

Sentinels on the Wing

The Status and Conservation of
Butterflies in Canada



Peter W. Hall



NatureServe
Canada

A Network Connecting Science With Conservation
Un Réseau pour la Science et la Conservation

Foreword

In Canada, our ties to the land are strong and deep. Whether we have viewed the coasts of British Columbia or Cape Breton, experienced the beauty of the Arctic tundra, paddled on rivers through our sweeping boreal forests, heard the wind in the prairies, watched caribou swim the rivers of northern Labrador, or searched for song birds in the hardwood forests of south eastern Canada, we all call Canada our home and native land.

Perhaps because Canada's landscapes are extensive and cover a broad range of diverse natural systems, it is easy for us to assume the health of our important natural spaces and the species they contain. Our country seems so vast compared to the number of Canadians that it is difficult for us to imagine humans could have any lasting effect on nature. Yet emerging science demonstrates that our natural systems and the species they contain are increasingly at risk. While the story is by no means complete, key indicator species demonstrate that Canada's natural legacy is under pressure from a number of sources, such as the conversion of lands for human uses, the release of toxic chemicals, the introduction of new, invasive species or the further spread of natural pests, and a rapidly changing climate. These changes are hitting home and, with the globalization and expansion of human activities, it is clear the pace of change is accelerating.

While their flights of fancy may seem insignificant, butterflies are sentinels or early indicators of this change, and can act as important messengers to raise awareness. Based on current evidence, and on a review of this evidence by a range of national and international experts, this report aims to provide an overview of the status of butterflies in Canada. Peter Hall has been the steward of this synthesis and a champion for butterfly conservation. NatureServe Canada gratefully acknowledges his efforts and firmly supports his conviction that the status of butterflies in Canada needs to be shared. Butterflies cannot serve as messengers unless we give them a voice.

NatureServe Canada is a network of conservation data centres housed within provincial and territorial agencies across Canada and coordinated through a national office. The network is a steward of accessible, comparable, high quality data based on scientific methods, data used to inform conservation actions and policy, program and operational decisions. Beyond this, our role is to highlight the importance of long-term monitoring and survey programs that create this data in the first place. As an example, this report recommends expanding monitoring efforts for butterflies across Canada. Although butterfly data holdings found with NatureServe Canada and elsewhere have grown, Canada's data need further development. To address this, one member program of NatureServe Canada, the Atlantic Canada Conservation Data Centre, is developing an atlas that will target butterfly and other insect species in the maritime provinces. Perhaps a national program is possible. Such high-quality, accessible and comparable data is critical to guide butterfly conservation programs, to support species status and trend assessments, and to provide a foundation for the legal protection of any butterflies at risk.

It is my conviction that to understand what is happening to the natural legacy of our country, we need to expand our efforts to collect and share information about butterflies and other species as basic infrastructure for a green and sustainable economy. Good policy and program decisions to sustain our natural legacy should be built on reliable knowledge. It is our hope that as you read through this report, your appreciation of the importance of conservation science and information management will grow as will your commitment to butterfly conservation efforts in Canada.

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Executive Director
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NatureServe Canada contributes to the conservation of Canada's biodiversity by providing scientific data and expertise about species and ecosystems to support decision-making, research and education.

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A report of this kind necessarily depends heavily on the cooperation and collaboration of many people.

First, I would like to thank the contributing authors who supplied case studies of particular butterflies that so eloquently tell the story of how certain keynote species, representing the problems and opportunities facing this country's butterflies, are faring. These contributors are Jeff Crolla, Don Davis, Denis Doucet, Jessica Grealey, Jennifer Heron and Don Lafontaine.

As well, I would like to recognize the contributions made by John Acorn, Bob Bowles, Paul Catling, Cris Guppy, John Fowler, Louis Handfield, Ross Layberry, Anna Leighton and Jim Troubridge who were willing to share their expertise and knowledge concerning butterflies.

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Even with the help of all those named above, there are probably still some errors in this report which are entirely the responsibility of the author as are all opinions expressed in this report.

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Executive Summary



The Gorgone Checkerspot is a species mainly of western North America, but with a few ephemeral populations in eastern Ontario where its adopted larval foodplant, Black-eyed Susan, is common.

Conservation-minded individuals and organizations have become aware recently that some of Canada's butterflies have vanished from known sites and that certain species are becoming harder to find. On the other hand, some butterfly species have been expanding their numbers and distribution, especially to the north. What has also been noted is that these changes to our butterfly populations are the direct result of human activities.

Knowledge of butterfly losses and increases in Canada has generated databases, reports and publications on butterfly populations and their conservation status at the local, provincial and regional levels. This has, in turn, spawned national and provincial/territorial lists with butterfly conservation rankings by organizations such as NatureServe Canada, the National General Status Working Group and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Although these ranking activities give insight into how Canada's butterfly populations are faring, there are still many outstanding issues and questions. Which species are nationally declining, which are increasing? Why are some species faring poorly while others are flourishing? What are the factors influencing the status and trends of butterfly populations in Canada? How are the ecosystems that support butterflies faring? What needs to be done to better encourage and protect our butterflies?

This report is a compilation and analysis of the amassed knowledge available on the status of Canada's butterflies with a focus on their conservation. It recommends actions and activities to better conserve and foster Canadian butterflies, and how governments, organizations, scientists and citizens can get even more involved in these activities for the future.

MAJOR FINDINGS

- A large number of factors affect butterfly numbers in Canada, including: habitat loss and degradation; habitat protection and wildlife gardening; transportation activities; pesticide use; invasive species; climate change; natural losses (species interactions and natural events); observing, collecting, and other exploitation activities; and legislation and regulations.
- Canada's richest areas of butterfly species lie in the south, particularly southern British Columbia, southern Manitoba and southern Ontario.
- Most of Canada's at risk butterflies are highly localized species found close to the United States border where urbanization, land development and agriculture are most intense.
- Of the 300 species of butterflies recorded in Canada, only 205 are listed nationally as "secure". Reviewed another way, close to one-third of Canadian butterfly species are believed to be at some level of risk.
- A total of 18 species or subspecies of Canadian butterflies have been placed on the Committee on the Status of Endangered Species in Canada (COSEWIC) Canadian species of concern list since 2000 and all are now protected under the federal Species at Risk Act (SARA). In addition, another 19 species are on a candidate list for consideration for future protection by COSEWIC.
- While most provinces have some form of endangered species act, only four provinces in Canada (Ontario, Manitoba, Alberta and New Brunswick) protect certain butterfly species under legislation.
- The five species of butterflies in Canada considered as endemic (found only in this country) are all assessed as being at some level of risk.
- There are 23 species of butterflies in Canada that are considered to be globally at some level of risk according to NatureServe Canada.
- The Monarch (*Danaus plexippus*) is a species that carries COSEWIC's designation of

Special Concern and is globally considered vulnerable because of its unique and dramatic annual migration and its vulnerability in its overwintering sites in Mexico and California.

- The conservation hot spots for butterflies in Canada with large numbers of species at some level of risk nationally are southern British Columbia (21 species), the Ontario Carolinian forest (13 species), the prairie grasslands (12 species), the Yukon Beringian refugium (8 species), and the Maritime salt marshes (3 species).
- Three species/subspecies that were formerly resident in the Canadian Carolinian zone no longer exist there.
- Some butterfly species have had the capacity to adopt non-native plant species as larval hostplants, or to move from native open areas into light agricultural areas and their numbers have increased overall.
- Four European butterfly species have been accidentally introduced into Canada in the last century and a half and are now permanent residents.

BUTTERFLIES ENDEMIC TO CANADA



Left: upperside; Right: underside
(photos by John Fowler)

RECOMMENDATIONS

RESEARCH

- Support research for those butterfly species for which there are gaps or inconsistencies in the knowledge of their life histories and taxonomy.
- Continue to carry out fieldwork on butterfly distributions in Canada and ensure results are deposited in long-term databases such as those maintained on the Canadian Biodiversity Information Facility (CBIF) website and by NatureServe Canada's Conservation Data Centres. Ensure data are readily available to support and focus future research.
- Increase the number of scientific studies on butterflies known to be at risk from climate change and make all resulting data available to specialists in other disciplines, such as conservationists, climatologists and distribution modelers, for work on climate change.

MONITORING AND ASSESSMENT

- Those butterfly species potentially at some level of risk in the future or that could be harmful aliens should be monitored in the field by the appropriate organizations.
- Develop a consensus list of Canadian butterfly and other species at risk at the national and sub-national levels based on scientific facts and work with international organizations to develop global lists.
- Formalize butterfly and other species ranking activities with appropriate funding as soon as possible. Where necessary, follow through with timely development of strategic plans for species preservation.

SPECIES PROTECTION

- All provinces and territories should enact appropriate legislation for species at risk that will be used to protect butterflies of special concern in those jurisdictions.
- Adopt the recommendations from the two Monarch preservation plans for Canada and North America as soon as they are completed. Specifically, review provincial and municipal weed control legislation to ensure the preservation of the larval foodplant milkweed species.
- Base any protective legislation on scientific facts and avoid blanket restrictions on collecting for scientific purposes. In addition, do not make applications for scientific work on potential species at risk so onerous that scientists will avoid making such applications.
- Encourage protection for Canadian populations of butterfly species that are becoming at risk in the United States.

HABITAT PROTECTION/ENHANCEMENT

- Set aside, protect and enhance where necessary as much area in these vulnerable ecosystems and butterfly hotspots as possible.
- Review the viability of protected areas in vulnerable ecosystems or butterfly hotspots and make the necessary adjustments to ensure continued preservation of species that may alter their distributions over time with climate change.
- Continue to be vigilant in preventing alien invasive species from entering this country and move as quickly as possible to eradicate weedy invasives when they first get established in Canada. Support implementation of an Alien Invasive Species Strategy for Canada, considering butterflies as key indicators of pernicious weedy invasives.
- Ensure conservation strategies protect areas where vulnerable butterfly species are resident and where lands are actively managed for other uses and build habitat corridors between nearby protected areas for species to intermingle and expand their genetic base.
- Continue to preserve and protect existing railway rights-of-way as species corridors and protect and enhance where possible the production of native plants in these rights-of-way. These areas should also be monitored regularly for possible invasive plants and animals.
- Individuals and organizations should be encouraged to adopt wildlife gardening techniques and approaches on their properties as a means to create butterfly habitat.
- Make blanket spraying of pesticides illegal.

