COSEWIC
Assessment and Status Report

on the

Mormon Metalmark
Apodemia mormo

Southern Mountain population
Prairie population

in Canada

ENDANGERED – Southern Mountain population
THREATENED – Prairie population
2003

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

COSEWIC 2002. COSEWIC assessment and update status report on the mormon metalmark *Apodemia mormo* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 22 pp.

Production note: COSEWIC would like to acknowledge Dennis St. John for writing the status report on the mormon metalmark *Apodemia momo*, prepared under contract with Environment Canada.

For additional copies contact:

COSEWIC Secretariat
c/o Canadian Wildlife Service
Environment Canada
Ottawa, ON
K1A 0H3

Tel.: (819) 997-4991 / (819) 953-3215
Fax: (819) 994-3684
E-mail: COSEWIC/COSEPAC@ec.gc.ca
http://www.cosewic.gc.ca

Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur la situation du mormon (*Apodemia mormo*) au Canada

Cover illustration:
Mormon metalmark — Photo by J. Pepper.

Catalogue No. CW69-14/341-2003E-PDF
ISBN 0-662-35391-9
HTML: CW69-14/341-2003E-HTML
0-662-35392-7


Recycled paper

COSEWIC
Assessment Summary

Assessment Summary – May 2003

Common name
Mormon Metalmark (Southern mountain population)

Scientific name
Apodemia mormo

Status
Endangered

Reason for designation
The Southern Mountain population of this species is a very small, disjunct, northern outlier of a species whose main range occurs in the southwestern US. The butterflies are confined to a very small area in a narrow valley in a populated area in southern British Columbia. The valley bottom is also an important transportation and utility corridor. The butterfly is vulnerable to natural stochastic events, and human activity can easily cause the extirpation of colonies.

Occurrence
British Columbia

Status history
Designated Endangered in May 2003. Assessment based on a new status report.

Assessment Summary – May 2003

Common name
Mormon metalmark (Prairie population)

Scientific name
Apodemia mormo

Status
Threatened

Reason for designation
The Prairie population of this species is a small, northern outlier of a species whose main range occurs in the southwestern US. Known populations are not currently 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, is a habitat specialist, and occurs in a highly restricted area, making it vulnerable to stochastic events.

Occurrence
Saskatchewan

Status history
Designated Threatened in May 2003. Assessment based on a new status report.

COSEWIC
Executive Summary

Mormon Metalmark
Apodemia mormo

Species information and distribution

The Mormon Metalmark, *Apodemia mormo* (Felder and Felder, 1859) is the only species in the family Riodinidae that occurs in Canada. It is a small butterfly with a wingspan of 25 to 35 mm. The species ranges from the Mexican states of Sinola and Baja California, north to southern portions of western Canada, where it occurs as two disjunct populations, one in south-central British Columbia, the other in southwestern Saskatchewan.

Habitat and biology

The Mormon Metalmark is a butterfly of arid regions. It appears to be associated with hillsides, dunes, and embankments on barren, sandy, or gravelly soils where the buckwheat larval hostplants grow. Adult butterflies live about 10 days and are relatively sedentary, seldom moving more than 50 m. The Mormon Metalmark uses snow buckwheat in British Columbia, and probably uses branched umbrella-plant in Saskatchewan as both larval foodplant and as adult nectar source. Common rabbitbrush is an important secondary nectar source in both provinces. The butterfly has one generation per year in Canada.

Population sizes and trends

Populations of this butterfly are probably subject to extreme fluctuations from year to year. The area occupied by the species appears to be stable in Saskatchewan. In British Columbia, the species once occurred in the Okanagan Valley but has not been seen in this location since the early years of the last century. The existing population in the Similkameen Valley is subject to extreme fluctuations in numbers, but appears to have had a stable or expanding area of occupation since 1995, though total population counts have declined.

Limiting factors and threats

Both Canadian populations of the Mormon Metalmark occur at the northern extent of the species' range, so climatic limiting factors cannot be ruled out. Distribution of the larval hostplants (two species of buckwheat) limits areas of potential habitat, but both

buckwheat species occur in many areas where the butterfly is currently absent. In Saskatchewan, the branched umbrella-plant is currently provincially listed as a species of special concern, but may be more common than previously thought. Snow buckwheat does not have a conservation listing in British Columbia. In the Okanagan and Similkameen Valleys, it appears to be limited to hot, dry habitats.

In British Columbia, human alteration of the landscape poses a significant threat to the Mormon Metalmark. At the same time, the butterfly depends on disturbance to produce the early successional habitats suitable for the growth of dense stands of the buckwheat hostplant. Construction and maintenance activities along narrow transportation and utility corridors, the very areas occupied by the butterflies, can destroy butterfly colonies, but depending on site-specific construction practices and mitigation efforts, can also create or enhance suitable habitat and therefore benefit the butterfly.

Eurasian weeds, such as diffuse knapweed, Dalmation toadflax and downy brome, may be significant competitors of snow buckwheat, reducing the quality of metalmark habitat at many sites.

Special significance of the species

The Mormon Metalmark is the only species in the mainly neotropical family Riodinidae that occurs in Canada. Its extensive range and taxonomic differentiation make it an interesting subject for evolutionary and ecological studies, as does the fact that the two Canadian populations are well separated both from each other and from the main range of the species, use different buckwheat species as hostplants, and could eventually prove to be different subspecies.

Existing protection or other status designations

In British Columbia, the Mormon Metalmark is designated as endangered by the Conservation Data Centre and is on the provincial Red List. In Saskatchewan, the species is also listed as endangered. In Saskatchewan, all colonies of the Mormon Metalmark fall within the proposed boundaries of Grasslands National Park, and half of these fall within current holdings of the park. In British Columbia, all colonies occur on transportation right-of-ways, Indian reserves and private lands, and none of them have any protection. Natureserve has given the species a national endangered ranking.

Summary of status report

The Mormon Metalmark butterfly reaches the northern extent of its range in the Similkameen Valley in south central British Columbia, and in the Frenchman River and Killdeer badlands of Grasslands National Park in southwestern Saskatchewan.

