

## Chapter 13

# Insects at Risk in the Prairie Region

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**Abstract.** This chapter describes and analyses insects at risk in the Great Plains grasslands in the prairie provinces (Alberta, Saskatchewan, Manitoba) and the Peace River region in British Columbia. Over the last century and a half, most of the native grasslands in this region have been replaced by intensive agricultural production or impacted by livestock, both activities hugely affecting insect populations. In addition to the relicts of grassland, “non-grassland” habitats exist within the region, including dunes, badlands, and riparian areas. These isolated habitats and their specific species, including insects, are an important part of the regional biodiversity.

At the national, regional, and provincial levels of government, and among other conservation organizations, a large number of programs and legislation are aimed at protecting species at risk, including insects. These efforts are reviewed in this chapter.

**Résumé.** Le présent chapitre décrit et analyse les espèces d’insectes en péril dans les grandes plaines des provinces des Prairies (Alberta, Saskatchewan, Manitoba) et dans la région de la rivière de la Paix, en Colombie-Britannique. Au cours des 150 dernières années, la plupart des prairies naturelles de cette région ont été remplacées par des zones d’agriculture intensive ou altérées par l’élevage du bétail, et ces changements ont eu un effet considérable sur les populations d’insectes. Outre les vestiges de la prairie naturelle, il existe dans la région d’autres types d’habitats comme les dunes, les bad-lands et les zones riveraines. Ces habitats isolés et les espèces particulières qu’elles abritent — y compris les insectes — constituent un élément important de la biodiversité régionale.

Beaucoup de programmes et de lois mis en vigueur par les pouvoirs publics nationaux, régionaux et provinciaux et par les organisations de conservation visent à protéger les espèces en péril, y compris les espèces d’insectes. Le présent chapitre évalue ces efforts.

### Introduction

Many species of the Canadian prairie grasslands and related habitats are at the northern edge of their North American range, and although they may not be at risk from a North American perspective, the peripheral Canadian populations may be at some level of risk (e.g., habitat destruction, geographical isolation). In some cases, these Canadian populations may also be more secure, as they may have larger populations here than in the United States.

Wildlife protection in the prairie grasslands region, as with all other regional wildlife protection efforts in Canada, has largely focused on megafauna, including mammals, birds, and fish, with only incidental protection of insects. This focus is related to a historical bias toward protecting game and larger organisms. When habitat is protected for any large keystone species, some insects within those habitats may coincidentally benefit, but this is not always the case. Insect conservation, including research efforts, is a complex and specialized field

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of activity; its effectiveness cannot depend upon accidental protection, nor should it, because some insects are as vulnerable as any other endangered organism. Furthermore, insects are extremely valuable for a number of critical reasons: in controlling pests, as environmental indicators, as pollinators, and as the basic mass at the bottom of the food chain. In fact, they may be more ecologically important than any form of game.

Most insect conservation and protection efforts to date in the prairie grasslands have involved butterflies, the best-known group of insects for which there is sufficient knowledge to make conservation decisions possible. Only recently have protection efforts expanded to other groups of insects. Although some achievements have been made, the effort so far has been insufficient and the number of species likely at risk, on the basis of the indicator group of butterflies, suggests urgency in both research and management.

This chapter provides a context for improved insect conservation in the prairie region.

## **Policy, Legislation, and Programs**

### **National Policy and Program Initiatives**

Under the *1996 National Accord for the Protection of Species at Risk*, the governments of Canada agreed to work jointly toward the protection of species at risk in Canada. Governments agreed to develop complementary legislation, regulations, policies, and programs to identify and protect threatened and endangered species and their critical habitats. The accord stimulated the development of Canada's General Program Monitoring the Status of Wild Species, now known as the General Status Program (GSP). It also stimulated the creation of the Canadian Endangered Species Conservation Council (CESCC), made up of federal ministers of Environment, Fisheries and Oceans, and Heritage, as well as the provincial and territorial ministers with responsibilities for wildlife.

The council's mandate is to provide national leadership for the protection of species at risk. It has specific responsibilities for identifying and recovering species at risk and coordinating action among all parties. It also serves as a forum for resolving any disputes that may arise out of implementation of the accord. At its inaugural meeting in September 1999, the council agreed that the Committee on the Status of Endangered Species in Canada (COSEWIC) would continue to provide independent scientific assessments of species at risk nationally. Both the national GSP and the efforts of COSEWIC have become key to identifying species at risk in Canada.

#### ***General Status Program***

Knowledge of the status of Canadian insects has recently been enormously increased in a systematic and comprehensive review by the GSP (see <http://www.wildspecies.ca/wildspecies2005/search.cfm?lang=e&sec=9>; Twolan and Nadeau 2004). This program produces a report on the status of species in Canada every five years.

The National General Status Working Group (NGSWG) is composed of representatives from each of the Canadian provinces and territories and the three federal agencies whose mandate includes wildlife (Canadian Wildlife Service, Fisheries and Oceans Canada, Parks Canada Agency). Members of the group are responsible for completing the general status assessments in their respective jurisdictions. The NGSWG was established by the Canadian Wildlife Directors Committee to meet the commitment of monitoring, assessing, and reporting on the status of wildlife, as required under the *Accord for the Protection of Species at Risk*. NGSWG members are responsible to the Canadian Wildlife

Directors Committee and ultimately to the CESSC. The only insects included in the 2000 report were butterflies (See Appendix 1, Some Notes on Prairie Butterflies at Risk). Dragonflies and tiger beetles were included in 2005. The 2010 report (to be released in 2011) is expected to include spiders, biting flies (i.e., mosquitoes, black flies, horse flies), ground beetles (Carabidae), ladybird beetles (Coccinellidae), diving beetles (Dytiscidae), some macromoths (Saturniidae, Sphingidae, and the subfamily Arctiinae, as well as the genus *Catocala* Schrank in the Erebiidae), yellowjackets and allies (Vespidae), and some bees (Apidae).

Note that the General Status (GS) ranking process does not consider subspecies, so that Gibson's Big Sand Tiger Beetle, *Cicindela formosa gibsoni* Brown, is not found as a taxon at risk with this approach, although it is under review by COSEWIC. The categories used in GS assessments to determine at-risk status include extinct (for Canada only), extirpated (from a subjurisdiction), at risk, may be at risk, sensitive, secure, undetermined, not assessed, exotic, and accidental.

In considering the GS rankings for the prairie region, and acknowledging the ecoregional distribution of the species listed, a few things are revealed that are not clear from other status rankings. Of course, many species that are rare and potentially at risk in the prairie region are common and secure in other parts of Canada, and these species are of less concern. Most important are those species that are found mainly in the prairie region for which there is a possibility of risk. GS rankings reveal 14 of these species (Table 1).

### ***The Committee on the Status of Endangered Wildlife in Canada***

It is COSEWIC whose responsibility it is to assess the status of wildlife at risk in Canada ([www.cosewic.gc.ca](http://www.cosewic.gc.ca)) (COSEWIC 2006). Originally established in 1977 and then formally acknowledged by both the CESSC and the federal *Species at Risk Act* (SARA), this committee brings together wildlife experts who assess the status of species suspected to be at risk. The committee is informed by the GSP, by NatureServe Conservation Status Ranks (NatureServe Canada is a network of conservation data centres across the country housed within provincial and territorial agencies and coordinated through a national office in Ottawa), and by information compiled in a status report. The entire committee then designates these species as belonging to one of the five following categories:

**Extinct:** A wildlife species that no longer exists.

**Extirpated:** A wildlife species that no longer exists in the wild in Canada, but exists elsewhere.

**Endangered:** A wildlife species that is facing imminent extirpation or extinction.

**Threatened:** A wildlife species likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.

**Special Concern:** A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

According to *SARA*, the Government of Canada must take COSEWIC's assessments into consideration when amending the *List of Wildlife Species at Risk set out in SARA Schedule 1*.

**Table 1.** Species of insects found mainly in the prairie region for which there is a possibility of risk based on National General Status rankings. All of the species listed are unknown from the northern territories (north of 60°) and from east of Quebec. Abbreviations: 1 = at risk; 2 = may be at risk; 3 = sensitive; 5 = undetermined; 6 = not assessed; 8 = accidental; BC = British Columbia; AB = Alberta; SK = Saskatchewan; MB = Manitoba; ON = Ontario; QC = Quebec. Data from *Wild Species 2005* (CESCC 2006; <http://www.wildspecies.ca/wildspecies2005/search.cfm?lang=e&sec=9>).