EDUCATION AND AWARENESS

- Promote and support public butterfly education activities such as wildlife and butterfly festivals and publicize butterfly and wildlife gardening efforts wherever possible.
- Develop curriculum for schools in Canada that are drawn from studies on climate change and its effects on butterfly populations and develop media guidelines to explain the links between butterfly conservation and climate change.
- Educate the public on the impact of certain human activities that will negatively affect butterfly populations and health.



TOP LEFT: European Common Blue - Peter Hall
TOP CENTRE: Maritime Copper - Denis Doucet
TOP RIGHT: Taylor's Checkerspot - Jennifer Heron
BOTTOM RIGHT: Juniper Hairstreak - Peter Hall
BOTTOM LEFT: Monarch larva - Peter Hall

Introduction

OVERVIEW OF CANADIAN BUTTERFLIES AND KNOWLEDGE OF THEIR STATUS

Butterflies are probably the most charismatic of the world's invertebrates. With their colourful wings and day-flying habits, they are readily noticed and appreciated by the public. Next to mammals and birds, butterflies have attracted the most attention of observers who have amassed considerable data and knowledge of their distribution, numbers and behaviour.

The vast majority of the world's butterflies live in the tropics with fewer species occurring towards the poles. Canada is the second largest country in the world, but contains only 300 of the estimated 18,000 butterfly species globally. A large number of Canadian butterflies are also found more widely distributed in other parts of the world (see Table 1). However, what is lacking in species numbers is made up in individual butterfly populations, and by the knowledge we have of them through years of study. Much is now known about the distribution and abundance of Canadian butterflies thanks to specialists working in many parts of the country, even in the remote north. Butterflies, because of this knowledge base, can act as a bellwether for scientists to determine if a habitat is under threat.

Canada is the second largest country in the world, but contains only 300 of the estimated 18,000 butterfly species globally.

The number of species recognized in Canada varies among butterfly specialists depending on their taxonomic views. Certain isolated, distinctive-looking butterfly populations are regarded as separate species by some authorities, while others view them as distinctive geographical forms of species usually called subspecies.

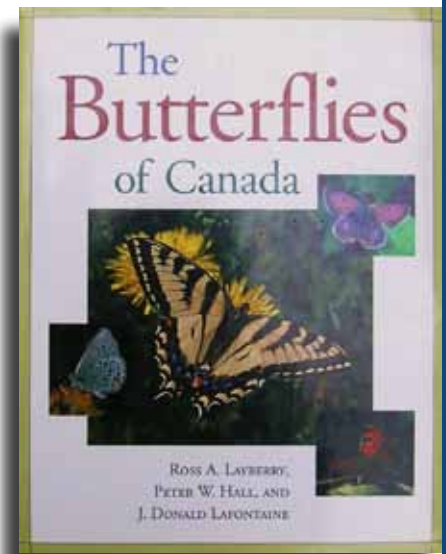
Many provincial butterfly books are available which give specific details of the distribution, behaviour and habitats of their butterfly fauna (see Further Reading). In 1998, the first comprehensive account of all Canadian butterflies, *The Butterflies of Canada* (Layberry et al., 1998), was published. All common

names used in this report are from *The Butterflies of Canada*. All scientific names used in the report are from the *Catalogue of the Butterflies of the United States and Canada*, a recent revision of butterfly taxonomy for North America by Jon Pelham (Pelham, 2008). The Pelham list contains about 50 scientific name changes from those used in *The Butterflies of Canada*. These differences are noted in Appendix A. Only one species in this report differs from the Pelham list and that is the Maritime Ringlet (see page 15 for explanation).

The distribution maps in *The Butterflies of Canada* were based on data assembled by individuals and often stored on labels in collections across the country. At present, many of these data are now available on the Canadian Biodiversity Information Facility (CBIF) website (www.cbif.gc.ca) through an updated database of 300,000 butterfly specimens from about 120,000 locations across the country. The data have been made available by 43 Canadian collection and observer providers.

Additional information on Canadian butterflies is also available through NatureServe's online encyclopedia of life (www.natureserve.org/explorer).

Conservation-minded individuals and organizations have also become aware in recent times that some of Canada's butterflies appear to have vanished from known sites. This is particularly true of the more highly localized species found close to the United States border where urbanization, land development and agriculture are most intense. On the other hand, some butterfly species have been expanding their numbers



The Butterflies of Canada, published in 1998, was the first comprehensive guide to all the butterfly species in Canada.

TABLE 1
GLOBAL DISTRIBUTION OF CANADIAN BUTTERFLIES

Distribution	Number	Percentage
Endemic to Canada	5	1.7
North America (incl. temperate Mexico)	214	71.3
Western Hemisphere (incl. tropical America)	39	13.0
Holarctic (2 or 3 northern continents)	39	13.0
Most continents (at least 4)	3	1.0
Total Canadian species	300	100.0

and distribution, especially to the north. This collected knowledge of losses and increases has led to the establishment of databases, reports and publications at the local, provincial and regional levels bearing on butterfly populations and their conservation status. This, in turn, has fostered global, national and provincial/territorial assessments of butterflies into conservation status ranks by organizations such as NatureServe, NatureServe Canada network of Conservation Centres, the National General Status Working Group and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Conservation status ranks give an insight into how Canada's butterfly populations are faring. Of the 300 species of butterflies recorded in Canada, only 204 or 68% are listed nationally as secure under General Status 2009 (CESCC, 2009). Ninety-six species or 32% of Canadian butterfly species are believed to be at some level of risk. Internationally, Canada has a role to play for conserving the 23 butterflies at risk globally (NatureServe 2009).

There are also many individuals and organizations that have been concerned with the welfare of Canadian butterflies, either directly or as part of larger conservation efforts. Butterfly education events, such as the Mariposa Butterfly Festival in Orillia, Ontario that started in 2007, are also being organized.

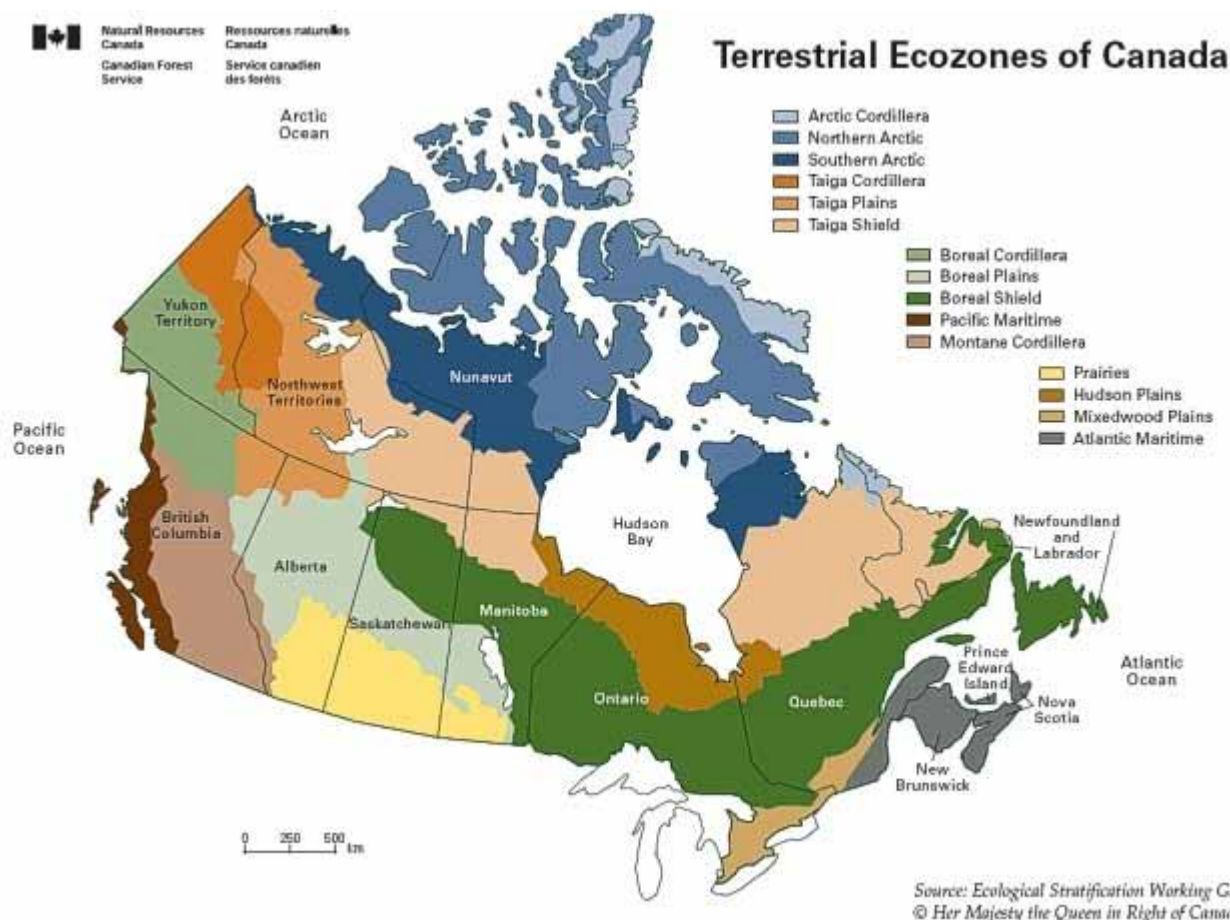
Regular butterfly counts are now conducted each year across the country as part of the North American Butterfly Association annual July 4 (July 1 in Canada) count. Environment Canada and Nature Canada are also planning on launching an Internet-based, citizen-science butterfly monitoring initiative. The Butterfly-Watch program will be part of the NatureWatch (www.naturewatch.ca) suite of protocols which engage Canadians in observing and reporting on ecological phenomena in their natural surroundings.