The Saskatchewan population enjoys the protection afforded by location in a national park, the presence of significant areas of suitable (though unsampled) habitat, and potential rescue populations further south.

None of the existing colonies in BC occur on lands with conservation protection of any kind, they share the region with a moderately dense and expanding human population and they are separated by too great distances for any rescue to seem likely.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determines the national status of wild species, subspecies, varieties, and nationally significant populations that are considered to be at risk in Canada. Designations are made on all native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fish, lepidopterans, molluscs, vascular plants, lichens, and mosses.

COSEWIC MEMBERSHIP

COSEWIC comprises representatives from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership), three nonjurisdictional members and the co-chairs of the species specialist groups. The committee meets to consider status reports on candidate species.

DEFINITIONS

Species	Any indigenous species, subspecies, variety, or geographically defined population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.
** Formerly described as “Not In Any Category”, or “No Designation Required.”
*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list.

Environment Canada | Environnement Canada
Canadian Wildlife Service | Service canadien de la faune

Canada

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

COSEWIC Status Report

on the

Mormon Metalmark

Apodemia mormo

Southern Mountain population
Prairie population

in Canada

2003

TABLE OF CONTENTS

List of figures

SPECIES INFORMATION

Name and classification

The Mormon Metalmark, *Apodemia mormo* (C. & R. Felder, 1859), is the only species in the family Riodinidae that occurs in Canada. The family includes five subfamilies with about 1300 species worldwide, of which about 1200 are neotropical.

Apodemia is a genus of about twelve species belonging to the tribe Emesini, a polyphyletic group of unresolved affinities within the subfamily Riodininae. The Emesini includes all riodinid butterflies with four radial veins, and contains over one hundred species comprising thirteen genera (DeVries 1997). The taxonomy of the Mormon Metalmark is in flux. *Apodemia mormo, sensu lato,* currently includes twenty named subspecies, of which all but four are found in California (Scott 1986, Emmel and Emmel 1998, Emmel *et al* 1998). Opler (1999) divides this species complex into four species. The Canadian populations are thought by most authors to belong to the nominate subspecies *A. m. mormo (eg*, Layberry *et al* 1998, Opler 1999, Pyle 2002). Scott (1986) considered the Saskachewan population to be *A. m. mejicanus* Behr. In a more recent paper, Scott and Fisher (1998) identified a subspecies from south-central Colorado east of the continental divide as *A. m. pueblo* Scott, but did not reassess the Saskatchewan population. The Saskatchewan population lacks the orange markings on the hindwing that are characteristic of *A. m. mejicanus* and *A. m. pueblo,* and superficially resembles those Mormon Metalmarks from British Columbia (R. Hooper pers. comm.). Until there has been a detailed comparison of the Canadian disjuncts with those in regions further south, it seems premature to assign them to a described subspecies.

Description

The following description applies to the nominate subspecies *A. m. mormo* and appears to be generally consistent with the appearance of specimens from both British Columbia and Saskatchewan. Detailed examination of the nominate subspecies in comparison to those from the Canadian populations has not been undertaken to my knowledge. Such a study may well reveal important differences between these populations.

Apodemia m. mormo is a small butterfly with a wingspan of 25-35 mm (Figs.1 and 2). The sexes are similar, but males are smaller, and the forelegs are reduced and not used for walking. Females have three pairs of functional walking legs. The forewing costa has very little curvature. Both wings have white checks and spots throughout the upper and lower surfaces. The ground colour is generally dark brown above, and gray ventrally. The ground colour of the anterior half of the basal two thirds of the forewings is red-brown on both dorsal and ventral wing surfaces (Layberry *et al* 1998). The body colour is dark gray with inconspicuous, diffuse, white highlights on the abdominal segments. The eyes are green, and the antennae have strong black and white bands.

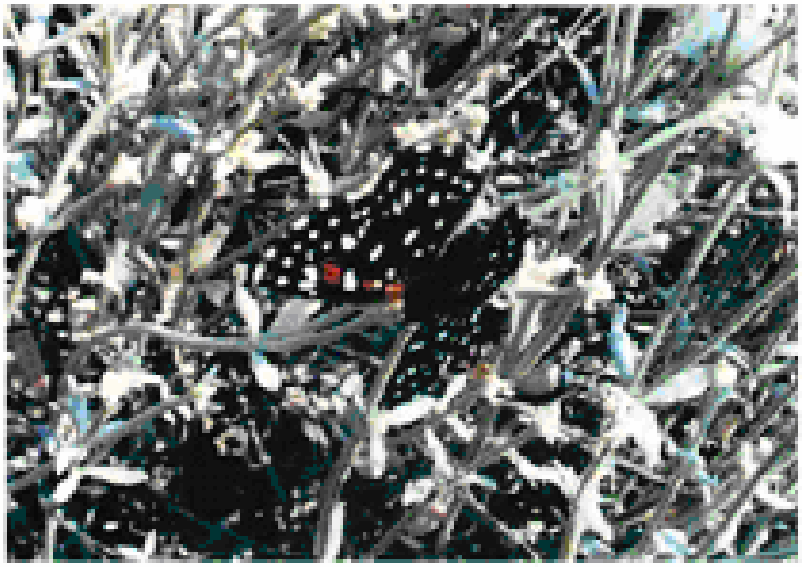

Figure 1. British Columbia – *Apodemia mormo* perching on *Erigonum niveum*. Photo by: D. St. John.

Figure 2. Saskatchewan – *Apodemia mormo* perching on *Erigonum pauciflorum*. Photo by: J. Pepper.

Eggs are flattened spheres, pink turning purple, laid in small groups of 2-4 on the larval hostplant (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 pupa is hairy in part, mottled brown, and is primarily found in the litter at the base of the hostplant (Scott 1986, Pyle 2002). Colour photographs of the larva and pupa can be found in Butterflies of British Columbia (Guppy and Shepard 2001).

Nationally significant populations

The Saskatchewan and British Columbia colonies of the Mormon Metalmark butterfly should be considered as distinct, nationally significant populations. The adults of the two populations are similar in appearance, but have not been studied in detail, nor have they been examined to determine the degree of genetic distinctiveness.