Order	Scientific Name	Common Name	BC	AB	SK	MB	ON	QC
Coleoptera	<i>Cicindela lepida</i> Dejean	Ghost Tiger Beetle	--	6	6	2	2	2
Coleoptera	<i>Cicindela nevadica</i> LeConte	Nevada Tiger Beetle	--	6	3	2	--	--
Lepidoptera	<i>Atrytonopsis hianna</i> (Scudder)	Dusted Skipper	--	--	3	3	2	6
Lepidoptera	<i>Hesperia dacotae</i> (Skinner)	Dakota Skipper	--	--	--	1	--	--
Lepidoptera	<i>Hesperia ottoe</i> W. H. Edwards	Ottoe Skipper	--	--	--	2	--	--
Lepidoptera	<i>Hesperia pahaska</i> Leussler	Pahaska Skipper	--	--	5	--	--	--
Lepidoptera	<i>Oarisma poweshiek</i> (Parker)	Poweshiek Skipperling	--	--	--	2	--	--
Lepidoptera	<i>Pyrgus scriptura</i> (Boisduval)	Small Checkered Skipper	--	5	5	--	--	--
Lepidoptera	<i>Speyeria edwardsii</i> (Reakirt)	Edwards' Fritillary	--	3	3	2	--	--
Lepidoptera	<i>Speyeria idalia</i> (Drury)	Regal Fritillary	--	--	8	8	2	--
Lepidoptera	<i>Apodemia mormo</i> (C. & R. Felder)	Mormon Metalmark	2	--	3	--	--	--
Odonata	<i>Somatochlora ensigera</i> Martin	Plains Emerald	--	--	5	2	2	--
Odonata	<i>Gomphus externus</i> Hagen	Plains Clubtail	--	--	5	2	--	--
Odonata	<i>Stylurus intricatus</i> (Hagen)	Brimstone Clubtail	--	3	5	--	--	--

The vast majority of the assessments suggested by COSEWIC have been accepted by the CESCC and by the federal Minister of the Environment. For example, Verna's Flower Moth (*Schinia verna* Hardwick) had first been assessed as threatened by COSEWIC in 2005. After being returned to COSEWIC for further information, it finally passed federal ministerial approval in March 2009. It is now listed as threatened on Schedule 1 of SARA and is the subject of an upcoming recovery plan.

The assessments by COSEWIC do not provide accurate information on the status of Canadian insects as a whole because of the small portion of species that have been assessed. For example, COSEWIC assessments are not intended to tell us how many Canadian insects are extinct or extirpated. The Rocky Mountain Grasshopper (*Melanoplus spretus* (Walsh)) once occurred throughout the southern prairie provinces but was extinct by 1903 (Lockwood and DeBrey 1990). It has not been officially assessed by COSEWIC. Only 37 of an estimated 60,000 Canadian insects have been assessed. However, the assessments by COSEWIC to date allow for some extrapolation based on coverage of indicator groups (see the section "How Many Insects Are Really at Risk in the Prairie Ecozone?").

The fact that COSEWIC status reports do not provide as accurate information on the status of insects as they do for other groups such as birds, reptiles, amphibians, and fish is not a major concern when other benefits are considered. These reports effectively draw attention to particular problems and promote solutions; among the solutions are recovery plans. The reports can also be used in conjunction with other rankings, such as those developed by the GSP. The COSEWIC status reports complement the GSP coverage, which can be incomplete for many taxa and does not include subspecies. The COSEWIC assessments and listings are also useful as indicators of environmental change that will affect other species. In addition, they help provide an indication of the urgency and specific needs of biodiversity protection (Catling *et al.* 2009)

By the time a candidate species has reached the priority 1 stage on the list maintained by COSEWIC'S Arthropod Species Specialist Subcommittee, it is likely to be assessed in an at-risk category. Priority is determined by considering levels of apparent risk, taxonomic distinctiveness, global distribution, and proportion of range in Canada. Only priority 1 species are listed in Table 2. Priority 2 and 3 species are not considered as "likely at risk" for one or more reasons.

For further information on federal efforts concerning species at risk in Canada, see Catling *et al.* (2009) and the Species at Risk Public Registry (<http://www.sararegistry.gc.ca>)

**Needed: More information on Verna's Flower Moth  
(*Schinia verna* Hardwick)**

It is known globally from only five locations, all in the Canadian prairies. It is ranked as SU (Status Uncertain) by the Alberta Conservation Information Management System, SH (historical occurrence) by the Saskatchewan Conservation Data Centre, and SNA (status not applicable) by the Manitoba Conservation Data Centre. The only records for the past 24 years are from Alberta in grazed grasslands, where the larvae feed on pussytoes (*Antennaria* Gaertn.) (Anweiler 2008). As a result of a rapid, buzzing, bee-like diurnal flight, these moths are difficult to identify in the field and frequently confused with other species such as the White-spotted Midget (see [www.entomology.ualberta.ca/searching.php](http://www.entomology.ualberta.ca/searching.php)).

**Table 2.** Names, species number, current status, threat code (from a database in preparation), and political and ecological distribution for 27 species of insects found in the prairie region that have been considered by COSEWIC (to March 2010) (see Plates 1–3 for specimen images). The list includes 1 extirpated species, 9 endangered, 4 threatened, 3 special concern, and 10 in various stages of preparation. Abbreviation: COSEWIC = Committee on the Status of Endangered Wildlife in Canada.

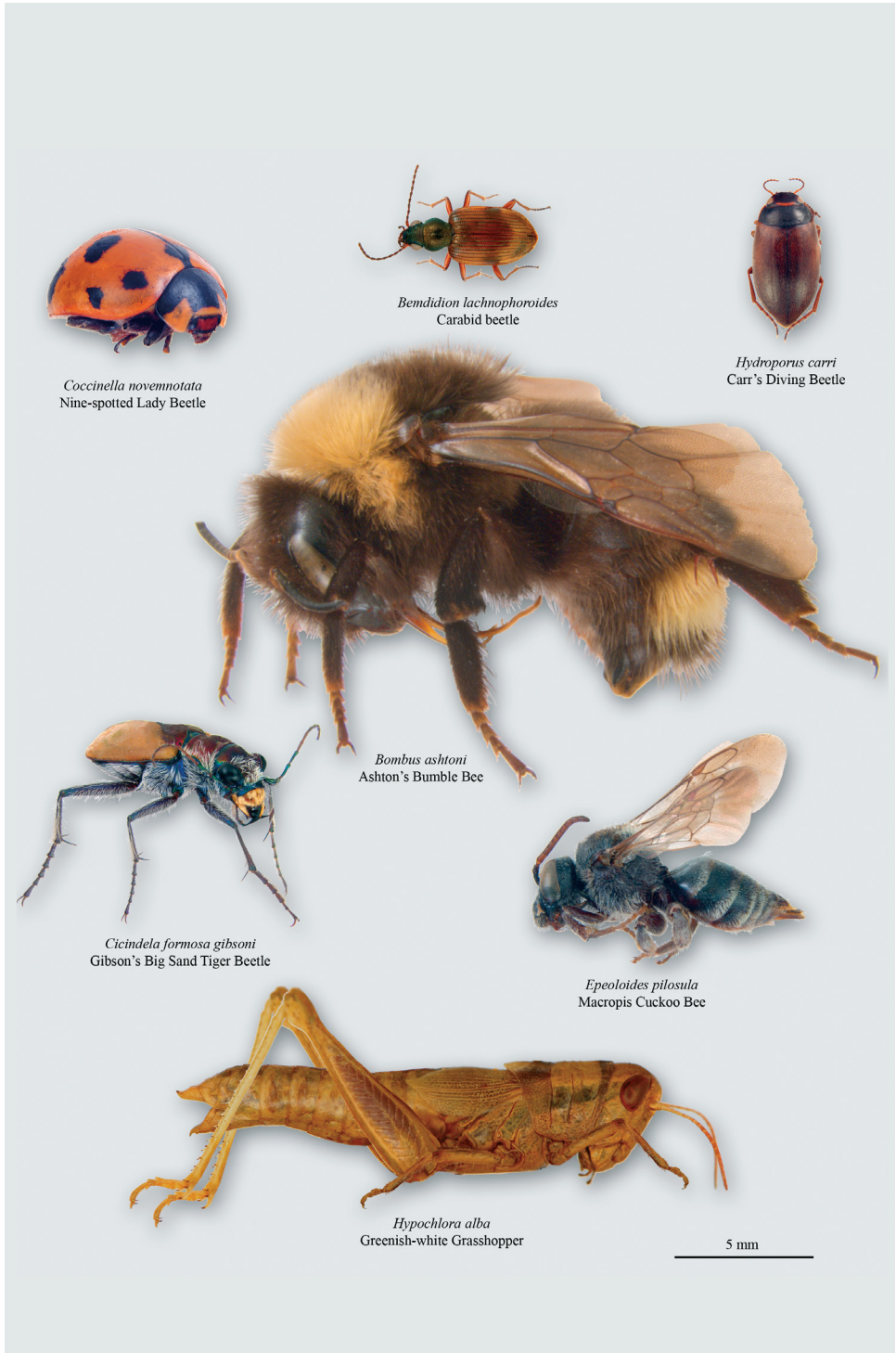
Scientific Name	Common Name	Species Number	Current Status <sup>1</sup>	Threat Code <sup>2</sup>	Distribution <sup>3</sup>	Ecozone <sup>4</sup>
<b>COLEOPTERA</b>						
<i>Bembidion lachnophoroides</i> Darlington	Carabid beetle	24	NA – priority 1	2, 3	AB, SK	12
<i>Cicindela formosa gibsoni</i> Brown	Gibson’s Big Sand Tiger Beetle	1	NA – in preparation	14, 17	SK	12
<i>Coccinella novemnotata</i> Herbst	Nine-spotted Lady Beetle	2	NA – priority 1	20	AB, BC, MB, NB, NS, ON, PE, QC, SK	10, 11, 12, 14, 15
<i>Hydroporus carri</i> Larson	Carr’s Diving Beetle	3	NA – priority 1	12	AB	12
<i>Sanfilippodytes bertae</i> Roughley & Larson	Bert’s Predaceous Diving Beetle	4	Endangered	12	AB	12
<b>HYMENOPTERA</b>						
<i>Bombus ashtoni</i> (Cresson)	Ashton’s Bumble Bee	25	NA – priority 1	28	AB, BC, MB, NB, NL, NS, NT, ON, PE, QC, SK, YT, NU	3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
<i>Epeoloides pilosula</i> (Cresson)	Macropis Cuckoo Bee	5	NA – in preparation	1, 2, 21, 25	SK, MB, ON, NS	9, 12, 14, 15
<b>LEPIDOPTERA</b>						
<i>Apodemia mormo</i> (C. & R. Felder)	Mormon Metalmark	6 (prairie population)	Threatened	21	SK	12
<i>Copablepharon grandis</i> (Strecker)	Pale Yellow Dune Moth	7	Special concern	14	AB, SK, MB	12
<i>Copablepharon longipenne</i> Grote	Dusky Dune Moth	8	Endangered	14	AB, SK, MB	12
<i>Danaus plexippus</i> (Linnaeus)	Monarch	9	Special concern	2, 7, 17	NL, AB, BC, MB, NB, NS, ON, PE, QC, SK, NT	5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
<i>Erynnis martialis</i> (Scudder)	Mottled Duskywing	26	NA – priority 1	3, 6, 17	MB, ON, QC	14
<i>Hesperia dacotae</i> (Skinner)	Dakota Skipper	10	Threatened	1, 3, 12, 19, 23	MB, SK	12