96 species or 32% of Canadian butterfly species are believed to be at some level of risk.

While these efforts raise awareness and are being used to enhance data on the health of our butterfly populations, there are still many outstanding issues and questions. Which species are continuing to decline, which are increasing? Why are some species faring poorly while others are flourishing? What are the factors influencing the status and trends of butterfly populations in Canada? How are the ecosystems that support butterflies faring? What needs to be done to better encourage and protect our butterflies?

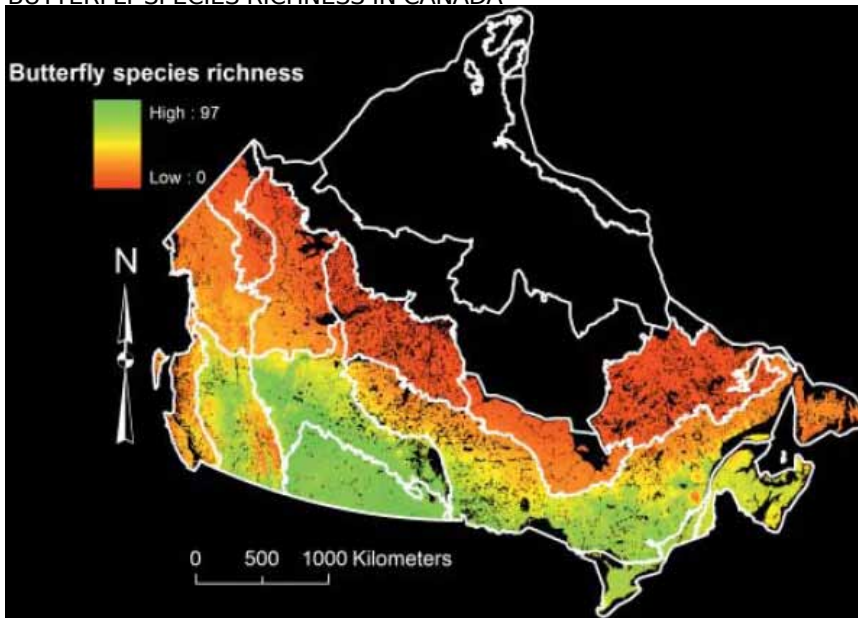
This report on the status and trends of Canadian butterflies compiles and analyzes the current knowledge available on the status of Canada's butterflies with a

FIGURE 1



NatureServe Canada, in conjunction with many partners, is working on a vegetation classification framework for Canada that will lead to new and more refined ecological maps.

FIGURE 2
BUTTERFLY SPECIES RICHNESS IN CANADA



Map showing butterfly species richness in the regions of Canada selected for the White and Kerr 2007 study. Although there are about 300 butterfly species present in Canada, 102 particularly well-collected species were chosen for this study. Gradients of butterfly species richness shown here are qualitatively similar to those discovered for other invertebrate, vertebrate and plant assemblages. / White and Kerr, 2007

focus on their conservation. The report makes recommendations for future activities to better conserve and promote Canadian butterflies, as well as how governments, organizations, scientists and citizens can get even more involved. It is not the intention of this report to give extensive details on individual species, subspecies, varieties or populations. There are many reports and books that provide these details which can be consulted for further study by interested parties (see References).

This report also contains important case studies of selected species which have a “story” to tell that illustrates the pressures or opportunities that are affecting butterflies in Canada.

CANADIAN BUTTERFLIES AND THEIR HABITAT NEEDS

Canada has a large number of natural ecozones, from the expansive arctic tundra and boreal forests stretching across the north to small regions of desert-like habitat in British Columbia and the Carolinian forests in Ontario. Canada’s butterfly species are present in all its ecozones and regions.

Many Canadian butterflies either have extensive ranges in large, northern ecozones, such as the boreal forest, or are non-specialists that can range across ecozones. The numbers of these butterflies appear to be secure or even expanding. Other smaller or less frequent ecoregions in Canada are coming under pressures that are having often detrimental impacts on the associated butterfly populations. Affected

populations of butterflies tend to be localized species whose habitats are endangered. Such deterioration of habitats affects all species within them, including localized plants that serve as food for butterfly larvae. Wetlands and prairies, in particular, have been much affected by landscape changes.

The number of species in an assemblage - called “species richness” - of Canadian butterflies varies as expected. The greatest butterfly species numbers are found in the south, particularly southern British Columbia, southern Manitoba and southern Ontario.

Fewer species occur farther north, with only six species found on Ellesmere Island (Layberry et al., 1998). The number of species is dependent on factors such as vegetation coverage and climatic conditions (Kerr, 2001). In addition to specific threats facing regionally or nationally endangered species, there are prevailing

disturbances affecting more widespread ecosystems that have caused local butterfly disappearances. Most of the pressures and disturbances causing negative changes to butterfly populations appear to be human-induced. Yet in other cases, some butterfly species have benefited from human activities and thrive in disturbed habitats.

SPECIES STATUS ASSESSMENT METHODS

Several international, national and provincial/territorial organizations have established criteria by which species can be assessed and assigned a conservation status rank. Ranks range from designations such as endangered or critically imperiled, to secure, or not at risk. Most evaluations also include a designation such as data deficient or undetermined to indicate that not enough is known about the species to assign a status. Assessment categories are based on criteria such as number of occurrences, population size, range, trends or threats.

The following are the Canadian organizations which have assessed the conservation status of butterflies in Canada:

- NatureServe Canada network of Conservation Data Centres, in conjunction with NatureServe, conduct a consistent and standardized method for evaluating the health and condition of species and ecological communities. Assessment leads to the designation of a conservation status

rank, which provides an estimate of extinction risk (Cannings et al., 2005). Conservation status ranks are developed within a geographic context of global, national, and provincial/territorial levels, and are assigned on a scale from one (critically imperiled) through five (secure). The conservation status ranks designated by staff within the NatureServe Canada network, as well as other information collected on species, are often the data source used for other ranking systems. In this report, the butterfly global assessments are those provided by NatureServe Canada (see Appendix B);

- Wild Species 2000 and subsequent updates compiled by the National General Status Working Group on behalf of the Canadian Endangered Species Conservation Council (CESCC) have assigned general status ranks for butterfly species in every province and territory, as well as established a general status rank for Canada. General status ranks range on a scale from one (at risk) to four (secure). The most recent butterfly rankings were done in 2008-09 and will officially be released in 2010 (CESCC, 2009). In this report, the butterfly national assessments are mainly those supplied by the National General Status Working Group and referred to as General Status 2009 (see Appendix B);
- The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses species for a national list of species at risk and makes recommendations to the federal Minister of the Environment for listing of these species under the Species at Risk Act (see Table 2). COSEWIC is the primary species assessment body in Canada; COSEWIC's work is informed to varying degrees by general status, and more directly by NatureServe Ranks. Some provincial governments in Canada have a similar committee which acts at the provincial level.

In addition to the Canadian bodies above, there are two international organizations that have butterfly conservation assessments that contain butterflies found in Canada. The Xerces Society was established to protect invertebrates and maintains a Red List aimed to help protect global invertebrates. There are 13 butterfly species found in Canada on this list. The World Conservation Union, formerly known as the International Union for the Conservation of Nature (IUCN), also has Red Lists for globally at risk species, but has only categorized one Canadian butterfly, the Dakota Skipper (*Hesperia dacotae*), as requiring protection.

OVERVIEW OF THE WILDLIFE PROTECTION PROCESS AND BUTTERFLIES IN CANADA

Eighteen species or subspecies of Canadian butterflies are now under the protection of the federal Species at Risk Act (SARA) since it came into force in June 2003 (Environment Canada, 2006). In some cases, specific populations are placed on the list even if populations in other parts of the country may not be at risk. In addition, another 19 species are on a COSEWIC candidate list for consideration of future protection under SARA. Specialists collect information regarding the status of a species or population and write a status report, which is evaluated by COSEWIC. If accepted, it is assigned a COSEWIC status designation and recommended to go to the federal Minister to be possibly listed under SARA.

18 species or subspecies of Canadian butterflies are now under the protection of the federal Species at Risk Act (SARA).

While most provinces have some form of endangered species act, only four provinces in Canada are actually protecting certain butterfly species under legislation. Currently, only 15 butterflies are protected under provincial legislation.

Most jurisdictions in Canada that have responsibility for designation of protected lands (parks, wildlife reserves, etc.) have some form of protection for the wildlife contained in those areas. This often takes the form of a prohibition against any form of collecting within the boundaries without a special permit. A number of rarer butterfly species benefit from this protection.

TABLE 2

CANADIAN BUTTERFLIES ASSESSED BY COSEWIC AND UNDER SARA PROTECTION

Common name	Scientific name	Population name	Historical occurrence range	Assessment date
EXTIRPATED				
Karner Blue	<i>Lycaeides melissa samuelis</i>		ON	May 2000
Frosted Elfin	<i>Callophrys irus</i>		ON	May 2000
Island Marble	<i>Euchloe ausinoides</i>		BC	May 2000
ENDANGERED				
Island Blue	<i>Plebejus saepiolus insulanus</i>		BC	Nov. 2000
Taylor's Checkerspot	<i>Euphydryas editha taylori</i>		BC	Nov. 2000
Eastern Persius Duskywing	<i>Erynnis persius persius</i>		ON	April 2006
Half-moon (Sooty) Hairstreak	<i>Satyrium semiluna</i>		BC, AB	April 2006
Mormon Metalmark	<i>Apodemia mormo</i>	southern mountain	BC	May 2003
Maritime Ringlet	<i>Coenonympha nipsisquit</i>		QC, NB	May 2005
Ottoe Skipper	<i>Hesperia ottoe</i>		MB	May 2005
THREATENED				
Behr's Hairstreak	<i>Satyrium behrii columbia</i>		BC	Nov. 2000
Mormon Metalmark	<i>Apodemia mormo</i>	prairie	SK	May 2003
Dakota Skipper	<i>Hesperia dacotae</i>		SK, MB	Nov. 2003
Dun Skipper	<i>Euphyes vestris</i>	western	BC	Nov. 2000
Poweshiek Skipperling	<i>Oarisma poweshiek</i>		MB	Nov. 2003
SPECIAL CONCERN				
Monarch	<i>Danaus plexippus</i>		All provinces	Nov. 2001
Sonora Skipper	<i>Polites sonora</i>		BC	April 2006
Weidemeyer's Admiral	<i>Limenitis weidemeyerii</i>		AB	May 2000