The two populations are disjunct from each other, and from the main metalmark populations to the south. They occupy different National Ecological Areas, the Southern Mountain Area in the case of the British Columbia population, and the Prairie Area in the case of the Saskatchewan population. The population in British Columbia uses a different hostplant, *Eriogonum niveum*, than the Saskatchewan population, which uses *Eriogonum pauciflorum*.

DISTRIBUTION

Global range

The Mormon Metalmark *sensu lato* ranges from Sinola, Mexico to southern British Columbia and southwestern Saskatchewan (Fig. 4). The species has its greatest number of subspecies in California and ranges eastward through Nevada, Utah and Colorado. North of these states, the species occurs in a series of disjunct populations. Opler (1999) and Pyle (2002) show a cluster of four disjuncts in the Pacific Northwest, which includes the British Columbia population, and a northeastern disjunct population in eastern Montana, North Dakota and southwestern Saskatchewan (Fig. 3). Throughout much of its range in the northwestern United States and Canada, the species is found mainly in habitats along the valleys of the Columbia and Missouri rivers and their tributaries (Hooper, pers. comm.).

The southern distribution of the species depends upon whether one accepts the more inclusive concept favoured by most authors, or accepts splitting into four separate species as did Opler (1999). Using the inclusive taxonomic concept of *Apodemia mormo*, the species ranges as far south as the Mexican states of Sinola (*A. m. mejicanus* Behr) and Baja California (*A. m. virguleti* Behr) and, extends eastward into Texas (*A. m. duryi* W. H. Edwards). Opler considers the subspecies extending into these areas to be separate species in the genus *Apodemia* (Fig.3).

Figure 3. North American Distribution of *Apodemia mormo*. Populations in regions shown in grey removed from *Apodemia mormo* by Opler 1999. Map adapted from Opler 1999 and Pyle 2002.

Canadian range

The Canadian range is limited to two disjunct populations. One population occurs in the Similkameen Valley in the southern interior of British Columbia. A single record from the Similkameen Valley in Washington State is about a kilometre south of the international border and about twenty kilometers from the nearest known site in British

Columbia (Pyle pers. comm.). It is considered (Pyle 2002) to be part of the disjunct population located primarily in British Columbia. The nearest known site further south is near Brewster, Washington, about 75 km further south, and is considered to be part of a disjunct population bordering the Columbia River (Pyle 2002).

The second Canadian population occurs in southwestern Saskatchewan in the east and west blocks of Grasslands National Park (Fig. 4). This population is considered (Opler 1999) to be part of a disjunct population extending into eastern Montana and North Dakota (see Appendices for more detailed maps of both populations). Badlands habitat that may be suitable for metalmarks continues across the Montana border.

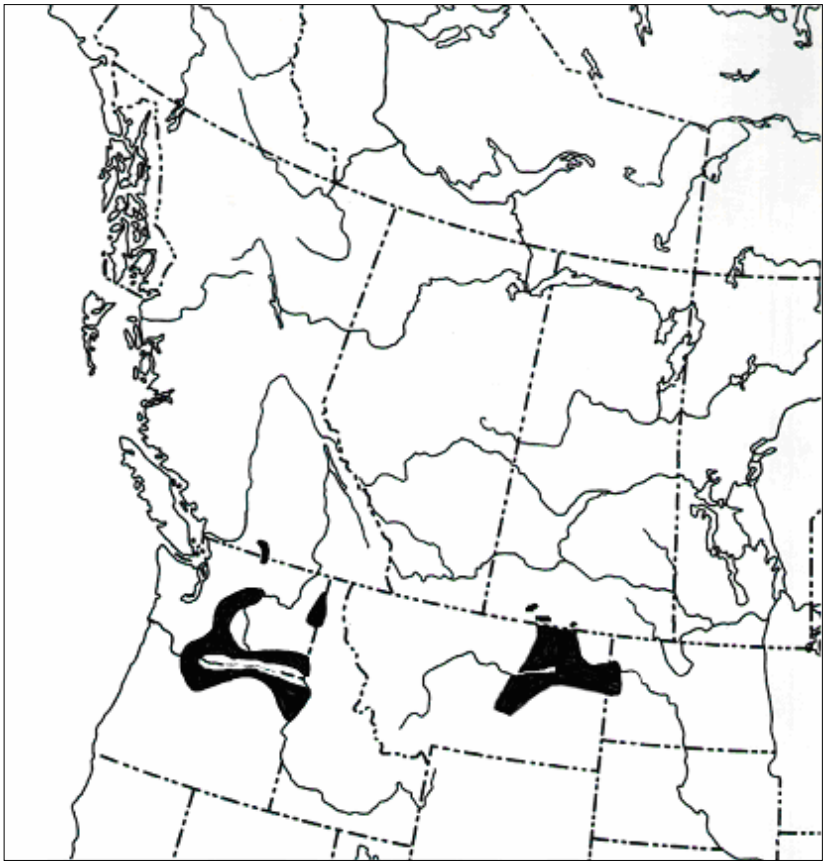

Figure 4. Canadian Distribution of *Apodemia mormo*.

HABITAT

Habitat requirements

The Mormon Metalmark is a butterfly of arid regions. It appears to be associated with hillsides, dunes, and embankments on sandy or gravelly soils where the buckwheat

larval hostplants grow (Opler 1999, Pyle 2002). In California, Arnold and Powell (1983) found the buckwheat hostplant (*E. nudum auriculatum* Benth.) requires a moderate disturbance regime in order to attain the moderate to high densities that the metalmark (in this case *Apodemia mormo langei* J. A. Comstock*)* appears to require. They also found that metalmarks require large, mature plants for oviposition, presumably to provide adequate food and protection for the butterfly's immature stages.

In both Saskatchewan (Hooper 2002) and British Columbia (St. John 2001), metalmarks are closely associated with unstable slopes, seldom straying onto flats even when the latter support significant hostplant populations (Figs. 5 and 6). In British Columbia, dense populations of the hostplant occur only on land that has been subject to disturbance, usually along road or railway corridors. Steeply sloping sites with gravely or sandy soils also provide enough soil disturbances from natural erosion to provide suitable conditions for dense populations of *Eriogonum niveum* Dougl. In Saskatchewan, the butterfly is also associated with arid hillsides, in this case supporting significant populations of *Eriogonum pauciflorum* Pursh.

