. However, habitat degradation may occur due to the potential for severe localized effects, although the probability of occurrence is low (Pruss *et al.* 2008).

The majority of threats to insect populations are the result, directly or indirectly, of human activity (Cardoso *et al.* 2020, Wagner 2020). Key threats outlined in the Recovery Strategy (Pruss *et al.* 2008) include:

IUCN Threat 1. Residential and commercial development;

Threat 1.3. Tourism and Recreation Areas

The development of backcountry campgrounds or infrastructures and trails are examples of activities that could destroy Mormon Metalmark habitat. However, existing park impact assessment and planning processes ensure that infrastructure development within park boundaries will consider species at risk needs and not jeopardize species survival and recovery. Researchers and park staff conducting population monitoring and habitat management activities will follow guidelines and practices to minimize disturbance and impact to any Mormon Metalmark habitat (e.g., avoid damaging host plants). Similarly, impact caused by off-trail hiking and visitor access will be monitored, mitigated and/or minimized. The risk of these threats occurring is overall considered to be low.

IUCN Threat 2. Agriculture and aquaculture

Threat 2.3. Livestock Farming & Ranching

Intensive ranching activities such as winter-feeding, salt blocks, or calving sites could potentially degrade Metalmark habitat and have acute localized effects on Metalmark colonies. Hooper (2002) noted that in overgrazed pastures, branched umbrella plants were eaten by cattle and the plants removed close to the ground. However, the probability of it occurring is low and can mostly be avoided as the majority of colony locations have been mapped.

IUCN Threat 7. Natural Systems Modification

Threat 7.1. Fire and fire suppression

Fires are an important source of disturbance in the northern mixed-grass ecosystems. Southeastern Saskatchewan, including the West Block of Grasslands National Park and the surrounding area, is historically (1981-2010) at a high or extreme fire risk from May to September (<https://cwfis.cfs.nrcan.gc.ca/ha/fwnormals?type=fwi&month=8>). However, because badland habitat is very sparsely vegetated, the loss of Metalmark habitat by fire is unlikely. Moreover, while in Grasslands National Park prescribed fire programs have been and will continue to be in place for targeted habitat management

and enhancement for multiple species at risk, uncontrolled fires (i.e., both wild and human-induced) are fully suppressed to prevent destruction of large areas of species at risk critical habitat.

IUCN Threat 8. Invasive & other problematic species & genes

Threat 8.1. Invasive non-native/alien species

Non-native weeds can outcompete host plants at some sites, potentially reducing Metalmark food supply and egg-laying locations. Of particular concern is yellow sweet clover (*Melilotus officinalis*) which has been found in and adjacent to Metalmark colonies (Wick 2013). This invasive species stabilises the soil as well as outcompeting and shading native plants thereby reducing native plant health and diversity (TechLine 2018).

IUCN Threat 9. Pollution

Threat 9.3. Agricultural and forestry effluents and Air-borne pollutants

In studies of other butterfly systems, agrochemical use and drift has resulted in direct moth and butterfly mortality, reduced adult lifespan or overall reduced fitness in adults, larvae, pupae, eggs, host plants, and food plants (Davis *et al.* 1991, Longley *et al.* 1997, Hahn *et al.* 2015, James 2019, Gols *et al.* 2020, Wagner 2020). Pollution related to agrochemical applications, in particular grasshopper control during outbreak years and invasive alien plant management is a potential threat. The distance that these chemicals can drift and have toxic effects on butterflies is subject to multiple factors and is not well understood (Felsot *et al.* 2010) but could range from 150 m to 500 m (D. Johnson, Univ. of Lethbridge, pers. comm. 2006). However, as spraying associated with agrochemical applications within the Grasslands National Park boundary can be mitigated, this threat is likely low.

IUCN Threat 11. Climate change and severe weather

Threat 11.1 Habitat shifting and alteration

Climate change may affect species' ranges and distributions, alter competitive interactions, cause resource asynchrony, and cause phenological changes and extinctions associated with an increase in frequency and intensity of extreme climatic events (Easterling *et al.* 2000, Forchhammer *et al.* 1998, Hughes 2000, Lemmen *et al.* 1997, Pruss *et al.* 2008, Thomas *et al.* 2001, Stenseth *et al.* 2002, Cardoso *et al.* 2020). Climate change influences on plant distribution and abundance will have profound and cascading effects on the suite of dependent insects (Wagner 2020).