TABLE 2 CONTINUED

CANDIDATE BUTTERFLY LISTINGS BY COSEWIC (OCTOBER 2006)

Priority and common name	Scientific name	Distribution
HIGH PRIORITY		
Mottled Duskywing	<i>Erynnis martialis</i>	MB, ON
Strecker's Giant Skipper	<i>Megathymus streckeri</i>	AB
Mormon Fritillary	<i>Speyeria mormonia erinna</i>	BC
MID-PRIORITY		
Bernadette's Checkerspot	<i>Euphrdryas bernadetta</i>	AB, SK
Edith's Checkerspot	<i>Euphydryas editha hutchinsi</i>	AB, SK
LOW PRIORITY		
Moss's Elfin	<i>Callophrys mossii mossii</i>	BC
Hoffman's Checkerspot	<i>Chlosyne hoffmanni</i>	BC
Eastern Tailed Blue (BC population)	<i>Everes comyntas</i>	BC
Early Hairstreak	<i>Erora laeta</i>	ON, QC, NB, NS, PEI
Propertius Duskywing	<i>Erynnis propertius</i>	BC
Rocky Mountain Dotted Blue	<i>Euphilotes ancilla</i>	AB, SK
Blackmore's Blue	<i>Icarica icarioides blackmorei</i>	BC
Johnson's Hairstreak	<i>Callophrys johnsoni</i>	BC
Edith's Copper	<i>Lycaena editha</i>	BC, AB
White-veined Arctic (Gaspé population)	<i>Oeneis bore gaspeensis</i>	QC
Pike's Old World Swallowtail	<i>Papilio machaon pikei</i>	AB, BC
Sandhill Skipper	<i>Polites sabuleti</i>	BC
Great Basin Fritillary	<i>Speyeria egleis</i>	BC
Bremner's Zerene Fritillary	<i>Speyeria zerene bremnerii</i>	BC

The Status of Canada's Butterflies

GLOBAL STATUS: CANADIAN BUTTERFLIES OF GLOBAL CONCERN

From a global viewpoint, Canada has relatively few butterfly species recorded within its boundaries, despite its immense size. However, Canada's butterfly fauna is among the most monitored and studied in the world, especially in those areas where they may be most at risk.

According to NatureServe Canada, 23 butterfly species found in Canada are assessed as being extirpated to vulnerable on a global basis.

Endemism (a plant or animal restricted to a certain area – e.g., a country) is one measure of biodiversity richness and Canada, with its many immense ecosystems, its northern location, and its 5,000 kilometres of shared border with the United States, has few butterfly endemics. Canada appears to have five endemic butterfly species, although some of these have been disputed taxonomically. Whatever their taxonomic classification, they are legitimate candidates for conservation consideration. All Canadian endemic butterfly species are at some level of endangerment.

Three of these Canadian endemics occur in the Atlantic Provinces and are genuine relict species persisting

from the last glacial period which ended about 12,000 years ago. From a conservation point of view, the most critical of these species is the Maritime Ringlet (*Coenonympha nipisiquit*) (Webster, 2000). The recent Pelham taxonomic list of North American butterflies (Pelham, 2008) mistakenly names this species as a subspecies of the Common Ringlet (*Coenonympha tullia*). The Maritime Ringlet is now considered endangered by COSEWIC and is also listed as such under New Brunswick provincial legislation. It occurs in only a few salt marshes around the Baie-des-Chaleurs of Quebec and New Brunswick.

Although very similar in appearance to the Common Ringlet (*C. tullia*), the Maritime Ringlet is entirely restricted to this habitat and does not mix with the much more abundant Common Ringlet, even when they are found in proximity. The larvae feed only on Salt Meadow Cordgrass (*Spartina patens*). The restricted range and isolation along the coast make the Maritime Ringlet a very vulnerable species to natural disasters, such as large storms, climate change, and to direct human activities, in particular pesticide runoff from surrounding agricultural lands. Its prime habitat falls mainly within the city limits of Bathurst and Beresford, and is threatened by urban development demands along the coast. This species is also listed as globally critically imperiled (G1 conservation status rank) with NatureServe's conservation assessment.

While more widespread, another relict species, the Maritime Copper (*Lycaena dospassosi*), is also considered threatened at the global level. It is a resident of salt marshes along the Gulf of St. Lawrence coasts of Quebec, New Brunswick, Nova Scotia and Prince Edward Island. While similar in appearance to the Dorcas Copper (*Lycaena dorcas*), which exists in scattered and isolated populations in eastern Canada, and to the Purplish Copper (*Lycaena helloides*), which is found no farther east than southern Ontario, the Maritime Copper is now considered by many specialists to be a separate species. It occurs only in sites where its larval food plant, Egede's or Coast Silverweed (*Potentilla egedii*), exists. The Maritime Copper is designated as G2 status (imperiled) by NatureServe but has not been listed as a candidate species for COSEWIC evaluation. It can be common in some isolated habitats. (see case study - Maritime Copper)

The third Maritime regional endemic is far more widespread than the other two species. The Short-tailed Swallowtail (*Papilio brevicauda*) is a large, colourful species found in all the Atlantic Provinces and the Gaspé region of Quebec, as well as at Cartwright,

TABLE 3
BUTTERFLIES ENDEMIC TO CANADA

Short-tailed Swallowtail (<i>Papilio brevicauda</i>)	
Johansen's Sulphur (<i>Colias johanseni</i>)	
Maritime Copper (<i>Lycaena dospassosi</i>)	
Beringian Fritillary (<i>Boloria natazhati</i>)	
Maritime Ringlet (<i>Coenonympha nipisiquit</i>)	

Left: upperside; Right: underside
(photos by John Fowler)

Maritime Copper: widespread in Atlantic salt marshes



This salt marsh in Bathurst, New Brunswick, is home to several highly local butterfly species, including the Maritime Copper. / Photo by Denis Doucet



The Maritime Copper (*Lycaena dospassosi*) is one of only five species of butterfly endemic to Canada. Until relatively recently, it was believed to be a race of the Dorcas Copper (*Lycaena dorcas*). However, mostly due to field research by Louis Handfield in the Gaspé in Québec and by Reginald Webster in New Brunswick, it was clearly shown that the Maritime Copper is a distinct species living in salt marshes along the Gulf of St. Lawrence. Its larvae feed on a silverweed (*Potentilla egedii*). The adults feed mainly on the nectar of Sea Lavender (*Limonium nashii*).

As of 1997 (Layberry et al., 1998), this species was officially recorded only from the Gaspé Peninsula of Québec and the Acadian Peninsula of New Brunswick. However, following major efforts to better establish the status and full distribution of the endangered Maritime Ringlet (*Coenonympha nipisiquit*), many salt marshes along the coasts of the Gulf of St. Lawrence and Northumberland Strait were visited and surveyed for butterflies. The Maritime Copper was located in a significant proportion of these. It is now clear that the range of the Maritime Copper is much larger than previously believed.

While the Maritime Ringlet still seems to be restricted to a few marshes in north-eastern New Brunswick and the Gaspé, this is not the case with the Maritime Copper. In fact, as early as the summer of 1997, the Maritime Copper was located in additional marshes a fair distance outside its known range. That summer it was located near Bouctouche by Jim Edsall and Denis Doucet, at Cap Bimet near Shediac by Rose-Alma Mallet, and on the New Brunswick/Nova Scotia border by Jim Edsall, some 150 km south of its former known range. By 2001, Edsall located the butterfly at Tidnish, just across the border in Nova Scotia. That same summer, the Maritime Copper was found by Denise Lajeunesse in a survey of the butterflies of Prince Edward Island National Park. It was found in salt marshes along New London Bay near Cavendish. In New Brunswick, Reginald Webster and Jim Edsall visited 62 marshes along the east and north coasts of New Brunswick in 2005, mainly looking for the Maritime Ringlet, but they found the Copper in 35 of them. Between 2002 and 2006 on Prince Edward Island, the butterfly was collected in no fewer than six more sites by the Harding family and others. In 2006, during a two-day survey, Edsall and Doucet found the butterfly in 4 of 11 salt marshes visited in Nova Scotia along a 100-km stretch of coastline between Tidnish, Cumberland County and Tatamagouche, Colchester County.

During the summer of 2008, Denis Doucet visited 45 salt marshes along the entire Northumberland Strait coast of Nova Scotia between Tidnish and the Canso causeway, in an effort to further understand the distribution of salt marsh butterflies. While no signs of the Maritime Ringlet were found, the Maritime Copper was located in 11 marshes in that study. Interestingly, it appears to be restricted to marshes along the coast between the NB/NS border and Brulé (just east of Tatamagouche); however, it has not yet been looked for specifically in Cape Breton or along the Atlantic coast of Nova Scotia.

Denis Doucet, NatureServe Canada, Sackville, N.B.



The Beringian Fritillary is an Arctic species found in drier areas, including this rocky slope on Victoria Island, NWT / Photos by Jim Troubridge



Labrador, and on St. Pierre and Miquelon (islands belonging to France, south of Newfoundland). It ranges far inland within these areas and feeds on a variety of plants of the carrot family (Apiaceae), so it is sometimes even found in backyard gardens. While not considered threatened under COSEWIC, it does receive a G3G4 global ranking (vulnerable to apparently secure) from NatureServe. However, it might best be considered secure in its widespread range.

The other two endemic species in Canada are both from the far north. Johansen's Sulphur (*Colias johanseni*) is a coastal relict on the Arctic Ocean coastline (see case study - Johansen's Sulphur). Only rediscovered at Bernard Harbour, Nunavut and named in 1990, this species' distribution is still poorly known, and to date, has only been observed in a few arctic coastal locations around Coronation Gulf. Also, very little is known about either its behaviour, or its larval foodplant. Currently the species is assessed as a G1G3 (imperiled to vulnerable) global rank from NatureServe and a General Status 2009 Canadian rank of 2 (may be at risk). At such a remote location, it doesn't appear to be in imminent threat from human activity, but more research is critically important (Layberry et al., 1998).