Adult metalmark butterflies also require a nectar source, and this is provided by the buckwheat hostplants throughout much of the flight season. Common rabbitbrush *Ericameria nauseosus* Pall. also appears to be an important nectar source in both provinces, especially at times when the hostplant is not in bloom. Adult nectaring appears to be restricted to these two plant species even though several other plants may be in bloom (St. John Pers. obs.).

All metalmark colonies in British Columbia occur in the Similkameen River drainage in sagebrush steppe in the hottest and driest biogeoclimatic subzone. This bunchgrass subzone covers approximately 366 km^2 in the Okanagan and Similkameen regions combined; and 117 km^2 in the Similkameen drainage. Most habitat units within this subzone are not suitable for Mormon Metalmarks. The total area of the 15 colony sites identified since 1995 cover approximately 8 ha (Dyer 2002). Given the butterfly's apparent absence from flat terrain and the high density of hostplant cover associated with metalmark colonies, it seems unlikely that the total area of suitable habitat in the Similkameen drainage can be much more than 50 hectares.

All metalmark colonies in Saskatchewan are found in badlands habitat within the present or proposed future boundaries of Grasslands National Park (GNP). There are approximately 300 km^2 of badlands habitat in GNP west block (Frenchman River Badlands) and 80 km^2 in GNP east block (Rocky Creek or Killdeer Badlands) (Pepper pers. comm.). Only the east block badlands are close to similar habitat in the United States. Metalmark colonies were confined to barren slopes of partially weathered shale and clay (Hooper 2002).

Figure 5. Metalmark Habitat – British Columbia.

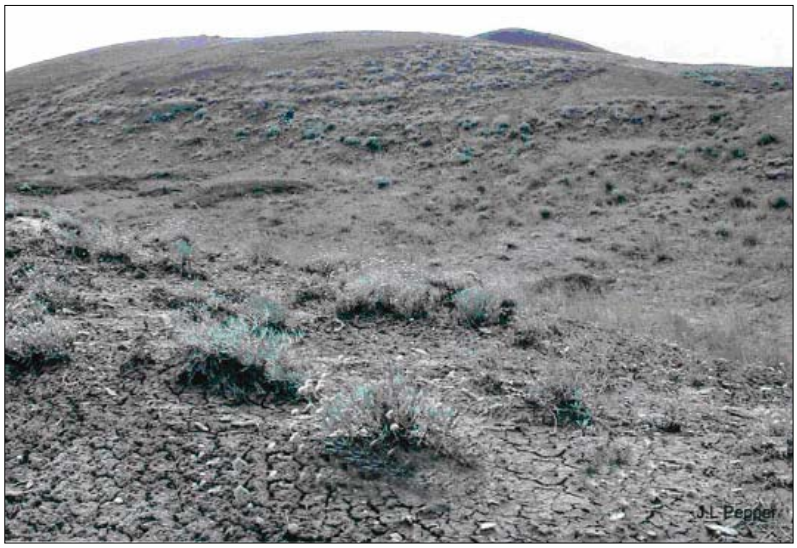

Figure 6. Metalmark Habitat – Saskatchewan.

Trends

It is difficult to assess the changes in habitat available to Mormon Metalmarks in British Columbia. Both the Okanagan and Similkameen Valleys have been subject to extensive agricultural development and growth of the human population. The occurrence of dense hostplant sites and metalmark colonies along transportation corridors suggest that some human activities may actually improve habitat availability. On the other hand, the immediate impact of construction activities could well cause extirpation of existing colonies. The introduction of Eurasian weeds, such as *Bromus tectorum* L.*, Centaurea*

diffusa Lam. and *Linaria dalmatica (*L.) Mill., may have reduced the dominance of the buckwheat hostplant and native nectar sources (Cannings et al 1998).

In Saskatchewan, the badlands habitat available to Mormon Metalmarks has probably been stable, and should remain so for the foreseeable future.

Protection/ownership

None of the presently known sites in British Columbia is protected. Four are on privately owned land, one is on a roadside on Indian Reserve no. 8 (Skemeoskuakin) and the remainder are on transportation corridor right-of-ways.

In Saskatchewan, three of the six metalmark colonies are within the current boundaries of Grasslands National Park. The remaining colonies are located on large ranches (Hooper 2002) within the proposed boundaries of the park.

BIOLOGY

General

The Mormon Metalmark has one generation per year in Canada. Adults typically fly from early August until mid-September (Guppy and Shepard 2001). Flight is swift and direct, and is restricted to short distances, usually to nearby host or nectar plants. Perching individuals hold the wings in a variety of orientations from open to closed, with a half open position being common. When nectar sources are rare, several individuals may be found on the same plant (St. John pers. obs.).

Reproduction

Males perch on hillside shrubs and nectar sources to await females (Arnold and Powell 1983, Scott 1986). In British Columbia, mating pairs were observed within three days of the appearance of adults on the wing (St. John, pers. obs.). In California, males of the endangered subspecies *A. m. langei* studied by R. A. Arnold and J. A. Powell (1983) eclosed a few days prior to females. Eggs were laid on the hostplant singly or in clusters of 2-4 on leaves, stems, or inflorescences (Arnold and Powell 1983).

Reproductive factors, which may affect colonization ability and effective colony size, such as duration of the oviposition period and average fecundity, are unknown. Spermatophore counts of 2.60 per female in *A. m. langei* (Arnold and Powell 1983) suggest multiple mating by females may be common in this species.

Survival and physiology

Adult life span of *A. m. langei* in California averaged about nine days in males and 11 days in females (Arnold and Powell 1983). If these estimates apply to the Canadian

populations, they suggest a staggered emergence over a period of about 3-5 weeks. Nothing is known about survivorship of other stages of the life cycle for any taxon in this species. Early instar larvae hibernate inside inflated stems of *E. inflatum* or dried flower heads of *E. fasciculatum*, or in litter near the hostplant (Scott 1986). Ballmer and Pratt (1988) found partially grown larvae of *A. mormo* on hostplants during winter, and observed feeding in another riodinid, *Calephelis nemesis*, whenever afternoon temperatures exceeded 12.8° C.