Table 2. (continued)

Scientific Name	Common Name	Species Number	Current Status <sup>1</sup>	Threat Code <sup>2</sup>	Distribution <sup>3</sup>	Ecozone <sup>4</sup>
<i>Hesperia ottoe</i> W.H. Edwards	Ottoe Skipper	11	Endangered	14, 19	MB, SK	12
<i>Limenitis weidemeyerii</i> W. H. Edwards	Weidemeyer's Admiral	12	Special concern	12, 27	AB	12
<i>Megathymus streckeri</i> (Skinner)	Strecker's Giant Skipper	13	NA – priority 1	21, 25	AB	12
<i>Melaporphyria immortua</i> Grote	Dark-banded Flower Gem	14	Data deficient	?	AB, MB, SK	12
<i>Oarisma poweshiek</i> (Parker)	Poweshiek Skipperling	15	Threatened	12, 14, 19, 22	MB	12
<i>Papaipema aweme</i> (Lyman)	Aweme Borer Moth	16	Endangered	3, 17, 21, 22	MB, ON	12, 14
<i>Prodoxus quinquepunctellus</i> (Chambers)	Five-spotted Bogus Yucca Moth	17	Endangered	11, 21, 25	AB	12
<i>Schinia avemensis</i> (Dyar)	Gold-edged Gem	18	Endangered	3, 14, 19	AB, SK, MB	12
<i>Schinia bimatrix</i> (Harvey)	White Flower Moth	19	Endangered	14	MB	12
<i>Schinia verna</i> Hardwick	Verna's Flower Moth	20	Threatened	4, 19	AB, MB, SK	12
<i>Speyeria idalia</i> (Drury)	Regal Fritillary		Extirpated	1,2,3	MB,ON	12
<i>Tegeticula corruptrix</i> Pellmyr	Non- pollinating Yucca Moth	21	Endangered	11, 12, 21,25	AB	12
<i>Tegeticula yuccasella</i> (Riley)	Yucca Moth	22	Endangered	11, 12, 21	AB	12
<b>ORTHOPTERA</b>						
<i>Hypochlora alba</i> (Dodge)	Greenish- white Grasshopper	23	NA – in preparation	1, 21	AB, SK, MB	12

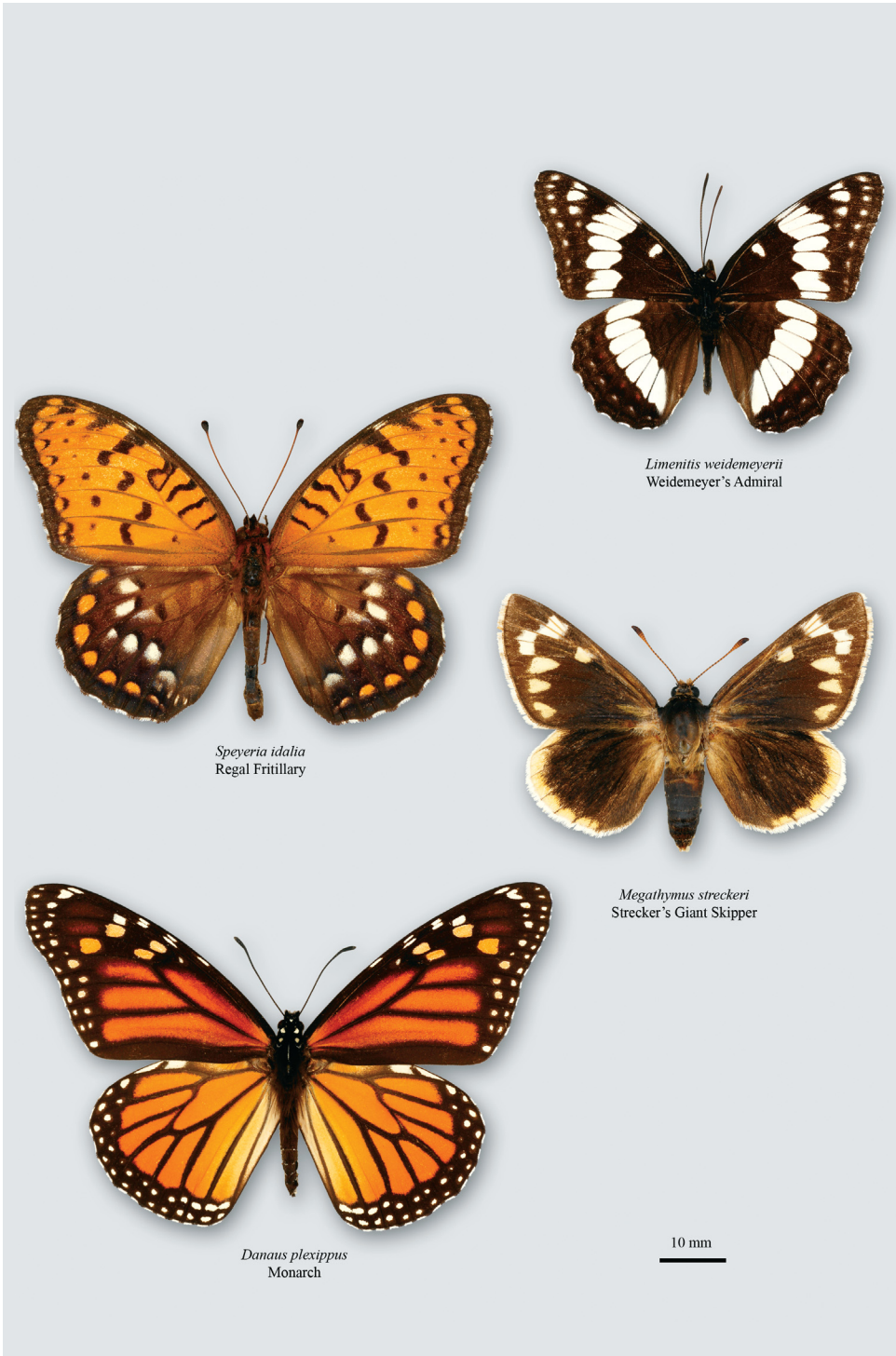
<sup>1</sup> NA - priority 1 = candidate species that are top priority on the candidate list.<sup>2</sup> Threat codes: see Table 3.<sup>3</sup> Provinces: AB = Alberta; SK = Saskatchewan; BC = British Columbia; MB = Manitoba; NB = New Brunswick; NS = Nova Scotia; ON = Ontario; PE = Prince Edward Island; QC = Quebec; NL = Newfoundland and Labrador; NT = Northwest Territories; YT = Yukon Territory; NU = Nunavut.<sup>4</sup> Ecozones: 3 = Southern Arctic; 4 = Taiga Cordillera; 5 = Taiga Plains; 6 = Taiga Shield; 7 = Boreal Cordillera; 8 = Boreal Plains; 9 = Boreal Shield; 10 = Pacific Maritime; 11 = Montane Cordillera ; 12 = Prairies ; 13 = Hudson Plains ; 14 = Mixedwood Plains; 15 = Atlantic Maritime.