The Beringian Fritillary (*Boloria nataszhati*) is a northern member of the Lesser Fritillary group and is known from widely scattered records in dry, rocky areas of the western Arctic, Yukon and northern British Columbia. It can be found in good numbers where it occurs and is globally designated as G3 (vulnerable) by NatureServe and as sensitive (3) by General Status 2009 for Canada. It, too, requires much more

research to determine its true population size (eventually it will probably be found in Alaska), distribution and larval foodplants.

Eighteen additional butterfly species in Canada have received ranks of global concern (Appendix B; Cannings et al., 2005) under NatureServe global assessments. All of these species are also found in the United States. While 10 of these North American species are considered by NatureServe to be vulnerable to apparently secure (G3G4) on a global basis, eight are more critically threatened in Canada, and should have protective measures in place in both Canada and the United States.

Three of these more critically threatened species are found only in the tall-grass prairie regions of North America. The Dakota Skipper (*Hesperia dacotae*) and the Poweshiek Skipperling (*Oarisma poweshiek*) are the only two species found in Canada that are ranked critically imperiled by all assessment systems, including the Red List of the Xerces Society. Less than 2% - about 50 km² - of tall-grass prairie habitat in North America remains intact (Environment Canada, 2007). The Dakota Skipper is also the only Canadian butterfly species listed as endangered by the World Conservation Union (IUCN). It should be noted that a recent survey of southwestern Manitoba and southern Saskatchewan by assessment consultant Reginald Webster turned up both these species in new locations associated with pastureland. However, they are still mainly restricted to tall-grass prairie habitat and both listed as endangered under Manitoba's Endangered Species Act (Webster, 2003). The Regal Fritillary (*Speyeria idalia*) is also a denizen of this habitat and is considered endangered in Canada because it occurs only sporadically in southern Manitoba and southern Saskatchewan and in grasslands in extreme southwestern Ontario. However, it appears now to be an accidental vagrant and there are no known resident populations to protect (Layberry et al., 1998).

Two other North American species, globally at risk and recorded in Canada only in extreme southern Ontario, were found in very different but threatened habitats. The Frosted Elfin (*Callophrys irus*) was formerly recorded in oak-pine woods in sandy areas in south-



The Duke's Skipper has become a species at risk throughout its eastern North American range.

Johansen's Sulphur : the rediscovery of a butterfly the Ice Age missed



Johansen's Sulphur was rediscovered on a hillside overlooking Bernard Harbour (above) on the arctic coast / Above photo by Jim Troubridge / Below photo by John Fowler



When the last Ice Age swept down through Canada more than 20,000 years ago, it wiped out almost all butterfly populations. As their ecosystems were slowly obliterated by mile-thick glaciers, the butterflies either died out or were forced farther south into what is now the United States. By 8000-10,000 years ago, when the Ice Age ended and the ice was melting back northward, most species now in Canada followed the ice north into the newly establishing habitats such as the boreal forest.

However, some species in unusual locations actually held on as the ice skirted round elevated patches of their habitat and isolated them; or, the hardy insects found new habitats that had been missed by the ice. These areas are called refugia and the surviving species are referred to as relicts. They are the oldest extant butterfly populations in Canada.

One of the most intriguing stories of a butterfly relict concerns Johansen's Sulphur (*Colias johanseni*). The range of this butterfly is very restricted. So far it has been found on only a few hillsides along the Canadian Arctic coast, near Bernard Harbour, Nunavut and in a few locations to the southwest, near Coppermine. A single specimen was discovered in 1916 by Fritz Johansen, a member of an arctic expedition. The specimen rested in the Canadian National Collection labelled as another, similar species known from the Rocky Mountains. After referring to Johansen's diary, Jim Troubridge and Kenelm Philip revisited Bernard Harbour and found more individuals of the species on the hillside location indicated by Johansen. They identified it as a new species, a Canadian endemic that appears to have survived the Ice Age in an Arctic Ocean coastline refuge.

A large question now looms about species like Johansen's Sulphur: Is this species now at risk, or is it perhaps benefitting from the rapidly altering conditions in the Canadian Arctic due to climate change? Further research is needed.

Don Lafontaine, Canadian National Collection of Insects, Agriculture and Agri-food Canada, Ottawa, ON.

western Ontario where its larval foodplant, lupines, grew abundantly. Due to increased shading from maturing pines, the lupines were eliminated and the butterfly has not been seen since 1988. The Frosted Elfin is now considered extirpated in Canada (Environment Canada, 2006). Duke's Skipper (*Euphyes dukesi*) is a butterfly of marshy areas in or near woodlands, and is also restricted in Canada to extreme southwestern Ontario. While this butterfly has always been highly localized throughout its North American range and some of its favoured sites have been lost to development, it has recently been found in roadside ditches

in its Canadian range. Hopefully, an expansion to this habitat will reduce its level of risk here (Lafontaine, 2006). However, its population should be carefully monitored.

A few other North American species with Nature-Serve global conservation status ranks of G1, G2 or G3 (critically imperiled, imperiled and vulnerable) are found in Alberta and/or British Columbia. Two of these species occur in the Rocky Mountains and are considered rare in these two provinces and their adjacent states in the United States. The Alberta

Fritillary (*Boloria alberta*) has always been considered a prize to observe in its high scree-slope habitat. Similarly, Gillette's Checkerspot (*Euphydryas gillettii*) is very localized and found only near streams in high mountain valleys in the two provinces and several northern states. These two butterfly species are not facing known human-related pressure as they occur mainly in national and provincial/state parks, but more information on their habits and population sizes is needed, especially in the face of possible climate change effects in mountainous areas.



The high mountain valleys and scree slopes of the Rocky Mountains harbour several rare butterflies in Canada. The author looks for butterflies on the shore of Lake Oesa, Yoho National Park, BC / Photo by Judy Hall

The final species considered to be globally at risk by NatureServe is Johnson's Hairstreak (*Callophrys johnsoni*). This rare and localized species is found in or near dense forests and ranges from northern California to a few locations in southern British Columbia. It has been declared an endangered species in British Columbia (Guppy et al., 1994), and is considered a candidate species for evaluation by COSEWIC.

Even though it is not assessed as globally threatened by NatureServe, the well-known Monarch (*Danaus plexippus*) is a species that carries COSEWIC's designation of special concern and is considered internationally as vulnerable because of its unique and dramatic annual migration and its vulnerability in its overwintering sites in Mexico and California. Numbers of Monarchs returning to Canada to breed from their overwintering grounds in Mexico and California

can fluctuate dramatically from year to year. Up until now, they have been able to rebound quickly following bad years of population losses caused mainly by inclement weather conditions. The main threat facing the Monarch is habitat loss in its Oyamel Fir (*Abies religiosa*) roosting sites in a few high valleys in central Mexico.

The governments of Canada, the United States and Mexico are cooperating to introduce measures to better protect this species (see case study - The Monarch)

In Canada, the Species at Risk Act (SARA) has designated the Monarch as a species of special concern which requires the development of a Management Plan for its protection.

As of January 2008, a draft plan has been under consultation with a number of resource management objectives for the Monarch:

1. Conserve and protect all currently known key staging habitats in Canada;
2. Reduce/manage the negative effects of land-use practices on the Monarch and its habitats in Canada;
3. Monitor the Canadian contribution to the North American Monarch population;
4. Fill the knowledge gaps related to: climate change, milkweed abundance and distribution, and plasticity of migration routes;
5. Engage citizens in conserving and monitoring the Monarch and its habitats;
6. Cooperate with Mexico and the United States to support the protection and management of overwintering sites.

A number of actions have already been implemented to help accomplish these objectives, including the protection of some overwintering habitat in Mexico, the establishment of a tri-national protected-areas network for the Monarch, and the funding of life history research and major monitoring projects. However, much more still needs to be done (Crolla and Lafontaine, 1996).

Two other Canadian species deserve mention for their global status although not yet listed under any global ranking system. The Mottled Duskywing (*Erynnis martialis*), recorded across southern Ontario into southern Quebec and in southern Manitoba, appears to have disappeared in recent years from most of its known locations in Canada and has also disappeared from many of its known locations in the United States. Similarly, the eastern population of the Tawny Crescent (*Phyciodes batesii*), while still appearing to do

Dakota Skipper: a threatened prairie butterfly



Tall-grass prairie in Manitoba; home to several species at risk.

The Dakota Skipper (*Hesperia dacotae*) occurs in Canada only in southern Manitoba and southeastern Saskatchewan. It is found in isolated populations through eastern North and South Dakota to western Minnesota in the United States. This skipper is found in native tall-grass prairies and dry, upland mixed-grass prairie. In Canada, only about 50 km² of the original 6000 km² of tall-grass prairie remains.

The Dakota Skipper is now protected under the federal Species at Risk Act and is listed as Endangered in Manitoba.

Conservation agreements with landowners are being established to secure native habitat of species at risk within the prairie grasslands of Manitoba. Saskatchewan continues to encourage and support habitat stewardship initiatives that contribute to the recovery of the species.

Extracted from Environment Canada, Species at Risk, 2006

well across its southern Ontario range, is probably gone from most of its eastern United States range. There are some scientists who consider this eastern population distinct enough from the more abundant prairie population that it should have its own specific rank. Both of these species require urgent monitoring of known sites with surveys conducted for possible new sites, as well as research into the reasons for these, thus far, unexplained disappearances. COSEWIC is presently sponsoring an assessment of the Mottled Duskywing in Canada. (See case study - Mottled Duskywing)

These two species join a number of others, including the Silvery Checkerspot (*Chlosyne nycteis*) and Harris's Checkerspot (*Chlosyne harrisii*), that appear to be declining in their known ranges in the eastern United States (O'Donnell et al., 2007; Webster and deMaynadier, 2005). While monitoring for these species is not as urgent as for the Mottled Duskywing and Tawny Crescent, careful observations should also be targeted on their populations in Canada.