Late instar larvae are nocturnal feeders in the southern part of their range (Arnold and Powell 1983) and rest during the day in nests of leaf litter held together with silk (Ballmer and Pratt 1988).

It is not known whether eggs hatch in fall or spring in the Canadian populations, or whether mature larvae are also nocturnal in Canada.

Movements/dispersal

Arnold and Powell (1983) have made the only quantitative study of dispersal, in the endangered subspecies, *A. m. langei*, in California. Adult butterflies dispersed an average of 9 m for males and 11 m for females, with maximum distances to about 600 m. Females moved greater distances per unit time than males (average Vagility, female: Vf=22.2-47.7 m/day, males Vm=10.4-27.5 m/day). Males were also more concentrated and females more dispersed.

Casual field observations of the species in British Columbia and Saskatchewan suggest that individuals in the Canadian populations also confine themselves to very limited dispersal over the adult lifespan (St. John & Hooper, pers. obs.). Nothing is known about dispersal in the larval stage, but it seems unlikely that larvae move between hostplants.

Nutrition and interspecific interactions

In both Saskatchewan and British Columbia, the flowering season of the buckwheat hostplants corresponds closely to the flight period of the butterfly, whereas other common buckwheat species bloom considerably earlier.

In Saskatchewan, *E. pauciflorum* begins to bloom in June on clay soils on flats. By August and early September, the plants on flats dry up, but those on the arid hillsides come into bloom and are visited by metalmarks. Mormon Metalmarks were seen nectaring exclusively on branched umbrella-plant during the first three weeks of observing. They were only found on rabbitbrush when the umbrella-plant flowers were deteriorating (Hooper pers. comm.).

In both provinces, adult metalmarks nectar on rabbitbrush as well as on buckwheats. In British Columbia, rabbitbrush appears to be polyphenic for flowering time, with some individuals coming into bloom as early as late June while many others

continue to flower into mid-October. The presence of early and late flowering rabbitbrush, in addition to buckwheat, may be necessary to provide adequate nectar throughout the metalmark flight period. Like buckwheats, rabbitbrush appears to require a moderate disturbance regime for its continued presence. At many sites in the southern interior of British Columbia, both species are abundant along roadcuts and largely absent from adjacent, less disturbed hillsides (St. John pers. obs.).

In British Columbia, the larval hostplant of metalmarks*, Eriogonum niveum,* has a late summer flush of vegetative growth that produces basal clusters of young leaves which overwinter while partially grown. The other common species of buckwheat (*E. heracleoides* Nutt.), which often occurs in similar habitats, lacks this autumnal growth flush (St. John pers. obs.), is not known to be used by metalmarks (Guppy and Shepard 2001), and was absent from all but one butterfly colony site.

Behaviour/adaptability

There is a strong association of these butterflies with the larval foodplant. Adults also use the same buckwheat species and rabbitbrush as nectar sources and perching sites. The base of the buckwheat hostplants also serves as a protected site for the larvae in periods of inactivity and during hibernation (Arnold and Powell 1983). Given this concentration of resources and the metalmark's sedentary habits, the butterfly is probably very sensitive to changes in the distribution and density of suitable habitat patches in its environment. All the species of endangered butterflies studied by Arnold and Powell (1983) in California shared the traits of dependence on one or two plant species and limited flight movements. This contrasts strongly with the lack of specific microhabitat association and much greater vagility found in more widespread butterfly species (Scott 1975, Sharp *et a*l 1974).

POPULATION SIZES AND TRENDS

There have been no thorough studies of population sizes in the Canadian populations of *Apodemia mormo*. Indeed the only study of this species to assess population size and other relevant parameters is that of Arnold and Powell (1983). Populations of this butterfly are probably subject to extreme fluctuations from year to year. The areas of occurrence and of occupation appear to be stable in Saskatchewan and include colonies at five sites in the west block of GNP, and one site in the east block of the park. The largest and densest population of metalmarks in Saskatchewan had a maximum daily density of approximately 41 individuals/ha (Hooper 2002), which is comparable to the average density of Californian populations (41.03/ha) studied over a five-year period. Using Arnold and Powell's estimates of a 10-day average adult lifespan, a 30-day emergence period, and roughly extrapolating from sampled maximum count, a total size for the largest colony of about 120 individuals seems generous. This colony and another with 12 individuals (maximum day count) were about a hectare in area. This is comparable to those in California and is about twice as large in area as those in the Okanagan Valley. The remaining four colonies in Saskatchewan were

found at sites where the area of apparently suitable habitat ranged from 1-20 km^2. In these colonies the absolute number of butterflies seen at each site was much smaller (2-7), and colony boundaries were not discernible. It was not possible to estimate an overall metalmark density or the total population at these sites, and therefore the overall provincial population size is unknown.

In British Columbia, the species has not been seen in the Okanagan Valley since the early 1900s. The butterfly is known only from specimens collected at Oliver and Okanagan Falls, and the size and extent of these populations and the reasons for their disappearance are unknown. The extant population in the Similkameen Valley is subject to extreme fluctuations in numbers, but appears to have had a stable or expanding area of occupation since 1995, although total population counts have declined. In recent years, the best known colony has generally yielded maximum daily counts in the range of 20-40 individuals in an area of under half a hectare. Between 1995 and 2001, this colony appears to have given rise to four daughter colonies distributed along a gravel slope which passes through Keremeos. It is likely that some limited movement of individuals occurred between these populations. However, in 2002, only the main colony and the nearest daughter colony sites appeared to be occupied. The remaining occupied colonies are separated from each other by several kilometers of unsuitable habitat. Until 2002, when only four adults were seen, the main colony yielded the largest absolute counts in the region. Counts were generally very low in British Columbia in 2002, with the largest site yielding a count of 10 individuals. A current total population size of fewer than 100 breeding adults would not be unreasonable.