**Plate 1.** Insects found in the Canadian prairie region that have been considered by the Committee on the Status of Endangered Wildlife in Canada (see Table 2).





**Plate 2.** Insects found in the Canadian prairie region that have been considered by the Committee on the Status of Endangered Wildlife in Canada (see Table 2).



**Plate 3.** Insects found in the Canadian prairie region that have been considered by the Committee on the Status of Endangered Wildlife in Canada (see Table 2).

### ***Listing and Protection within Provinces***

Even though most provinces have some form of legislation for protection of wildlife species at risk, only one province in the prairie region of Canada—Manitoba—has legislative protection that is being used to protect some insect species: All listed insects in Manitoba are Lepidoptera. However, all provinces in the prairie region, as well as British Columbia (listed here alphabetically), do afford some kind of protection and are developing more programs for the protection of insects.

#### ***Alberta***

The Alberta Conservation Information Management System (ACIMS) has insect tracking lists for butterflies, dragonflies, and tiger beetles (<http://tpr.alberta.ca/parks/heritageinfocentre/animals/default.aspx>). The tracked information is maintained in databases and used to identify critical areas in need of protection and to assist in stewardship programs. Although a number of provincial parks and ecological preserves protect insects that are rare and/or at risk, none has been established for that purpose alone. It is encouraging that restricted species continue to be discovered in protected areas, an example being the recent discovery of the Magdalena Alpine (*Erebia magdalena* Strecker) in Willmore Wilderness Park adjacent to Banff (W. Nordstrom, ACIMS, pers. comm.), although this is not a prairie grassland species.

Alberta has an Endangered Species Conservation Committee (ESCC; <http://www.srd.alberta.ca/BioDiversityStewardship/SpeciesAtRisk/LegalDesignation/EndangeredSpeciesConservationCommittee/Default.aspx>) that advises the provincial government and produces periodic reports that include species recently assessed and species currently listed under the *Wildlife Act* (Fish and Wildlife Division 2008). This act does not, at present, protect any insects or other invertebrates. Currently, however, the Yucca Moth (*Tegeticula yuccasella*) and Weidemeyer's Admiral (*Limenitis weidemeyerii*) are awaiting regulation development. The Alberta Soapweed and Yucca Moth Recovery Team (2006) submitted a recovery plan to ESCC in 2006 and the plan was approved by the minister. Recovery actions are under way. A provisional management plan will be prepared for Weidemeyer's Admiral, and it will be integrated with other programs currently under way in the Milk River Basin, such as the Multiple Species at Risk Program. A major component of this plan will be monitoring. See Pohl (2008) for a useful outline of the protection of insects at risk in Alberta.

The Peace River prairie outlier is a potentially important prairie area that is shared by British Columbia and Alberta. For more information about this area, see the section "British Columbia."

The Alberta Lepidopterists' Guild ([www.biology.ualberta.ca/old\\_site/uasm/alg/](http://www.biology.ualberta.ca/old_site/uasm/alg/)) does much to promote communication about insects and their conservation in the province. John Acorn's books, as well as his popular lectures, have done a great deal to help Albertans understand insects and the need to conserve them (e.g., Acorn 1993). In fact, Acorn's work has had an impact through much of North America.

#### ***British Columbia***

In British Columbia, the provincial *Wildlife Act* protects virtually all vertebrate animals from direct harm, except as allowed by regulation (e.g., hunting or trapping; see [www.env.gov.bc.ca/atrisk/legislation.html](http://www.env.gov.bc.ca/atrisk/legislation.html)). The BC act does not, at present, protect any insects. British Columbia has no stand-alone endangered species act, although the province includes insects in the red and blue lists of species of concern.

In British Columbia, the government, working with non-governmental organizations such as the Nature Conservancy of Canada (NCC) and The Nature Trust of British Columbia, has designated 10 butterfly species and subspecies at risk in the area of southern Vancouver Island and the Gulf Islands and is encouraging private landowners to save appropriate habitat (Hall 2009). Most of these habitats are contained in the Garry oak ecosystem of this region (Kondla *et al.* 1999). However, none of these Lepidoptera is protected by any provincial legislation. Also, none of these species is included in the BC portion of the prairie region, which includes part of the Peace River grasslands. Some insect species that occur in this region are disjunct, limited in area of occurrence, and may warrant protection, such as Pike's Old World Swallowtail (*Papilio machaon pikei* Sperling), or are significant disjunctions, such as the Variable Tiger Beetle (*Cicindela terricola* Say) and several butterflies (see Catling 2006 and references therein).

For an overview of invertebrate species at risk in British Columbia, see Scudder (1994), as well as the British Columbia Conservation Data Centre website (<http://www.env.gov.bc.ca/cdc>).

### **Manitoba**

Four insects are listed in the *Manitoba Endangered Species Act*: Uncas Skipper (*Hesperia uncas* W. H. Edwards) is listed as endangered, Dakota Skipper (*Hesperia dacotae*) and Ottoo Skipper (*Hesperia ottoe*) are listed as threatened, and Ridings' Satyr (*Neominois ridingsii* (W. H. Edwards)) is listed as extirpated (<http://www.gov.mb.ca/conservation/wildlife/sar/sarlist.html>).

In Manitoba, wildlife is also protected under *The Wildlife Act*. However, wildlife is defined as a vertebrate animal of a species or type that is wild by nature in the province, but does not include fish or insects.

The Manitoba Conservation Data Centre maintains lists of insects of conservation concern (<http://www.gov.mb.ca/conservation/cdc/db.html>).

Manitoba Conservation (the provincial government) has funded provincial insect projects, such as the development of a dragonfly survey (see textbox) and website (<http://www.naturenorth.com/dragonfly/index.html>). The provincial government also maintains an extensive natural areas network that provides some degree of protection for biodiversity in all of the province's natural regions (<http://www.gov.mb.ca/conservation/pai/maps.html>).

On tallgrass prairie lands protected by the NCC in the Vita–Stuartburn area, the habitat of the Poweshiek Skipperling (*Oarisma poweshiek*) is protected, and future management of the prairie vegetation by fire is expected to take insects into account. Sandy open habitats in Spruce Woods Provincial Park protect insects, and the management plan for Shilo Military Base takes insect habitat into account.

### **Saskatchewan**

Although the province of Saskatchewan has a provincial wildlife act (*The Wildlife Act*) that lists a number of mammals, birds, and plants (see Saskatchewan Conservation Data Centre site, "Species at Risk in Saskatchewan," <http://www.biodiversity.sk.ca/Docs/SpeciesAtRiskinSK.pdf>), no insects are currently listed because they are not considered "wildlife" under the legal definition. Wildlife is defined as vertebrate animals or plants. However, under the *Wild Species at Risk Regulations*, within *The Wildlife Act*, insects might be included. The situation is currently under review by the provincial government.

The Saskatchewan Conservation Data Centre has a tracking list that includes six species of Lepidoptera listed by COSEWIC, as well as 35 other insects, all of which are Lepidoptera,



### Manitoba Dragonfly Survey

The Manitoba Dragonfly Survey, a project of the Manitoba Wildlife and Ecosystem Protection Branch in partnership with [NatureNorth](http://www.naturenorth.com), is a volunteer-based survey of Manitoba's diverse populations of dragonfly species. Citizens interested in participating can obtain a manual explaining how to capture and identify dragonflies over the course of the summer. Each species of dragonfly has a different period of activity between late May and early September and, as a result, different species can be found at different times. Many species can be identified by the volunteers and quickly released, but for hard-to-identify species, specimens can be preserved and sent to the Wildlife and Ecosystem Protection Branch for identification.

Dragonflies are of interest for several reasons, not the least of which is their ability to reduce the mosquito population. They spend a large part of their life cycle in water and are thought to be excellent indicators of environmental stresses such as pollution. Changes in dragonfly populations can thus be indicators of the overall health of our local lakes, waterways, and surrounding ecosystems.

For more information and how to get involved, see <http://www.gov.mb.ca/conservation/wildlife/spmon/dragonfly.html> <http://www.naturenorth.com/dragonfly/index.html>

including many that are rare in the province (see the Saskatchewan Conservation Data Centre site, "Tracked Species List for Invertebrates," <http://www.biodiversity.sk.ca/Docs/inverttrak.pdf>).