NATIONAL STATUS: CANADIAN BUTTERFLY DIVERSITY AND CONSERVATION HOTSPOTS

At the national level, Canada has seen the status of a large number of the more vulnerable butterfly species alter over the years. There is a variety of factors most likely responsible for these changes that will be described in the next section, but the overall results will be outlined here.

Most Canadian butterfly species occupy a wide range, either North American or Holarctic (occurring in the temperate regions of the whole Northern Hemisphere), and are considered secure in large ecozones, such as the boreal forest. Others, such as the Red Admiral (*Vanessa atalanta*), are migrants that do not often overwinter in any stage in Canada and appear in varying numbers each year from their main overwintering range, mostly in the southern U.S. Some of these usually annual migrants can be quite numerous on their Canadian breeding grounds. However, there are 20 species that appear only as vagrants or accidentals with few records of breeding, and none overwinter in Canada when they show up at all. A number of these, such as Great Southern White (*Ascia monuste*), Red-banded Hairstreak (*Calycopis cecrops*), Brazilian Skipper (*Calpododes ethlius*), Zarucco Duskywing (*Erynnis zarucco*), Clouded Skipper (*Lerema accius*), Mexican Fritillary (*Euptoieta hegesia*) and Whirlabout (*Polites vibex*), have appeared only once or twice in Canada. Many of these extreme vagrants were reported at Point Pelee National Park in southern Ontario. There are no specific risks to these accidental

species in Canada as they are not resident nor do they breed here.

Concerning one of these vagrant species, there was a noteworthy development in 2008. The northern subspecies *ontario* of Southern Hairstreak (*Fixsenia favonius*) had been recorded only a few times in Ontario (even though the original type specimen of *ontario* was described from a single butterfly captured at Port Stanley in 1868) and had been considered to be not a breeding species here. However, in June 2008, several were photographed along the Sydenham River north of Wallaceburg, Ontario. Subsequently, as many as 10 specimens a day were seen at the same location and farther north along the river. It obviously had reproduced in 2008 in this vicinity.

There are 50 butterfly species found in Canada that are largely United States' species just reaching some part of Canada along the northern edge of their range and are known to breed here regularly. Although secure on a global basis as a result of their secure status in the United States, most of these are at some level of risk in Canada as assessed by General Status 2009 because they tend to be found in limited and/or endangered habitats that are also butterfly hotspots close to the Canada/United States border.

Carolinian Forest

In eastern Canada, the Carolinian forest region found only in southern Ontario is one of the most at-risk habitats in Canada. More than 90% of this ecoregion in Canada, which formerly extended from Point Pelee in the southwest to Toronto, with some elements in the area just north of the United States border in eastern Ontario and southern Quebec, has been lost. Today, there exist only scattered fragments, surrounded by agriculture, of this once densely forested region. Characteristic trees include the Hackberry (*Celtis occidentalis*) and Tulip-tree (*Liriodendron tulipifera*).

Three butterfly species/subspecies that were formerly resident in the Canadian Carolinian forest region no



The Juniper Hairstreak in Ontario and eastern Quebec is restricted to areas where Red Cedar, the larval foodplant, is found.



The aptly named Skunk's Misery (due to a proliferation of mosquitoes) Carolinian Forest tract in south-western Ontario is surrounded by agricultural fields.

longer exist there. These extirpated butterfly populations disappeared about 20 years ago because their existence depended on the adequate presence of their larval foodplant, lupines, which were shaded out in their oak savannah habitat by pine plantings. These butterflies are the Karner Blue (*Lycaeides melissa samuelis*), Persius Duskywing (*Erynnis persius persius*) and Frosted Elfin (*Callophrys irus*).

There are 13 butterfly species characteristic of the Carolinian region that are considered at some level of risk nationally due mainly to the severe loss of habitat. Seven of these are assessed as may be at risk conservation status while six are considered sensitive.

A number of those Carolinian species that may be at risk are relatively widespread in the remaining patches of habitat. None of these is listed by COSEWIC. These include Giant Swallowtail (*Papilio cresphontes*), Wild Indigo Duskywing (*Erynnis baptisiae*) and Juniper Hairstreak (*Satyrrium gryneus*).

The limiting factor for the distribution of these species is mainly the availability of the appropriate larval hostplants. The Juniper Hairstreak is found outside of the Carolinian region where it feeds as a caterpillar on Eastern Red Cedar (*Juniperus virginiana*) in its range east of Manitoba. The Wild Indigo Duskywing has been expanding its range in Ontario to the east because it has been adopting Crown-vetch (*Coronilla varia*), a plant species now being widely used as a ground cover along new highway construction, as an alternate foodplant (see case study - Wild Indigo Duskywing). The Giant Swallowtail has also been expanding its range north and east in Ontario, likely as a result of warming climates.

Several Carolinian species that may be at risk are more restricted in their distribution even within this ecoregion. These include Hayhurst's Scallopwing (*Staphylus hayhurstii*) and Southern Cloudywing (*Thorybes bathyllus*). The Scallopwing is resident only on Pelee Island where it is considered uncommon, despite feeding as a larva on the very common and

The Monarch: a natural phenomenon at risk



Monarch populations are a phenomenon at risk both on their wintering grounds in central Mexico and in their breeding territory in Canada.



The Monarch (*Danaus plexippus*) is probably the most familiar of all butterflies. Its large size, bright orange colouring and attraction to garden flowers brings it into people's view more than most butterflies. As well, the unique story of its annual migrations from Canada to Mexico and California and back has captured the public's imagination.

The well-publicized story of the life cycle of the Monarch has been appearing more often in the media in recent years. As it flies south from its North American breeding sites and then settles into its wintering grounds in high, small valleys in the mountains of central Mexico or in tree groves on the coast of California, its journey is reported in newspapers and on television and radio. It is also tracked on its migration by hundreds of observers who report their sightings on the Internet. An organization called Monarch Watch works to track Monarch movements through tagging and school education programs (www.monarch-watch.org). Monarch Watch also encourages the setting up of nectaring waystations on private and public properties to support the Monarchs on their journeys north and south.

However, recently the Monarch has also caught the public's attention as a phenomenon at risk. Although it is not in danger as a species, because it has widespread, non-migratory global populations on many continents, its North American migratory population has come under pressure due to loss of overwintering habitat in Mexico and to loss of breeding habitat in North America due to agriculture and development, pesticide spraying, and other factors.

To try to address these risks to North American Monarchs, the three countries involved—Canada, the United States and Mexico—have developed The North American Monarch Conservation Plan. It is overseen by the Commission for Environmental Co-operation under the North American Free Trade Agreement. The plan puts forward a list of recommendations to protect the Monarch migration (www.cec.org/monarca). Regular meetings and workshops are being held in the three countries to implement the recommendations from the plan.

In Canada, the Species at Risk Act was introduced in 2003. Under it, the Monarch was designated a species of special concern which requires the development of a Management Plan for its protection. Consultations are now taking place to arrive at recommendations to conserve the Monarch in this country.

Donald Davis, citizen scientist, Presqu'île Provincial Park, ON.



The Hickory Hairstreak fluctuates widely in numbers from year to year in southern Ontario and Quebec.

widespread Lamb's Quarters (*Chenopodium album*). The Southern Cloudywing is resident along the northern shore of Lake Erie east to Hamilton and feeds on a variety of the plants from the pea family (Fabaceae). This butterfly also was discovered to exist in southern Manitoba after several old specimens were found in the Canadian National Collection in Ottawa.

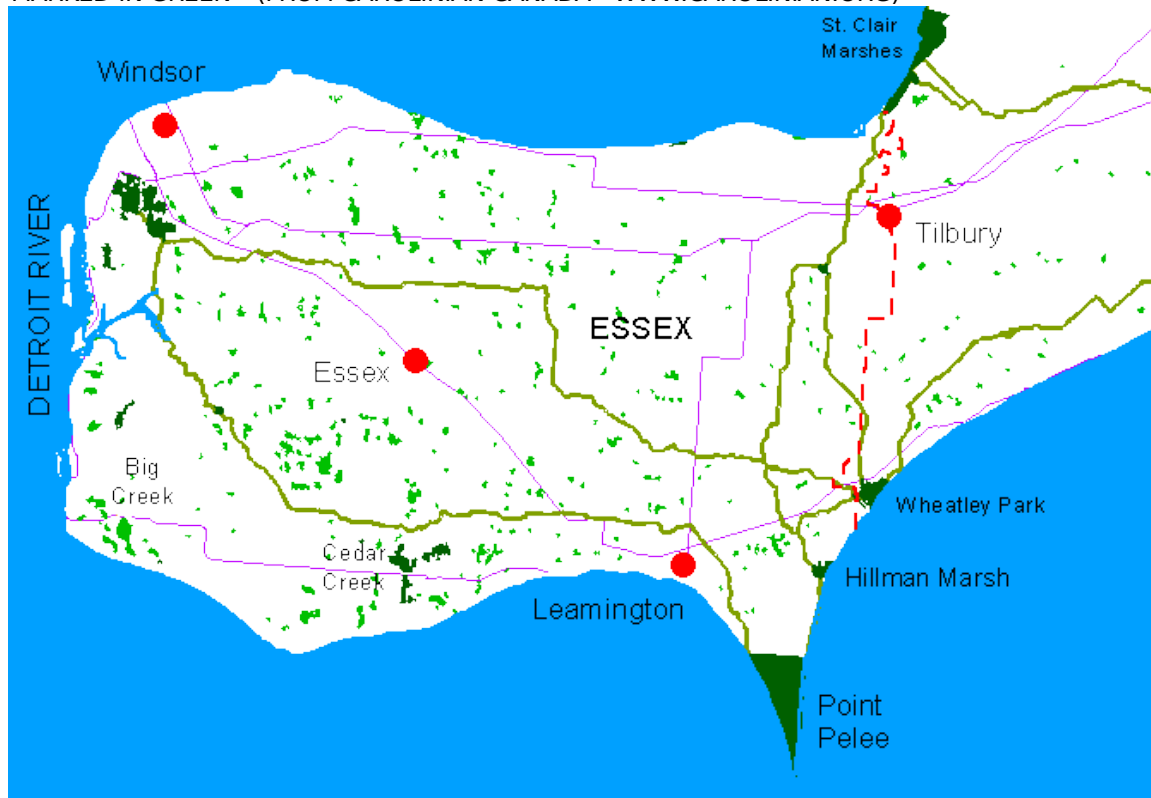
Seven Carolinian region species ranked sensitive in Canada are not considered at as high a risk as those outlined above. They include Sleepy Duskywing (*Erynnis brizo*), Black Dash (*Euphyes conspicua*), Little Glassywing (*Pompeius verna*), West Virginia White (*Pieris virginiensis*), Mulberry Wing (*Poanes massasoit*), Hackberry Emperor (*Asterocampa celtis*) and Tawny Emperor (*Asterocampa clyton*). The last three are also found in the Mixed Deciduous Woodland Zone of eastern Ontario. All seven species are locally