LIMITING FACTORS AND THREATS

Limiting factors for *Apodemia mormo* in Canadian populations are unknown. Both Canadian populations are at the northern extent of the species' range so climatic limiting factors cannot be ruled out. In British Columbia, the fact that the existing population is now confined to a single valley may render it especially vulnerable to local climatic extremes causing flowering failure in nectar sources, as well as local outbreaks of disease organisms and predator and parasitoid populations. For example, in 1998 there was an exceptionally large population of ambush bugs, *Phymata fasciata,* in the south Okanagan and Similkameen Valleys. A rabbitbrush plant situated in the largest metalmark colony, which had in previous years served as a key nectar source for the butterflies, was infested with eight ambush bugs, one of which was feeding on a metalmark. No other metalmarks were observed, although this was about the middle of the normal flight season (Aug. 28). In 1995, Pyle (pers. comm.) found a single colony of metalmarks along the Similkameen River west of Oroville, Washington, and considers this part of the same disjunct population that extends into Canada. This colony is 20 km from the closest site record in British Columbia. If the Washington portion of this population is limited to the Similkameen River, then its extent there may be less than in British Columbia. Although that area of Washington is not experiencing the same growth of the human population as is occurring in southern British Columbia, climatic

and biotic factors common to the whole lower Similkameen Valley may threaten both populations.

In both British Columbia and Saskatchewan, distribution of the larval hostplants limits areas of potential habitat, but both buckwheat species occur in many areas where the butterfly is currently absent. In Saskatchewan, *Eriogonum pauciflorum* is currently listed as S2S3 (Pepper pers. comm.), but may be more common than previously believed (Hooper Per. Comm.). *Eriogonum niveum* does not have a conservation listing in British Columbia, but appears to be limited in the Okanagan and Similkameen Valleys to dry, low elevation habitats. In British Columbia, human alteration of the landscape poses a significant threat to *Apodemia mormo.* At the same time, the butterfly is largely dependent on human activity to produce the disturbed habitats permitting the growth of dense stands of the buckwheat hostplant. Depending on site-specific construction practices and mitigation efforts, construction and maintenance activities along transportation and utility corridors can create new habitat and potentially enhance metalmark populations. Such activity may also threaten or even wipe out populations of *Apodemia mormo*. A recent proposal for a gas pipeline would have passed through three of the existing metalmark colony sites, but was rerouted because of opposition by the municipality of Keremeos. The pipeline proposal currently under consideration will pass through a different colony site at the Blind Creek gravel pit.

Eurasian weeds are probably significant competitors of snow buckwheat, reducing the quality of metalmark habitat at many sites. Diffuse knapweed (*Centaurea diffusa*), Dalmation toadflax (*Linaria dalmatica*) and downy brome (*Bromus tectorum*) occur in many of the same sites as snow buckwheat and may reduce the size and density of buckwheat plants (St. John pers. obs.).

Development on private lands and agricultural practices such as pesticide use and grazing may adversely effect metalmark populations. Residents with lots adjacent to one colony, for example, dispose of prunings and other garden waste by dumping them on the hillside where Mormon metalmarks and their buckwheat hostplant are found. The municipality of Keremeos also planted and irrigated part of a hillside supporting a metalmark colony, making it less suitable for the hosplant and so for metalmarks as well. The municipality has discontinued this project after being informed of the presence of the butterfly at this site.

SPECIAL SIGNIFICANCE OF THE SPECIES

The Mormon Metalmark, *Apodemia mormo* (C. & R. Felder, 1959), is the only species in the family Riodinidae that occurs in Canada – its northernmost extent in the New World. Even if several of the subspecies currently assigned to *Apodemia mormo* are accorded full species status, the remaining taxon will represent the most geographically widespread riodinid in North America. The varying degrees of taxonomic differentiation, variety of hostplants utilized, and the existence of adjacent, allopatric, and geographically disjunct populations make this species an interesting candidate for

evolutionary studies (eg. Opler and Powell 1961, Pratt and Ballmer 1991). There is a significant lack of information on the biology of the Canadian populations, which belong to widely separated, disjunct populations and differ in the larval hostplant utilized. Further study is needed to clarify their taxonomy.

EXISTING PROTECTION OR OTHER STATUS

Natureserve has assigned a national ranking of N1 for the species in Canada.

In British Columbia, *Apodemia mormo* is designated as Endangered (S1) by the Conservation Data Centre and is on the provincial Red List. None of the known colony sites is on land that has any protection of conservation values.

In Saskatchewan, the species is also listed S1. The hostplant *Eriogonum pauciflorum* is also listed as S2S3 by the Conservation Data Centre of Saskatchewan (Pepper pers. comm.). The known colonies in Saskatchewan are located within the present and proposed boundaries of Grasslands National Park (Hooper 2002).

SUMMARY OF STATUS REPORT

The Mormon Metalmark butterfly, *Apodemia mormo*, reaches the northern extent of its range in the Similkameen Valley in south-central British Columbia and in the Frenchman River and Killdeer badlands of Grasslands National Park in southwestern Saskatchewan. The Saskatchewan colonies appear to be part of a larger population occupying a substantial region of eastern Montana and western North Dakota.

The Saskatchewan populations enjoy the protection afforded by location in a national park, the presence of significant apparently suitable (but unsampled) areas of habitat, and potential rescue populations further south.

In British Columbia *Apodemia mormo* survives in extremely low numbers in a very small geographic area in a small number of occupied sites with little available suitable habitat. None of the extant colonies in BC occur on lands with conservation protection of any kind, and they share the region with a moderately dense and expanding human population.