The NCC in Saskatchewan has these and all COSEWIC-assessed insect species listed as targets in their regional Natural Area Conservation Plans. However, the inventories that precede NCC's acquisitions, and those of other agencies, frequently use plants, birds, and mammals as indicator groups. No sites are known that were especially protected for an insect at risk or included an insect at risk. However, some acquisitions likely support insects at risk, and beneficial aspects of protection of a landscape have sometimes been discovered after the fact. For example, protection by NCC of the Old Man on His Back site, which included a number of more or less pristine wetlands, led to the protection of the shallow freshwater habitat of Margaret's Diving Beetle (*Agabus margaritae* (Needham), L. Gabruch, NCC Saskatchewan, pers. comm.). This species has declined in parts of Saskatchewan because of excessive trampling by cattle and nutrient enrichment in shallow, temporary prairie sloughs, but information on decline is not yet sufficient to make it a priority 1 candidate for the COSEWIC Arthropod Species Specialist Subcommittee.

The only site that is generally well-known in Saskatchewan for protecting an insect is Grasslands National Park, where a population of the Mormon Metalmark (*Apodemia mormo*) is protected and recognized as an important element (Jeff Keith, Saskatchewan Conservation Data Centre, pers. comm.). The park is the lead on the recovery strategy for the butterfly, and co-operative research is under way to identify critical habitat for inclusion in park planning and monitoring (R. Sissons, Conservation Biologist, Grasslands National Park, pers. comm.)

Parks Canada has recognized that the vast prairie grasslands evolved with the impact of the plains bison and that, with the loss of bison, the mixedgrass prairie lost a number of important ecosystem processes related to the benefits of differential grazing, wallowing, and nutrient cycling and fertilization (from dung). What is truly encouraging to an entomologist, however, is the recognition that a variety of insects depend directly or indirectly on bison, and some that feed on bison dung are instrumental in the nutrient cycling process. This kind of valuable educational information concerning interdependencies in nature has accompanied literature on the reintroduction of bison, after 120 years of absence, into the west block of Grasslands National Park (e.g., [www.pc.gc.ca/apprendre-learn/prof/sub/bison/etu-stuplan3case7e\\_e.pdf](http://www.pc.gc.ca/apprendre-learn/prof/sub/bison/etu-stuplan3case7e_e.pdf)). Grasslands National Park is inviting professional and amateur entomologists to get involved in monitoring insects under several grazing and fire treatments planned for both the west and east blocks of the park (for an overview of the park, see [http://www.pc.gc.ca/pn-np/sk/grasslands/index\\_e.asp](http://www.pc.gc.ca/pn-np/sk/grasslands/index_e.asp)). The invitations for professional help have resulted in a number of insect surveys in the park that have led to the discovery of insects found nowhere else in Canada (Henderson 2006).

A number of other areas are known to protect insects at risk in Saskatchewan (J. Pepper, pers. comm.). For example, the Great Sand Hills Ecological Reserve includes populations of the Dusky Dune Moth (*Copablepharon longipenne*), the Pale Yellow Dune Moth (*Copablepharon grandis*), and the geometrid moth *Animomyia hardwicki* Rindge, which is known only from the holotype collected in the Great Sand Hills. As another example (outside the prairie region), an endemic subspecies of the Hairy-necked Tiger Beetle (*Cicindela hirticolis athabascensis* Graves, Krejci and Graves) of the Athabasca Sand Dunes is protected under the provincial *Parks Act*.

### ***Other Legal Tools***

Some protection for insects is also found federally under the provisions of the *Canada National Parks Act*. Collecting within national park boundaries is prohibited without a special permit. A number of rare and endangered insects benefit from this protection. Similar legislation exists in most provinces and territories for their parks and other protected areas.

Doug Hyde, Executive Director for NatureServe Canada, has noted that other legal tools exist, specifically in a discussion on butterfly-related conservation issues:

While specific legislation for the protection of species at risk may be lacking in many jurisdictions, all jurisdictions have tools at their disposal to support habitat protection and conservation in the face of a range of land uses in Canada. Preventing or controlling habitat alteration or loss is a key factor in butterfly conservation, as it is a primary threat to many butterfly species. On crownlands, such instruments can create restrictions on uses such as forestry, agriculture, mining, oil and gas operations, transportation including rail and road development, hydro electric development, and municipal development, or can be applied to set aside land in the form of parks or protected areas. (Hall 2009)

## **General Threats to Biodiversity, Including Insects**

### ***Habitat Loss and Degradation***

The prairie grassland region of North America has been one of the most affected parts of the continent from the perspective of human activities. In particular, the tallgrass prairies in Manitoba and Saskatchewan have been almost eliminated, except for a few isolated



### Where Does the Information Come from? Ron Hooper: A True Example

What makes an entomologist? Some have professional training, but many are so-called amateur entomologists. Although lacking formal education in entomology, they often contribute immensely. One of the finest amateur entomologists in the prairie region was Ronald Hooper. Pastor of Fort Qu'Appelle Apostolic Church, Ron began preaching in 1952, mostly to First Nations groups. It was also in the 1950s that he began work as an entomologist, much of the time as a volunteer, with the Royal Saskatchewan Museum in Regina, where he almost single-handedly developed the provincial insect collection (now the R.R. Hooper Entomology Collection). Each summer he travelled extensively to native settlements advocating kindness and an appreciation of nature, and he had a huge beneficial impact on native communities. Whenever he could, he enjoyed being in the outdoors and studying insects. His enthusiasm resulted in the publication of hundreds of scientific articles (including a book on the butterflies of Saskatchewan) and the contribution of thousands of valuable specimens. The Entomological Society of Canada recognizes the outstanding work of amateurs with the Norman Criddle Award, which Ron received in 1983. Ron served (voluntarily) as an active advisor to the Committee on the Status of Endangered Wildlife in Canada for more than a decade. He made a significant contribution to the protection of Canadian insects and their environment. Much of our knowledge of prairie insects came from this remarkable man, never trained as an entomologist, who devoted most of his life to helping people. Ron passed away on December 2, 2010 after a short illness. We lost a great man. [Prepared with the help of Ray Poulin, Royal Saskatchewan Museum]



patches. As recently as 200 years ago, hundreds of thousands of bison were present in a complex prairie ecosystem with numerous interdependencies (Catling and Kostiuk 2006). By 1900, this ecosystem had been largely destroyed. Today, the North American tallgrass prairie is 1/10 of 1% of the size it was, and good-quality remnants of the mixedgrass prairie are estimated to be less than 30% of their pre-settlement extent. Very few native insects have benefited as a result of conversion of the landscape to agriculture.

Fires that regularly raged across the prairies, burning in a patchwork related to changes in grazing, had a clear role in maintaining rich open grasslands. The loss of these grasslands in many areas is due, through deliberate management practices, to the loss of fire.

The smaller non-grasslands habitat areas within the grasslands region have also been eliminated or damaged. Dune areas have been used widely for recreational activities, such as driving all-terrain vehicles (ATVs), which has damaged the native flora. Badlands have not been as seriously damaged, but they are always subject to erosion and any damage to native plants can speed up this process. Riparian areas along prairie waterways have their own specialized plants and animals, and losses of these areas to crops or to the trampling and defecation of livestock could put native insect species at risk.

### ***Transportation Activities***

Although the building of roads and railway lines across the prairies has been detrimental to some species, such as terrestrial vertebrates, this has not been true for invertebrates in general, with a few exceptions, such as substantial losses of migratory dragonflies (Catling and Kostiuk 2008).

In some respects, railway building has had a beneficial effect on localized insect populations across the prairies. As the railways moved west across the country, they offered rights-of-way on both sides of the lines. These areas were often left intact but periodically burned, which preserved the native plants. Some of them were food plants for butterflies and other insects, and the railway lines have provided limited but continuous native habitats for insects in areas where they are surrounded by agricultural crops. In some situations, the railway side prairie strips provide important connectivity between larger conserved prairie sites.

### ***Pesticides***

Widespread use of pesticides in prairie croplands, starting after the Second World War, has had a large impact on insects. Most often, the targets of the pesticides are insect species that damage prairie crops, such as some grasshoppers and some moth and beetle larvae. However, the effects extend far beyond the target species. Many of these pesticides, over the years, were deadly to a huge variety of insect and arachnid species, and ultimately influenced other groups such as birds. The problem of pesticides is ongoing, and even today, the widespread use of *Bacillus thuringiensis* for the biological pest control of certain moth larvae on crops affects all Lepidoptera species, including those at risk.

### ***Invasive Alien Species***

The accidental or intentional introduction of non-native plants and insects to the prairies has also had a detrimental effect on native plants and animals, including insects. As an example, from an initial start in Canada in the late 1800s and early 1900s, leafy spurge (*Euphorbia esula* L.) now occurs extensively in the southern prairie provinces. It is regarded as a serious national pest of rangelands, croplands, and pastures. It is also a serious threat to endangered native plant species and their associated insects because of its aggressive

competition with most types of herbaceous vegetation. Another example is the introduction of exotic ladybird beetles, which has had a huge impact on native ladybird biodiversity.