rare to uncommon and, except for the West Virginia White and the Sleepy Duskywing, feed on various grasses and sedges which can survive outside the vulnerable wooded habitats in the Carolinian region. The Sleepy Duskywing and the West Virginia White have been found as resident outside the Carolinian region - the Sleepy Duskywing in southern Manitoba, and the West Virginia White as far north as Sault Ste. Marie, Ontario and southern Quebec. This latter species was once protected under Ontario legislation but was removed in 1990 when more colonies of the species were discovered farther east and north in Ontario.

The Dion Skipper (*Euphyes dion*) had been considered sensitive but has recently been re-assessed as secure. The Dion Skipper is now found in roadside ditches as far east as Quebec. The Hickory Hairstreak (*Satyrrium caryaevora*) should also be mentioned. Previously considered a sensitive species, its numbers fluctuate wildly from year to year. It is found in a band from Windsor, Ontario, to the Eastern Townships in Quebec (Layberry et al., 1998) and is now considered secure.

There are six mainly Carolinian species not assigned any conservation status because it is not yet clear what level of risk they face. The Zebra Swallowtail (*Eurytides marcellus*) periodically shows up in southwestern Ontario and has been known to breed, but whether there is a resident breeding population is still unknown. The Fiery Skipper (*Hylephila phyleus*), Little Yellow (*Pyrisitia lisa*), Common Buckeye (*Junonia coenia*) and American Snout (*Libytheana carinenta*) are relatively common migrants in southern Ontario

FIGURE 3
REMNANTS OF CAROLINIAN FOREST IN ESSEX COUNTY WITH SCATTERED POPULATIONS MARKED IN GREEN - (FROM CAROLINIAN CANADA - WWW.CAROLINIAN.ORG)



Wild Indigo Duskywing: native skipper meets non-native hostplant



As Crown-vetch has been planted along roadsides to stabilize soil the Wild Indigo Duskywing has adopted it as a larval foodplant increasing the butterfly's range in Canada.



The Wild Indigo Duskywing (*Erynnis baptisiae*) is native to much of the eastern United States, occurring in Canada only in southwestern Ontario. As its common and scientific names suggest, it has always been closely associated with Wild Indigo (*Baptisia tinctora*), its larval hostplant. Both skipper and hostplant have historically shared an uncommon and local distribution in eastern North America, being restricted to barrens, prairies, and other very dry or sandy habitats. In Canada, as recently as the 1990s, the Wild Indigo Duskywing was established in only a few well-known sand barrens and prairies in southern Ontario, including Ojibway Prairie, Walpole Island, St. Williams Forest, and South Walsingham Sand Ridges. However, in the late 1980s, an indication of change came when a few immigrants of this normally scarce and localized skipper were found for the first time at Point Pelee National Park. By the late 1990s, the Wild Indigo Duskywing began to appear in Ontario as far north as Toronto, and in association with a new hostplant, the exotic legume Crown-vetch (*Coronilla varia*).

Crown-vetch was introduced to North America from the Mediterranean region some time after 1890 and by the mid-20th century was being planted extensively as a ground cover and to prevent soil erosion along highway embankments and waterways. Due to its aggressive spreading habit, Crown-vetch has since become naturalized in much of southern Canada and the United States in old fields and other open weedy habitats. In the late 1970s Dr. Arthur Shapiro, an American lepidopterist, noted that in areas where Crown-vetch was abundant in Pennsylvania, the Wild Indigo Duskywing outnumbered all other species of butterflies and skippers combined, and he made repeated observations of females laying eggs on Crown-vetch.

Since that time, the Wild Indigo Duskywing has rapidly expanded in northeastern North America, becoming much more abundant within its historical range, and greatly broadening its choice of habitat to include just about any open weedy area where Crown-vetch grows. In Ontario it has expanded well beyond its previous northern limit in the Carolinian Zone to the Oshawa and Lake Simcoe areas of south-central Ontario, and shows no signs of stopping. Plantings of Crown-vetch along highway verges and other rights-of-way provide a more or less continuous corridor for the hostplant, greatly facilitating the expansion of this butterfly. In Ontario the Wild Indigo Duskywing is rapidly becoming one of our more common and familiar skippers, and in Toronto where it was first discovered in 1998, this species is now frequently found near Crown-vetch in city parklands, waste areas, and railroad rights-of-way. This is a rare example of human intervention in the natural world that unintentionally benefits a native butterfly, and is one of a few recent examples of native butterflies and skippers expanding their palate and habitat preference to capitalize on a readily available, non-native hostplant.

Jeff Crolla, Ontario/Quebec Zone Coordinator, The Lepidopterists' Society

with large numbers arriving in some years. They also breed regularly. However, with their widely fluctuating numbers it is difficult to evaluate their conservation status. The Hoary Edge (*Achalarus lyciades*) first appeared in Ontario in 1998 and the few subsequent records are all from the same area near the Ojibway Prairie Preserve at Windsor. It is not yet known if an actual colony exists, so a rank is difficult to assign.



In southern parts of Eastern Canada, the Early Hairstreak has always been considered a rare species.

Maritime salt marsh zone

As mentioned under species globally at risk, there are a number of butterflies at risk found in the salt marshes and nearby areas along the Atlantic Coast. Some of these are ancient species missed by the last glacial period as their coastal habitats were not frozen.

Most of the salt marshes inhabited by the Maritime Ringlet (*Coenonympha nipisiquit*), the threatened Maritime Copper (*Lycaena dospassosi*) and the possibly vulnerable Short-tailed Swallowtail (*Papilio brevicauda*) are not yet protected and therefore the conservation of these species is not assured.

Other eastern Canadian species

There are two other butterfly species found from Ontario to Nova Scotia that are subject to some level of national vulnerability. The Early Hairstreak (*Erora laeta*) has long been a mysterious butterfly and has been avidly sought by butterfly enthusiasts. It is a mainly Appalachian species in the United States associated with beechwoods where the main larval food source - the nut of the American Beech (*Fagus grandifolia*) - is found in the tops of large, mature trees. Rarely seen, the species is now conjectured to inhabit mainly the crowns of the beech trees and only comes down to the ground to occasionally sip at roadside puddles (Layberry et al., 1998). Although assigned as a vulnerable to sensitive species under most rankings, more research is required to determine its exact abundance and suitable conservation status.

Another species ranked as secure, but perhaps still should be ranked as undetermined, the Cherry Gall Azure (*Celastrina serotina*) is a recently recognized species. Little is known of its distribution or abundance. It belongs to a group of sibling species and was only recognized once its unusual larval food, mite galls on cherry tree leaves, was identified (Wright, 1995).

Prairie Canada

There are 12 butterfly species found only in the three prairie provinces of their Canadian range that have some level of risk nationally assigned to them. They are

dependent on prairie grasslands and other included habitats, such as riparian areas; however, most of this region is under severe stress mainly due to its conversion to agricultural lands. Two of these, the Dakota Skipper (*Hesperia dacotae*) and Poweshiek Skipperling (*Oarisma poweshiek*), are mentioned under global assessment.

Of the other 10 species, six are also skippers. Like the Dakota Skipper, two of them are members of the Branded Skippers genus (*Hesperia*). These two species are assigned may be at risk ranks under General Status 2009 but are considered critically imperiled nationally by NatureServe. The Ottoo Skipper (*Hesperia ottoo*) is found in areas with native grasses (the larval foodplants) and it appears to be becoming rarer. The Pahaska Skipper (*Hesperia pahaska*) is a species of short-grass prairie and open pine forests. It is considered extremely rare in southern Saskatchewan and only one historic record exists for Manitoba. The Oslar's Roadside Skipper (*Amblyscirtes oslari*) and Simius Roadside Skipper (*Notamblyscirtes simius*), as well as the Small Checkered Skipper (*Pyrgus scipitura*), all require short-grass prairie in Saskatchewan and Alberta. They are all so rare in Canada that an assessment of their status is difficult (Bird et al., 1995).

The final skipper in this region 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



The Milk River runs through Writing-on-stone Provincial Park in the prairies of southern Alberta where the Plains Skipper flies.



Mottled Duskywing: a butterfly in decline in Canada



The Mottled Duskywing has been disappearing from many of its known sites in Eastern Canada. It is now subject to a COSEWIC survey carried out by Jessica Grealey seen here at the Constance Bay sandhills near Ottawa. / Photo above by Jessica Grealey



The Mottled Duskywing (*Erynnis martialis*) has historically been known to occur in southeastern Manitoba, southern Ontario and southwestern Quebec. It prefers dry sandy areas or limestone alvars where its hostplant, New Jersey Tea (*Ceanothus* sp.), is found. Records from the past 20 years indicate that populations of Mottled Duskywing are declining across their Canadian range and have disappeared altogether from some previously known localities. This trend has been observed not only in Canada, but throughout the rest of this species' eastern North American range

The Mottled Duskywing has not been seen in Quebec since the mid-1990s, and habitat loss due to intense development pressures is likely to blame. Successional pressures on this species' hostplant have also resulted in habitat loss in several localities where the overstorey has grown and filled in areas where the low-growing New Jersey Tea once flourished. In other localities, aerial spraying for the destructive Gypsy Moth (*Lymantria dispar*) may have wiped out small local populations which were unable to recolonize as more common species have.