TECHNICAL SUMMARY

Apodemia mormo
Mormon Metalmark — French common name: Le Mormon
Southern Mountain population
British Columbia

Extant and Area information	
• *extent of occurrence (EO) (km²)*	~0.5 km² of specific habitat
• *specify trend (decline, stable, increasing, unknown)*	Stable
• *are there extreme fluctuations in EO (> 1 order of magnitude)?*	No
• *area of occupancy (AO) (km²)*	<0.08 km²
• *specify trend (decline, stable, increasing, unknown)*	Stable?
• *are there extreme fluctuations in AO (> 1 order magnitude)?*	Yes
• *number of extant locations*	<15 during last 7 years; 6 in 2002
• *specify trend in # locations (decline, stable, increasing, unknown)*	Unknown, perhaps increasing until 2002, perhaps fluctuating
• *are there extreme fluctuations in # locations (>1 order of magnitude)?*	No
• *habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat*	Excluding the Okanagan, stable but vulnerable to human disturbance
Population information	
• *generation time (average age of parents in the population) (indicate years, months, days, etc.)*	1 year
• *number of mature individuals (capable of reproduction) in the Canadian population (or, specify a range of plausible values)*	~100? (2002 was a very low year for metalmarks)
• *total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals*	Unknown
• *if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)*	40% decrease between 2001 and 2002, but may be fluctuation.
• *are there extreme fluctuations in number of mature individuals (> 1 order of magnitude)?*	Yes
• *is the total population severely fragmented (most individuals found within small and relatively isolated (geographically or otherwise) populations between which there is little exchange, i.e., ≤ 1 successful migrant / year)?*	Yes. (One group of sites is in close proximity. These may have >1 migrant/yr); estimate 3-5 population clusters with little, if any, exchange of individuals
• *list each population and the number of mature individuals in each*	~30,12,18,6,6,3
• *specify trend in number of populations (decline, stable, increasing, unknown)*	Apparent recent increase until 2001. Apparent decline in 2002
• *are there extreme fluctuations in number of populations (>1 order of magnitude)?*	No
Rescue Effect	
• *does species exist elsewhere ?*	Saskatchewan, in Canada, but nearest population is in Washington
• *status of the outside population(s)?*	Not listed in Washington
• *is immigration known or possible?*	Low to moderate
• *would immigrants be adapted to survive here?*	Probably
• *is there sufficient habitat for immigrants here?*	No
Rescue potential	Low. The known single population in northern Washington (20 km distant) is very small (one colony site). Nearest disjunct is ~75km

TECHNICAL SUMMARY

Apodemia mormo
Mormon Metalmark
Prairie population
Saskatchewan

French Common name: Le Mormon

Extent and Area information	
• *extent of occurrence (EO)(km²)*	380 km^2
• *specify trend (decline, stable, increasing, unknown)*	Stable
• *are there extreme fluctuations in EO (> 1 order of magnitude)?*	Unknown
• *area of occupancy (AO) (km²)*	~ 30 km^2
• *specify trend (decline, stable, increasing, unknown)*	Stable
• *are there extreme fluctuations in AO (> 1 order magnitude)?*	Unknown
• *number of extant locations*	6
• *specify trend in # locations (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in # locations (>1 order of magnitude)?*	No
• *habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat*	Stable
Population information	
• *generation time (average age of parents in the population) (indicate years, months, days, etc.)*	One year
• *number of mature individuals (capable of reproduction) in the Saskatchewan population (or, specify a range of plausible values)*	200-1000?(large areas of badlands were not adequately surveyed)
• *total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals*	Probably stable
• *if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)*	Unknown
• *are there extreme fluctuations in number of mature individuals (> 1 order of magnitude)?*	Probably
• *is the total population severely fragmented (most individuals found within small and relatively isolated (geographically or otherwise) populations between which there is little exchange, i.e., ≤ 1 successful migrant / year)?*	Yes
• *list each population and the number of mature individuals in each*	123, 36, 12, 9, 21, 6 (minimums for known populations). Some areas were too large to adequately sample.
• *specify trend in number of populations (decline, stable, increasing, unknown)*	Unknown
• *are there extreme fluctuations in number of populations (>1 order of magnitude)?*	No

Rescue Effect	
• *does species exist elsewhere (in Canada or outside)?*	Nearest populations are in Montana and North Dakota
• *status of the outside population(s)?*	Not listed
• *is immigration known or possible?*	Possible
• *would immigrants be adapted to survive here?*	Probably
• *is there sufficient habitat for immigrants here?*	Yes – providing that the large areas with the hostplant but apparently lacking metalmarks are in fact suitable
Rescue potential	Moderate. The GNP west block habitat connects with badlands in the US

ACKNOWLEDGEMENTS

I would like to thank the Canadian Wildlife Service, Environment Canada, which provided funding for the writing of this report and for inventory work in British Columbia and Saskatchewan. Theresa Fowler served as advisor and coordinator in the preparation of this report. Donald Lafontaine provided Canadian National Museum records for the Mormon Metalmark. Crispin Guppy, Norbert Kondla, Mike Sarell, and Karen Needham contributed valuable information on the Metalmark in British Columbia. Orville Dyer provided GIS mapping and area estimates for the BC metalmark population. Jeanette Pepper kindly provided information, photographs, and field work on the Saskatchewan population. Ronald Hooper conducted an extensive inventory and provided a report on current and historical information on the species in Saskatchewan. Ronald Thompson and Allison Haney provided invaluable assistance with graphics. Paul Opler, Norbert Kondla and Donald Lafontaine offered useful comments on the taxonomy of *Apodemia mormo*. Theresa Fowler and the members of the Lepidoptera Specialist Group of COSEWIC provided useful comments on many aspects of the content of this report, and Theresa Fowler edited the report. I also wish to thank Steve Cannings for first making me aware of the existence of *Apodemia mormo* in BC.

LITERATURE CITED

Arnold, R.A. and J.A. Powell 1983. *Apodemia mormo langei*. Ch. 6 in Ecological studies of six endangered butterflies (Lepidoptera, Lycaenidae): Island biogeography, patch dynamics and design of habitat preserves. Univ. Cal. Publ. Entomol. 99:1-161.

Austen, G.T. 1998. A checklist of Nevada butterflies. Pp. 837-844 in *Systematics of western North American butterflies*, T.C. Emmel Ed. Mariposa Press, Gainsville FL. 878 pp.

Ballmer, G.R. and G.F. Pratt. 1988. A survey of the last larval instar of the Lycaenidae of California. J. Res. Lep. 27:1-81.

Cannings R.J., Durance E. and L.K. Scott. 1998. South Okanagan ecosystem recovery plan: Scientific assessment. Unpublished Report, British Columbia Ministry of Environment. Penticton. 108 pp.