### ***Climate Change***

Canadian insects will undoubtedly continue to be affected by changes to the Canadian climate. Rising temperatures, greater variation in precipitation, and so forth, are already changing species distributions and habits. To date, observations of these changes in Canada have been mostly anecdotal, but the evidence is building. In particular, certain butterfly species have been seen in recent years to be expanding their distributions farther north in some parts of Canada (Hall 2009). An increasing number of scientists, in Canada as well as worldwide, have been more systematically studying the effects of greenhouse gas emissions on our climate and wildlife, including insects. This work will likely show changes in insect distributions in the prairie region as a result of global warming.

### **Synopsis of Specific Threats to Prairie Insects and Arachnids at Risk**

From COSEWIC status reports and related information, the most important threats to insects in the prairies, based on the number of species threatened (Table 3), are (1) reliance upon a plant that is at risk, (2) grazing and/or trampling by cattle, and (3) dune stabilization and succession. Fifteen other threats are identified but they each affect fewer than six species.

Regarding reliance on food plants, it is the threats to the plants that are the ultimate threats to the insects. The threatened Soapweed (*Yucca glauca* Nutt.) near Onefour, Alberta, is the only larval food for three endangered species: Yucca Moth (*Tegeticula yuccasella*), Non-pollinating Yucca Moth (*Tegeticula corruptrix*), and Five-spotted Bogus Yucca Moth (*Prodoxus quinquepunctellus*). The candidate Strecker's Giant Skipper (*Megathymus streckeri*) is also dependent on the Yucca and will likely receive endangered status. The threats to all of these insects are the same as the threats to the host plant, including ungulate herbivory, destruction of plants by ATVs, and collection of plants for horticulture. Among the other species dependent on plants at risk is the Mormon Metalmark (*Apodemia mormo*), feeding on threatened *Eriogonum pauciflorum* Pursh in Saskatchewan and on *E. niveum* Douglas ex. Benth., which has declined in the Okanagan and Similkameen valleys of British Columbia. Larvae of the Aweme Borer Moth (*Papaipema aweme*) may depend on rare or at-risk species of Asteraceae, but the host plant is not yet known. The flightless Greenish-white Grasshopper (*Hypochlora alba*) is believed to feed only on White Sagebrush (*Artemisia ludoviciana* Nutt.), which has declined. The parasitic Macropis Cuckoo Bee (*Epeoloides pilosula*) is indirectly dependent on species of the food plants of its *Macropis* Panzer bee host, which include species of *Lysimachia* L. that are declining.

Cattle concentrate in wet and moist areas much more than bison ever did, and this can lead to destruction of critical habitat by trampling. Particularly susceptible to this kind of threat are a number of insects that require shallow prairie sloughs and springs. Sometimes these habitats are only a few metres in extent and are reduced by trampling to a murky mudhole without any aquatic vegetation. This destruction represents a threat to Carr's Diving Beetle (*Hydroporus carri*) and Bert's Predaceous Diving Beetle (*Sanfilippodytes bertae*).

Generally, heavy grazing and trampling can eliminate important larval food plants and nectar resources for Lepidoptera. Among the species threatened in this way are Dakota Skipper (*Hesperia dacotae*), Weidemeyer's Admiral (*Limenitis weidemeyerii*), Poweshiek Skipperling (*Oarisma poweshiek*), Non-pollinating Yucca Moth (*Tegeticula*

**Table 3.** Threats to 27 species (in order of number of species threatened) considered by COSEWIC to be at some level of threat in the prairie region, showing the threat code, the number of species associated with each threat, and the species involved. Abbreviations: ATVs = all-terrain vehicles; COSEWIC = Committee on the Status of Endangered Wildlife in Canada.

Threat	Threat Code <sup>1</sup>	Number of Species	Species Number <sup>2</sup>
Food plant at risk	21	8	5, 6, 13, 16, 17, 21, 22, 23
Cattle grazing and/or trampling	12	7	3, 4, 10, 12, 15, 21, 22
Dune stabilization and general succession	14	7	1, 7, 8, 11, 15, 18, 19
Lack of fire – loss of early succession and conversion to woodland	3	5	10, 16, 18, 24, 26
Invasive dryland plants and their control with herbicides	19	5	10, 11, 15, 18, 20
Loss of associated animal	25	4	5, 13, 17, 21
Tree or grass planting and subsequent pesticide use	17	4	1, 9, 16, 26
Agricultural expansion, causing habitat loss and fragmentation	1	3	5, 10, 23
Recreation ATVs, trampling	11	3	17, 21, 22
Urban expansion causing habitat loss and fragmentation	2	3	5, 9, 24
Fire management to maintain prairie flora	22	2	15, 16
Loss of ecological processes	4	1	20
Pesticides for urban insect control	6	1	26
Haying	23	1	10
Pesticides in agriculture	7	1	9
Subsidized and invasive predation	20	1	2
Water regulation – dams	27	1	12
Pathogen spillover from commercial insects	28	1	25

<sup>1</sup> Threat codes that apply to Canadian insects are numbered 1–30 (PMC, pers. documents), but only 18 of these apply to insects in the Prairies Ecozone.

<sup>2</sup> See Table 2 for species numbers.

*corruptrix*), Five-spotted Bogus Yucca Moth (*Prodoxus quinquepunctellus*), and Yucca Moth (*Tegeticula yuccasella*).

The stabilization of sand dunes, which includes a decrease in moving sand and a loss of open sand because of increasing vegetation cover, has been increasing in the prairie region. Some entire areas of active dune that existed a few decades ago have become covered with vegetation, and others have become much smaller (Hugenholtz and Wolfe 2005; Wolfe and Thorpe 2005). Changes in atmospheric carbon and nitrogen may also have played a role. The extent of open sand probably fluctuated in the past, but the recent lack of prairie fires and of large herds of bison may have contributed to the decline of open sandy habitat. Among the insects at risk from the threat of declining open sand are Gibson's Big Sand Tiger Beetle (*Cicindela formosa gibsoni*), Pale Yellow Dune Moth (*Copablepharon grandis*), Dusky Dune Moth (*Copablepharon longipenne*), Gold-edged Gem (*Schinia avemensis*), and White Flower Moth (*Schinia bimatrix*).

A phenomenon closely related to the loss of open sand (and included in threat 14 as general succession) is the loss of grassland, which is often the result of changes in fire regime. In many parts of the prairie, vegetation succession occurs in the absence of fire, or for a variety of reasons (invasives, ungulates, etc.), thus resulting in the replacement of prairie by woodland. Lack of fire is often considered the major factor in allowing succession and it remains a threat that requires management, even in protected areas. The requirements of both insects and of vegetation have to be taken into account to develop the appropriate balance of burning and not burning. Species threatened by succession from lack of fire include Dakota Skipper (*Hesperia dacotae*), Ottoe Skipper (*Hesperia ottoe*), Poweshiek Skipperling (*Oarisma poweshiek*), Aweme Borer Moth (*Papaipema aweme*), and Gold-edged Gem (*Schinia avemensis*). Interestingly, management with fire to promote prairie flora is listed as a threat to both Poweshiek Skipperling (*Oarisma poweshiek*) and Aweme Borer Moth (*Papaipema aweme*). See Swengel (2008) for an illuminating discussion of the dangers of fire to prairie butterflies.

Multitudes of interdependencies occur in an ecosystem and many are direct and obvious. Some endangered animals are entirely dependent on another species of animal, which may or may not be at risk itself. This dependency is, of course, true for parasites with one or a few hosts, a good example being the Macropis Cuckoo Bee (*Epeoloides pilosula*), which is a cleptoparasite of oil-collecting Melittid bees of the genus *Macropis*. Another interesting example is the dependence of four species on Soapweed. Without the pollinating Yucca Moth (*Tegeticula yuccasella*), there would be less recruitment and increase in Soapweed populations, perhaps to the point of endangering the dependent Lepidoptera. In addition, the Non-pollinating Yucca Moth (*Tegeticula corruptrix*) requires the successful pollination of Soapweed flowers by the Yucca Moth in order to lay its eggs. The Non-pollinating Yucca Moth needs early-stage yucca fruit to be present at the time of its emergence for oviposition.