Threat 11.2. Droughts

As noted in Pruss et al (2008), general circulation model simulations propose that trends throughout the Northern Great Plains will be decreased precipitation and increased mean annual temperatures (Karl *et al.* 1991, Lemmen *et al.* 1997). Predictions for these areas include: longer growing seasons, higher mean annual temperatures with warmer, wetter winters, and an increase in summer drought conditions (Hufkens *et al.* 2016, Lemmen *et al.* 1997, Sushama *et al.* 2010). This is largely due to heat waves that are longer, more intense and frequent in combination with more variable annual precipitation with longer inter-rain periods (Meehl *et al.* 2007, Swain and Hayhoe 2015, Wagner 2020). Climate models by Rizzo and Wiken (1992) suggest that southern Alberta and Saskatchewan will become a semi-desert. All of these predicted changes may alter the timing of host plant flowering, result in insufficient moisture for healthy host plant growth or larval development thereby affecting Metalmark populations (Pruss 2008, COSEWIC 2014)

Threat 11.4. Storms and flooding

Small isolated populations of Metalmarks are particularly vulnerable to stochastic events such as hailstorms or severe frost (COSEWIC 2014).

5. Management Objective

The management objective for the Mormon Metalmark is to ensure the long-term persistence of the Mormon Metalmark in Canada by maintaining, and potentially increasing, its population distribution and abundance.

6. Broad Strategies and Conservation Measures

6.1 Actions Already Completed or Currently Underway

All recovery objectives identified within the Mormon Metalmark recovery strategy (Pruss et al. 2008) have been implemented fully or in part (Parks Canada Agency 2018). This work, among other things, resulted in COSEWIC down listing this species from Threatened to Special Concern after the discovery of many more Mormon Metalmark colonies.

In an effort to assess and map all potential Mormon Metalmark habitat outside of the known eight colonies in 2008, surveys were conducted throughout suitable un-surveyed badland habitat in Grasslands National Park, Val Marie and Beaver Valley Agriculture and Agri-food (formerly Prairie Farm Rehabilitation Administration) community pastures, as well as private and provincial leased land adjacent to Grasslands National Park (Henderson 2008, Wick 2013, Illerbrun 2015). A landscape scale predictive model was

developed and used to guide subsequent surveys which increased the ability to accurately focus survey effort (Wick 2013, Illerbrun and Wick 2014). This increased the total number of colonies to over 160 (Illerbrun 2015). Mark and recapture population estimates were determined for seven Mormon Metalmark colonies of varying sizes, which provides a rough estimate of population numbers based on colony size (Wick 2013). Additionally, attributes of occupied Metalmark habitat were compared to unoccupied habitat. Butterflies were found to occur in sites with a combination of the following variables: higher percent bare ground and soil pH, steeper slope, southerly to southwesterly aspect, lower elevation, and lower soil nitrogen (Wick 2013, Illerbrun and Wick 2014). All these data were used to delineate Mormon Metalmark critical habitat in and around Grasslands National Park (Parks Canada 2016).

Genetic work by Proshek *et al.* (2013) revealed that Saskatchewan Metalmark populations are much more genetically diverse and not closely related to those in British Columbia (BC). While the BC population is relatively isolated, in Saskatchewan, Proshek *et al.* (2013) found gene flow with several other eastern populations in the United States. Understanding Mormon Metalmark distribution and habitat requirements has helped guide management for activities occurring near Metalmark colonies. For example, a trail in Grasslands National Park was re-routed to avoid disturbing an active colony which was later designated as critical habitat.

Implementation of the Recovery Strategy resulted in some unique first time Metalmark observations in Canada which include: the earliest flight period observation ever documented on 23 July 2007 (Henderson *et al.* 2008); first Canadian observations of Mormon Metalmark caterpillars (Peterson *et al.* 2010); and female butterflies laying eggs directly on soil and rocks (Wick *et al.* 2012) instead of on the branched umbrella host plant. Observations of egg laying as well as using different habitat were both Canadian firsts and this behaviour is distinctly different from the Mormon Metalmark butterflies found in the United States.

A surveillance and management program is implemented within Grasslands National Park to prevent expansion or reduce the distribution of invasive alien plant species that impair the quality of Species at Risk habitat, including Greater Short-horned Lizard and Mormon Metalmark habitat (e.g., mechanical removal of yellow sweet clover).

Finally, multi-species action plans that included the Mormon Metalmark butterfly were completed by both Parks Canada and Environment and Climate Change Canada (Environment and Climate Change Canada 2016, Parks Canada Agency 2016) and a recovery strategy implementation report was written (Parks Canada Agency 2018).

6.2 Broad Strategies

Parks Canada will continue to protect individuals and suitable habitat within the Grasslands National Park proposed boundary and where feasible, support partners and neighbors on recovery and protection of this species. Additionally, GNP will work with partners to conduct population surveys in the park and help inform management

decisions as new colonies or populations are found, existing colonies start to decline, or habitat issues (e.g., erosion, degradation, invasive plant species) arise.