DeVries, P.J. 1997. *The Butterflies of Costa Rica. Volume II: Riodinidae.* Princeton University Press, Princeton. 288 pp.

Dyer, O. 2002. Electronic terrestrial ecosystems mapping. BC Ministry of Water, Land and Air Protection.

Emmel, J.F. and T.C. Emmel. 1998. Two new geographically restricted subspecies of *Apodemia mormo* (Lepidoptera: Riodinidae) from the vicinity of San Bernardino, California. Pp. 795-800 in *Systematics of western North American butterflies*, T.C. Emmel Ed. Mariposa Press, Gainesville FL. 878 pp.

Emmel, J.F., Emmel T.C. and G.F. Pratt. 1998. Five new subspecies of Apodemia mormo (Lepidoptera: Riodinidae) from southern California. Pp. 801-810 in *Systematics of western North American butterflies*, T.C. Emmel Ed. Mariposa Press, Gainesville FL. 878 pp.

Emmel, J.F., Emmel T.C. and S.O. Matoon. 1998. A checklist of the butterflies and skippers of California. Pp. 825-836 in *Systematics of western North American butterflies*, T.C. Emmel Ed. Mariposa Press, Gainseville FL. 878 pp.

Harms, V.L. 2002. *Eriogonum* Species in Saskatchewan. Unpublished report, Saskatchewan Conservation Data Centre, Regina.

Hooper, R.R. 2002. Status Report of *Apodemia Mormo* (C. R. Felder) in Saskatchewan 2002. Unpublished Report, 8 pp. Box 757, Fort Qu'Appelle, SK, S0G 1S0.

Guppy, C.S. and J.H. Shepard. 2001. *Butterflies of British Columbia*. UBC Press, Vancouver. 414 pp.

Guppy, C.S., J.H. Shepard and N.G. Kondla. 1994. Butterflies and skippers of conservation concern in British Columbia. Canadian Field-Naturalist 108:31-40.

Layberry, R.A., P.W. Hall, and J.D. Lafontaine. 1998. *The Butterflies of Canada*. University of Toronto Press, Toronto. 280 pp.

Opler, P. W. 1999. *A field guide to western butterflies*. 2nd ed. Houghton Miflin Company, Boston. 540 pp.

Opler, P. and J. A. Powell. 1961. Taxonomic and distributional studies on the western components of the *Apodemia mormo* complex (Riodinidae). J. Lep. Soc. 15:145-171.

Pratt, G. F. and G. R. Ballmer. 1991. Three biotypes of *Apodemia mormo* (Riodinidae) in the Mojave desert. J. Lep. Soc. 45:46-57.

Pyle, R. M. 2002. *The butterflies of Cascadia: A field guide to all the species of Washington, Oregon, and surrounding territories*. Seattle Audubon Society, Seattle. 420 pp.

St. John, R.D. 1996. Survey of rare Okanagan butterflies. Unpublished report, BC Conservation Data Centre, Ministry of Environment Lands and Parks, Victoria. 7 pp.

St. John, R. D. 2001. Assessment of the impact of the proposed Gas Pipeline on the Mormon Metalmark butterfly. Unpublished Report, prepared for Westland Resource Group. 12 pp.

Scott, J.A. 1975. Flight patterns among eleven species of diurnal Lepidoptera. Ecology 56:1367-1377.

Scott, J.A. 1986. *The butterflies of North America: A natural history and field guide*. Stanford University Press, Stanford. 581 pp.

Scott, J. A. and M. S. Fisher 1998. New Western North American butterflies. Papilio (New Series) 11:1-12.

Sharp, M, L., D.R. Parks, and P.R. Ehrlich. 1974. Plant resources and butterfly habitat. Ecology 55:870-875.

Stanford, R. E. 1973. *Apodemia mormo* near *dialeuca* (Riodinidae) from montane Southern California: new for U.S.A. J. Lep. Soc. 27: 304-305.

Stanford, R.E., and P.A. Opler. 1993. *Atlas of Western USA Butterflies*. Stanford and Opler, Denver and Fort Collins

BIOGRAPHICAL SUMMARY OF CONTRACTOR

Dennis St. John holds a Ph.D. degree in Animal Behavior from the Department of Ethology, Ecology and Evolution, University of Illinois. He has authored several scientific publications and unpublished reports, and taught courses in biology and psychology at several universities. Since 1991 he has worked as a consulting biologist on a number of projects in the southern interior of British Columbia, including a survey of rare butterflies in the Okanagan and Similkameen valleys and a report on the impact of a proposed gas pipeline on the Mormon Metalmark.

AUTHORITIES CONSULTED

Mr. Crispin Guppy
Habitat Protection Officer,
Planning Quesnel.

Rev. Ronald Hooper
Box 757, Fort Qu'Appelle, SK, S0G 1S0

Mr. Norbert Kondla, Planner,
Planning Castlegar, BC. Ph. 250-365-8610

Dr. Donald Lafontaine,
Eastern Cereal & Oils Research Centre
Research Branch, Agriculture & Agri-food Canada.

Ms. Karen Needham
Curator, Spencer Entomological Museum
Dept. of Zoology, 1270 University Boulevard,
UBC, Vancouver, BC V6T 1Z4

Dr. Paul Opler
P.O. Box 2227
Loveland Co 80539-2227
USA

Dr. Jeanette Pepper
Zoologist, Saskatchewan Conservation Data Centre,
Fish and Wildlife Branch, Sask. Environment,
Rm 436, 3211 Albert St. Regina, Sask. S4S 5W6

Dr. Robert M. Pyle
369 Loop Rd. Gray's River
Wa 98621. USA

Ms. Leah Ramsay
Program Zoologist BC Conservation Data Centre,
Terrestrial Information Branch PO Box 9993 Stn Prov Govt,
Victoria, BC V8W 9R7

Dr. James A. Scott
60 Estes St.. Lakewood.
Co 30226-1254
USA

Dr. Felix Sperling
Dept. of Biological Sciences
cw405 Biological Centre
University of Alberta, Edmonton, AB, T6G 2E9