Although agricultural expansion that caused habitat loss and fragmentation more than a century ago was responsible for huge habitat declines and likely the extirpation and extinction of some species, such as the Rocky Mountain Grasshopper (*Melanoplus spretus*; see Lockwood and DeBrey 1990), in general, expansion appears to be less of a problem today for insects in the habitats that remain. However, agricultural expansion has been cited as a threat to three species in the Prairie Ecozone: Macropis Cuckoo Bee (*Epeoloides pilosula*), Dakota Skipper (*Hesperia dacotae*), and Greenish-white Grasshopper (*Hypochlora alba*). Moreover, the decline of many of the butterflies in the prairies, or the shrinkage in range back from Manitoba to Alberta, is likely due to this effect. Species

such as Edwards' Fritillary (*Speyeria edwardsii*) and Regal Fritillary (*S. idalia*), which are strong, wide-ranging fliers, may wander out of suitable patches of native prairie to nectar on grazing lands where suitable host plants and habitat are not available. For this reason, larger butterflies seem to have been affected more than smaller butterflies.

Recreational activities can have a variety of impacts on species at risk. For example, ATV traffic and trampling were recorded as threats to Dakota Skipper (*Hesperia dacotae*), Aweme Borer Moth (*Papaipema aweme*), and Gold-edged Gem (*Schinia avemensis*).

The planting of non-native grasses such as smooth brome grass (*Bromus inermis* Leyss.) and crested wheat grass (*Agropyron cristatum* (L.) Gaetn.), and their subsequent management with pesticides, has been noted as a threat to three species: Gibson's Big Sand Tiger Beetle (*Cicindela formosa gibsoni*), Monarch (*Danaus plexippus*), and Aweme Borer Moth (*Papaipema aweme*). The non-native grasses have the capacity to increase the rate of infilling of open sandy areas and may compete with native plant species upon which native insect biodiversity depends. These planted grasses, along with other accidentally introduced invasive grasses, may be included in another category of threat, that of invasive dryland plants generally and their control with herbicides to reduce dominance in natural habitats. The deleterious effects of herbicide applications are not well documented, but herbicides often eliminate nectar sources required by butterflies. The threat to three butterflies, Dakota Skipper (*Hesperia dacotae*), Ottoo Skipper (*Hesperia ottoo*), and Poweshiek Skipperling (*Oarisma poweshiek*), with the displacement of an essential diversity in native vegetation by leafy spurge (*Euphorbia esula*), is considered to be very real, especially regarding the Ottoo Skipper in Spruce Woods Provincial Park in Manitoba. Dakota Skipper was eliminated from at least one site in North Dakota as a direct result of invasion of leafy spurge (Royer and Royer 1997).

Other threats involve only a few of the 27 species in Table 2. A carabid beetle (*Bembidion lachnophoroides*), the Macropis Cuckoo Bee (*Epeoloides pilosula*), and the Monarch are the only species for which urban expansion is listed as a threat. Additional water regulation along the Milk River has likely changed flood plants to the detriment of Weidemeyer's Admiral (*Limenitis weidemeyerii*), but the impacts of water regulation on insect faunas of other prairie rivers, although likely substantial, are poorly documented.

Although invasive predators account for a substantial risk in other groups of organisms, few examples have come to light in insects, although many likely exist. The one that is relevant and gaining notice in the prairie region is the threat of alien and escaped Lady Beetles, such as the Asian Lady Beetle (*Axyridis harmonia* (Pallas)), and their diseases, to the native Nine-spotted Lady Beetle (*Coccinella novemnotata*). The invasive alien species were introduced to control aphids in commercial greenhouses.

The Monarch (*Danaus plexippus*) is the only species for which agricultural pesticides are listed as a current threat, and, considering the wandering nature of these butterflies through agricultural landscapes, exposure to pesticides is not surprising. However, pesticide drift from agricultural land may be responsible for substantial declines of other insects in natural habitats as well. The Monarch is also the only species for which documented threats involve areas outside Canada. Monarchs are threatened by logging on their wintering grounds in the remaining patches of fir forests in Mexico, where predation is also an increasing problem.

In only one species has pathogen spillover, in this case from non-native commercial bees (used for pollination in greenhouses), been identified as a threat: Ashton's Bumble Bee (*Bombus ashtoni*). However, a number of bees in other parts of Canada are believed to be at risk for the same reason.

The major threats to insects in the prairie region are different from those experienced across Canada as a whole (Catling *et al.* 2009), where urban and agricultural expansion, alien invasive plants, and pollution are at the top of the list.

### How Many Insects Are Really at Risk in the Prairie Ecozone?

In the relatively well-studied butterflies, of which there are 270 resident Canadian species (30 of the known 300 species are migrants; Layberry *et al.* 1998; Hall 2009), 19 species (6.3%) are considered to be at risk from the COSEWIC evaluation (Catling *et al.* 2009). To the extent that butterflies are an indicator group that has been systematically covered by COSEWIC, this percentage is likely representative of other terrestrial plant-eating insects. However, this figure is probably best treated as a minimum because insects in other habitats may be exposed to more serious threats, such as aquatic habitats influenced by pollution

#### Prairie Species of Global Concern

Some prairie species are of global conservation concern, including six insects in Canada's prairie region (Cannings *et al.* 2005) that have been identified on the basis of global ranks developed for a few insect groups; included are five butterflies and one dragonfly (see Table 4). Of most concern is the Powesheik Skipperling (*Oarisma poweshiek*). Remarkably, this resident butterfly was discovered in Canada as recently as 1985 (Catling and Lafontaine 1986), suggesting that new, rare, and endangered insects can still be found in Canada; several other new Canadian butterflies have been discovered since then.

**Table 4.** Insects of the Canadian prairie region that are of global conservation concern based on global ranks developed for a few insect groups (Cannings *et al.* 2005). Abbreviations: G2 = imperilled; G3 = vulnerable; G4 = apparently secure; MB = Manitoba; SK = Saskatchewan; ON = Ontario; QC = Quebec.

Common Name	Scientific Name	Order	Global Rank	Province/Territory
Powesheik Skipperling	<i>Oarisma poweshiek</i> (Parker)	Lepidoptera	G2	MB
Dakota Skipper	<i>Hesperia dacotae</i> (Skinner)	Lepidoptera	G2 G3	MB, SK
Regal Fritillary	<i>Speyeria idalia</i> (Drury)	Lepidoptera	G3	MB, ON, SK
Mottled Duskywing	<i>Erynnis martialis</i> (Scudder)	Lepidoptera	G3 G4	MB, ON, QC
Ottoo Skipper	<i>Hesperia ottoe</i> W. H. Edwards	Lepidoptera	G3 G4	MB, SK
Elusive Clubtail	<i>Stylurus notatus</i> (Rambur)	Odonata	G3	MB, ON, QC, SK

and soil influenced by European earthworms. Accepting that the butterflies are a reasonable indicator group, and considering that there are 30,000 described insects in Canada and that at least a third of them, that is, 10,000 species, occupy the Prairie Ecozone on the basis of distributions of species in well-known groups, it may be estimated that 720 insect species are at risk in the prairie region. Because aquatic habitats are particularly susceptible in the Prairie Ecozone, the number of at-risk insects may be much higher. Another consideration that vastly elevates the number is that 30,000 undescribed species of insects are estimated to exist in Canada, essentially doubling the number of at-risk insects. Thus, an estimate of 1,500 insects at risk in the prairie region is not unreasonable.

The preceding observations often cause people to suggest that this is reason enough to abandon a species approach and just protect habitats, but a viable solution is not simple. Loss of habitat is often only one of many threats. Protecting species requires an understanding of specific aspects of ecology (Catling *et al.* 2009). Putting a fence around an area is not enough. Many threats, such as invasive aliens, exist beyond the level of local habitat or even the ecosystem and require broad-scale solutions such as biocontrol. Fortunately, focusing on an individual species helps scientists and conservationists to understand important ecological processes and habitat requirements, which leads to the often inadvertent protection of many other species with similar requirements. Protecting Soapweed (*Yucca glauca*) has led to the protection of at least four dependent insects, only one of which is included in the impressive “Draft Recovery Plan for Soapweed and Yucca Moth in Alberta 2000–2006” (Alberta Soapweed and Yucca Moth Recovery Team 2006). Protecting the habitat alone would not necessarily have done that.

### Are There Any Trends?

Apart from the decline of open sandy areas, which is affecting many species, it is hard to discern recent trends in insect populations in the prairie grasslands region of western Canada. Despite this difficulty, a few observations are worth mentioning. First, declines of the Poweshiek Skipperling in the Midwestern United States occurred on the southern edge

#### **Rapid Decline of Poweshiek Skipperling**

Information on status can change rapidly. The information available from General Status ranking can be 5 years old and that from the Committee on the Status of Endangered Wildlife in Canada status reports can be up to 10 years old. Thus, at any time, status may not be as reported, although the monitoring of some species does allow a current evaluation. A distressing case of recent rapid decline (C. Hamel, Nature Conservancy of Canada, pers. comm.) is that of the Poweshiek Skipperling, a prairie butterfly known in Canada only from a small region of southern Manitoba. The number of these butterflies recorded in Manitoba surveys over the past few years has declined from over 200 in 2008 to 13 in 2010 (Westwood 2010). As well, there have been significant decreases in 2008 and 2009 in Minnesota, North and South Dakota, and Iowa and, in 2010, this species was absent from most survey sites in the United States and is believed extirpated in some of these sites. It is always more alarming when the reasons for rapid declines, such as this one, are not well understood.



of the range (Swengel 2008). This trend appears to be continuing now in Canada, as the species has had declines in recent years in its limited Canadian grassland distribution.