Progress towards the objective of this management plan will be achieved over the next five years through the following broad strategies:

1. Monitoring of Metalmark populations and habitat
2. Mitigating and preventing habitat loss and degradation
3. Providing information and outreach

6.3 Conservation Measures

Table 2: Conservation measures and implementation schedule

Conservation Measure	Priority ^e	Threats or Concerns Addressed	Timeline
Broad Strategy			
1. Monitoring of Metalmark populations and habitat			
1.1 Implement a monitoring program to confirm continued occupancy and detect temporal changes in population abundance and distribution.	Medium	Lack of long term information on population fluctuations, and trends particularly in light of climate change.	Ongoing
2. Mitigating and preventing habitat loss and degradation			
2.1 Invasive Alien Plant Management: prevent expansion or reduce the current distribution of invasive plant species that impair the quality of species at risk habitat.	Medium	Invasive species encroachment on multiple species at risk habitat (i.e. Greater Short-horned Lizard and Mormon Metalmark)	Ongoing
2.2 Maintain host plants at known occupied colonies by avoiding activities that remove or cause long-term destruction or alteration to larval and adult nectar host plants or alter density of colony host plants. These include: soil or gravel extraction, intensive livestock grazing, concentrated livestock winter feeding sites, salt blocks, or confined calving sites; the development of new built trails, roads and infrastructures; application of herbicides in a manner that results in direct mortality of host plants; activities that remove or compact soil such that the host plants cannot survive or become re-established or larvae or pupae may not be able to complete their life cycles.	High	Destruction of habitat	Ongoing
2.3 In areas where the species occur, mitigate or eliminate management, farming or ranching practices that result in the deliberate introduction or promotion of invasive plant species that will out-compete the native vegetation and host plants such as: moving or feeding bales containing viable seed of invasive alien species, or seeding invasive alien species that did not occur in the past; agrochemical applications; construction of new built trails or roads that have the potential to introduce and spread invasive species through the disturbance of the habitat and the transportation of mud that contains invasive seeds.	High	Invasive plants	Ongoing
2.4. In areas where the species or the host plant occur, monitor, mitigate and/or minimize impacts to habitat or individuals caused by park staff, researchers and visitors.	Low	Habitat degradation	Ongoing

3. Information and Outreach			
3.1 Support outreach activities regarding threats to species at risk, particularly programs that aim to educate the public; if feasible, incorporate citizen science surveys as well to reduce the spread of invasive species	Medium	Invasive non-native/alien plant species.	Ongoing

^e “Priority” reflects the degree to which the measure contributes directly to the conservation of the species or is an essential precursor to a measure that contributes to the conservation of the species. High priority measures are considered those most likely to have an immediate and/or direct influence on attaining the management objective for the species. Medium priority measures may have a less immediate or less direct influence on reaching the management objective, but are still important for the management of the population. Low priority conservation measures will likely have an indirect or gradual influence on reaching the management objective, but are considered important contributions to the knowledge base and/or public involvement and acceptance of the species.

6.4 Narrative to Support Conservation Measures and Implementation Schedule

Broad Strategy 1: Monitoring and Assessment of Mormon Metalmark Populations and Habitat

As there is a lack of consistent long-term monitoring, little is known about the population trends and fluctuations but past surveys suggest that the population is stable. However, this is uncertain in the face of climate change. Yearly monitoring of a subset of Metalmark colonies would provide some insight into long terms trends for this population and provide the opportunity to enact mitigation measures as/if appropriate. Should resources be available, surveys will be conducted to validate unconfirmed habitat locations or populations (e.g., Dixon pasture).

Broad Strategy 2: Mitigating and preventing habitat loss and degradation
 Invasive species management is underway to prevent expansion of or reduce the current distribution of species that compromise the quality of habitat for multiple species at risk.

Best management practices will ensure that colonies of host plants that are occupied by Metalmark butterflies are maintained and not destroyed or degraded or host plant health and density compromised.

Broad Strategy 3: Information and Outreach
 Support outreach activities regarding threats to species at risk including education and on the ground citizen science activities.

7. Measuring Progress

Every five years, the success of this management plan will be measured against the following performance indicators:

- A significant subset of Metalmark colonies has been surveyed for continued occupancy and their relative abundance and distribution has been maintained.
- Invasive species affecting badlands habitat and multiple species at risk are contained, reduced or eradicated.
- Best management practices are consistently implemented so that no colonies of butterflies disappear due to human activities.
- Conservation stories and messaging are shared with Grasslands National Park visitors and the general public through interpretation programs, social media or other communication tools.

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Personal Communications

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Appendix A: Effects on the Environment and Other Species

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the [Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals](#)⁵. 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 and to evaluate whether the outcomes of a recovery planning document could affect any component of the environment or any of the [Federal Sustainable Development Strategy](#)'s⁶ (FSDS) goals and targets.

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

The conservation measures outlined in this management plan likely benefit other badland dwelling plants and animals. These would include, but are not limited to the Greater Short-horned Lizard (*Phrynosoma hernandesi*) and the Eastern Yellow-bellied Racer (*Coluber constrictor flaviventris*). No negative impacts on the environment or other species are anticipated.

⁵ <http://www.ceaa.gc.ca/default.asp?lang=En&n=B3186435-1>

⁶ www.ec.gc.ca/dd-sd/default.asp?lang=En&n=F93CD795-1