The other interesting observation is that three widespread prairie species seem to be declining in the eastern part of their prairie range in Manitoba, but not farther west. If this is so, the explanation may be of great interest. Ridings' Satyr (*Neominois ridingsii*) is now extirpated in Manitoba, and the Uncas Skipper (*Hesperia uncas*) is listed as endangered. Edward's Fritillary (*Speyeria edwardsii*) also appears to have disappeared from the eastern part of its prairie range, where suitable habitat is now more fractured, and now exists in the Canadian prairies in southeastern Alberta and southwestern Saskatchewan, where extensive suitable habitat still remains.

### What Is Next?

Insect protection in the grassland prairie region of Canada has largely depended on efforts of the federal and provincial governments under wildlife legislation and designated protected areas within the jurisdiction of these two levels of government. For protection to be most effective in the future, it will be necessary to extensively engage landowners and non-governmental organizations, such as Nature Conservancy of Canada, as well as to highlight the specific requirements of insects at risk.

Although the information presented here clearly indicates that a new level of understanding of the threat to insect diversity has been reached, it is less clear that there will be appropriate funding and programs and research to carry out the necessary actions. Volunteer groups (park friends), universities, and naturalist organizations can all play an important role and may also be able to help leverage the necessary support.

A major hindrance to protection of endangered species is the time it takes between recognition that a species may be in trouble and when it is actually protected. In a number of cases, such as the Ridings' Satyr in Manitoba, the species was gone before any legislation comes into effect to provide the profile, programs, and recovery actions that are needed to save it (Klassen *et al.* 1989).

As well, certain key habitats have been overlooked pertaining to species at risk. Badlands in the prairie region have often not been well served with monitoring programs, and thus little is known of the insects in this dryland habitat, including species distributions and life histories.

Although some arthropods have some protection through legislation and protected areas, all insects in the prairie region are heavily dependent on human uses of their habitats in the form of agricultural management practices such as pesticide spraying, crop rotations, and set asides for land renewal. All of this habitat use is particularly important for soil-inhabiting insects, about which we know so little. It is critical that agricultural practices over time encourage the health of prairie insects and that governments encourage farmers to use such practices. Although insects are useful indicators, they are far more useful as a vital functioning component of ecosystems upon which so many other species depend.

A final area of concern for insect protection is ensuring that we maintain a highly trained cadre of insect specialists, including taxonomists and ecologists, to monitor and study species in Canada. The number of taxonomists in this field has declined in the last decades. Universities will need to continue their systematics and ecology training programs to produce graduates capable of managing Earth's biodiversity. Equally important, governments and museums must reinvigorate employment of taxonomists to continue building our knowledge of Canadian insects and arachnids. After all, we have done only

about half the job of naming and identifying Canadian insects. Additionally, all of the data used in insect studies in Canada should be digitized, standardized, collected, and accessible through appropriate databases and web mechanisms to aid in future research (Expert Panel on Biodiversity Science 2010).

Even more than this will be required. We need better informed public school teachers and parents to get our children back into nature. We need children who are fascinated by and respectful of the natural world—children who are not afraid of anything that has more than four legs. We need the world to know that plants, birds, and mammals (including humans) need insects—badly!

The truth is that protecting insects is part of a much bigger picture of human relationships with life on our planet.

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## Appendix 1

### Some Notes on Prairie Butterflies at Risk

Butterflies are the best known and most popular of insects and so it is appropriate to consider them in more detail. As may be expected, almost all legislative activity to date protecting insects in the prairie region has focused on this group. Fourteen butterfly species found in Canada that occur only in the prairie grasslands region and its extensions have some level of protection assigned to them by national, and in some cases provincial, legislation (Hall 2009). A few other species at risk in the prairie region also occur in the east (Table 1). The 14 species at risk that are confined to the prairie region are mostly dependent on grassland habitats and are described in detail in Layberry *et al.* (1998).

The Dakota Skipper (*Hesperia dacotae*) and the Poweshiek Skipperling (*Oarisma poweshiek*) are the only two species found in Canada that are ranked critically imperilled, or the equivalent, by four assessment systems: COSEWIC, *Wild Species 2005* (CESCC

2006), NatureServe Canada, and the Red List of the Xerces Society. The Dakota Skipper is the only Canadian butterfly species listed as endangered by the International Union for Conservation of Nature. Note that a recent survey of southwestern Manitoba and southern Saskatchewan by Reginald Webster turned up both of these species in new locations associated with pasture land. However, these species are still mainly restricted to tallgrass prairie habitat and are presently listed as endangered under Manitoba's *Endangered Species Act* (Webster 2003; Environment Canada 2007).

Of the remaining species, six are also skippers from several subfamilies. Like the Dakota Skipper, the Ottoe Skipper (*Hesperia ottoe*) and the Pahaska Skipper (*Hesperia pahaska*) are members of the Branded Skippers genus. These two are given a "may be at risk" ranking by *Wild Species 2005* (CESCC 2006). The Ottoe Skipper has a wide range in the United States but is established in Canada only in southern Manitoba. It is found in areas with native grasses (the larval food plants) and appears to be becoming rarer. It is listed as threatened under provincial legislation. The Pahaska Skipper is a species of shortgrass prairie and open pine forests. It is considered extremely rare in southern Saskatchewan and one old record exists from Manitoba.

The Oslar's Roadside Skipper (*Amblyscirtes oslari* (Skinner) and Simius Roadside Skipper (*Notamblyscirtes simius* (W. H. Edwards)), as well as the Small Checkered Skipper (*Pyrgus scriptura*), require shortgrass prairie in Saskatchewan and Alberta. They are all very rare in Canada and restricted to shortgrass prairie habitats (Bird *et al.* 1995).

One final at-risk skipper that requires dryland habitat has only recently been discovered in Canada. Strecker's Giant Skipper (*Megathymus streckeri*) feeds on several members of the yucca family as a caterpillar. Larvae were found on a yucca in the Milk River region of southern Alberta that emerged as adults of this butterfly. The species has not yet been assigned a conservation status ranking but, like its food plant, it, too, will require protection and is now a high-priority candidate for listing by COSEWIC.

Five non-skipper species also require some form of protection in the prairie region. The only prairie population of the Mormon Metalmark (*Apodemia mormo*), located in the Val Marie area of Saskatchewan close to the United States border, was assessed as threatened by COSEWIC. Edward's Fritillary (*Speyeria edwardsii*) was historically found across the southern prairie provinces. It has since disappeared from sites in Manitoba despite still having some suitable habitat left. The remnant habitat is conjectured to be too small to sustain the species permanently in Manitoba.

A species of poplar and willow habitats in the Milk River Valley, Weidemeyer's Admiral (*Limnitis weidemeyerii*), is at the extreme northern edge of its western United States range in Canada. The Rocky Mountain Dotted Blue (*Euphilotes ancilla* (Barnes & McDunnough)) is a common butterfly in the western United States, occupying dry prairies and sagebrush. It is considered rare and a candidate species by COSEWIC in southern Saskatchewan and Alberta. Pike's Old World Swallowtail (*Papilio machaon pikei*) is a subspecies found only in the Peace River grassland region of northern Alberta and British Columbia (Bird *et al.* 1995). This butterfly is another candidate for consideration by COSEWIC because of its restricted distribution.

Two other nationally unranked species in Canada's grassland regions should be monitored carefully. Ridings' Satyr (*Neominois ridingsii*), although still locally common in Alberta and Saskatchewan, has disappeared from Manitoba where it was once common. The Regal Fritillary (*Speyeria idalia*) is an uncommon resident of tallgrass prairie in North America, but has not been assessed because there has been only one recent observation of a stray in Saskatchewan of this large and conspicuous species.

The Monarch (*Danaus plexippus*) is a butterfly species found in the prairie region that has a COSEWIC designation of special concern and is globally considered vulnerable because of its unique and dramatic annual migration. Its breeding range across Canada also includes native grasslands where its larval food plants, *Asclepias* spp., are found. Numbers of Monarchs returning to Canada to breed from their overwintering grounds in Mexico and California can fluctuate dramatically from year to year. However, until now, they have been able to rebound quickly following bad years of population losses caused mainly from inclement weather conditions. Most of the problem facing the Monarch is the result of habitat loss in their Oyamel Fir roosting sites in a few high valleys in central Mexico. However, the governments of Canada, the United States, and Mexico are co-operating to introduce measures to better protect this species. Under SARA, the Monarch was designated a species of special concern, which requires the development of a management plan for its protection.