This butterfly is now represented by only very small, extremely localized populations in southern Ontario and southwestern Manitoba. Although suitable habitat remains abundant throughout its previously recorded range, the Mottled Duskywing has been unable to adapt to habitat loss and alterations at a local scale.

The Committee for the Status of Endangered Wildlife in Canada (COSEWIC) has retained Natural Resource Solutions Inc. to prepare a status report on the Mottled Duskywing. However, long-term monitoring of disturbed and undisturbed locations is needed to understand more about the Mottled Duskywing's habitat preferences, resilience to disturbance, and specific reasons for its decline.

Jessica Grealey, Natural Resources Solutions Inc., Waterloo, ON.

on a yucca in the Milk River region of southern Alberta. These emerged as adults of this butterfly. The species is considered as undetermined but, like its foodplant, it too will require protection and is now a high-priority candidate for listing by COSEWIC (Lafontaine, 2006).

A non-skipper species that exists in two isolated populations in Canada, one in the prairie region, is the Mormon Metalmark (*Apodemia mormo*). In its small prairie population near Val Marie, Saskatchewan, it is considered threatened under COSEWIC and has a recovery strategy in place (Pruss et al., 2007). Three other non-skipper species also require evaluation for conservation status in the prairie region. Edwards' Fritillary (*Speyeria edwardsii*) was historically found across the southern Prairie Provinces. It has since disappeared from its grassland and open pine and mixed-forest sites in Manitoba despite there being some suitable habitat left. It is conjectured that the remnant habitat is too small to sustain the species in Manitoba and Saskatchewan (Lafontaine, 2006). Careful monitoring of the species in Alberta should be conducted.

A species found in poplar and willow habitats of Alberta's Milk River valley, Weidemeyer's Admiral (*Limenitis weidemeyerii*) is at the extreme northern edge of its adjacent western United States range. The Weidemeyer's Admiral is presently being reviewed for protection under Alberta legislation and a management plan is being drawn up. The Rocky Mountain Dotted Blue (*Euphilotes ancilla*) is a common butterfly in the western United States occupying dry prairies and sagebrush. It is considered rare and a candidate species under COSEWIC in southern Saskatchewan and Alberta.

Finally, a recently discovered species in Alberta, Edith's Copper (*Lycaena editha*), was found near the Montana border. Its full distribution in Canada is still unknown and its status should be considered as undetermined until more is known about its existence in Canada.

Yukon Beringian

During the last glacial period, the largest ice-free refugium in Canada was located in western Yukon, adjacent to ice-free Alaska; together these areas are referred to as the Beringian Refugium. Many plant and animal species found in this region have strong affinities with Asian species farther west, not with North American species, because of the former connection of this region to the co-existing Asian refugium across a dry land bridge.

There are six Beringian butterfly species mainly in this region with their stronghold in the mountainous parts of Yukon that have some level of risk in Canada. These are Green Marble (*Euchloe naina*), Phoebus Parnassian (*Parnassius phoebus*), Philip's Arctic (*Oe-*



The Reddish Alpine flies in remote mountainous areas of Canada's north-west, including this site along the Dempster Highway, Yukon. / Photos by J. Donald Lafontaine



neis philipi), and three species of Alpines. These Alpines are: Four-dotted Alpine (*Erebia youngi*), Yellow-dotted Alpine (*Erebia pawloskii*), and Scree Alpine (*Erebia occulta*).

Most of these butterflies are relatively recent discoveries, and little is known of their full distribution and behaviour. None is considered at high risk because of their inaccessible high mountain scree and alpine habitats. They are all ranked as sensitive (3) under General Status 2009 as a result of their restricted ranges. Of particular concern is their vulnerability to climate change in northern Canada. The Reddish Alpine (*Erebia lafontainei*) has recently been re-assessed as secure in Yukon, but little is known about its life history and it is still assessed as sensitive in the Northwest Territories.

British Columbia cordillera, lower mainland and Vancouver Island

British Columbia has the largest number of butterflies (176 species) of any province in Canada. Of these, the Mormon Metalmark (*Apodemia mormo*) is listed as endangered under SARA and at risk/critically imperiled under General Species 2009 and NatureServe Canada respectively. The Behr's

Taylor's Checkerspot: a rediscovered west coast butterfly



Taylor's Checkerspot (*Euphydryas editha taylori*) is identified by federal authorities as an endangered butterfly, known from fifteen locations throughout Garry Oak (*Quercus garryana*) and associated ecosystems on the leeward side of southern Vancouver Island, BC. Garry Oak ecosystems are among the four most endangered ecosystems in Canada, with less than 5% of the original habitat remaining, mostly in private ownership, and fragmented throughout its range (www.goert.ca).

Habitat information for Taylor's Checkerspot in BC is limited. The most recent colony was located in the open maritime meadows of Helliwell Provincial Park, Hornby Island. Unfortunately, this population was extirpated in the late 1990s, due to unknown causes. Helliwell Provincial Park was the last known location, and thus the species was thought extirpated in Canada. Nonetheless, surveys continued to target similar habitats elsewhere within the species' known range with the hope of finding an unknown population.



In 2005 a checkerspot sighting was reported from a young clearcut on Denman Island and, in 2007-2008 a larger survey, led by Parks Canada Agency and BC Ministry of Environment, revealed a much larger population. Results showed the butterfly's larval host plants inhabiting young clearcuts, open and disturbed roadsides, road ruts where heavy machinery had caused disturbance, and depressions where vernal pools and seepages occur. The information gathered from these surveys has completely shifted our understanding of the butterfly's ecology and habitat needs in BC.



The challenge to conserving Taylor's Checkerspot on Denman Island will become more significant in the near future. The young clearcuts where the larval hostplants occur are quickly being encroached upon by the natural succession of Red Alder (*Alnus rubra*), and by saplings such as Shore Pine (*Pinus radiata*), Western Hemlock (*Tsuga heterophylla*) and Douglas-fir (*Pseudotsuga menziesii*). This scenario poses a dilemma for conservation practitioners: it appears that soil and vegetation disturbance prevent encroaching conifers and natural succession from overtaking larval foodplants; yet the techniques used to complete these tasks (e.g., digging using a small backhoe) need to be done with care. In addition, habitat information from Garry Oak ecosystem sites, such as at Helliwell, leads one to believe the species is more a resource specialist (e.g., will inhabit areas where the hostplants are plentiful and healthy) than a habitat specialist. Regardless, it is exciting to know Taylor's Checkerspot has not been extirpated from Canada.

Jennifer Heron, British Columbia Ministry of Environment, Vancouver, B.C.

Taylor's Checkerspot (eggs, larvae and adult shown above) is a federally endangered subspecies of Edith's Checkerspot re-found in the Garry Oak and associated woodlands of southern BC. / Photos by Jennifer Heron



The Hoffmann's Checkerspot is a rare species in the southern Rocky Mountains. / Photo by Jennifer Heron

Hairstreak (*Satyrrium behrii*), is also ranked as at risk/imperiled under both ranking systems and is also listed as threatened under SARA. These are both restricted in British Columbia to the southern Okanagan valley. Behr's Hairstreak is always found close to its larval foodplant, the Antelope-brush (*Purshia tridentata*). The Antelope-brush ecosystem in British Columbia is considered imperiled (Tews,

2004), while the plant species itself has been recently evaluated to be more at risk globally due to lack of regeneration and declining populations (Anions, 2009). The Sabuleti Skipper (*Polites sabuleti*) is also considered at risk in the Okanagan but is listed as a low candidate species under COSEWIC. The Sooty Hairstreak (*Satyrrium semiluna*) is also assessed as at risk and is listed as endangered under COSEWIC.

Three British Columbia species are listed as may be at risk nationally under General Status 2009. These include the Sonoran Skipper (*Polites sonora*) and the Indra Swallowtail (*Papilio indra*). Both are dryland species of the southern valleys and mountains of central British Columbia. As well, the third may be at risk species is Johnson's Hairstreak (*Callophrys johnsoni*) mentioned earlier as a species also globally at risk.

A further eight butterfly species in British Columbia are considered sensitive nationally. Four of these - Propertius Duskywing (*Erynnis propertius*) on Vancouver Island and the lower mainland, Gillette's Checkerspot (*Euphydryas gillettii*) in the Rocky Mountains, Hoffmann's Checkerspot (*Chlosyne hoffmanni*) in the Manning Park area, and Mormon Metalmark (*Apodemia mormo*) in the Okanagan- are also considered as endangered or candidate species under COSEWIC.



Butterflies, such as the California Hairstreak, in the Okanagan Valley, BC, are becoming scarcer as their habitats near areas such as Osoyoos are disappearing to urbanization and agricultural production



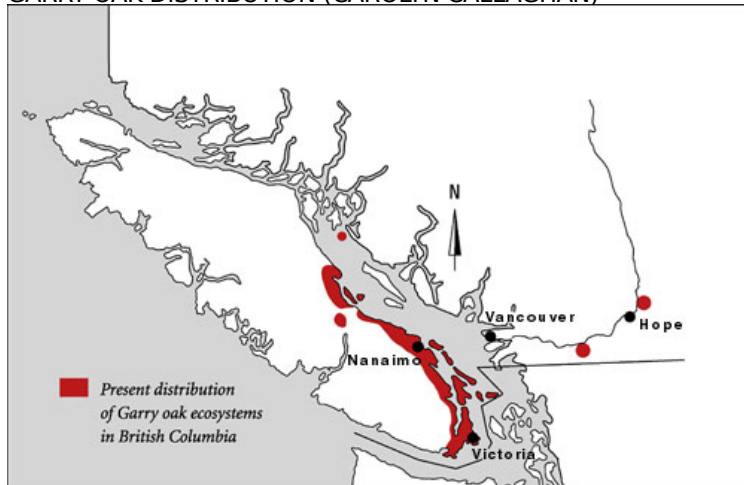
The other four species listed as sensitive under General Status 2009 are not considered at risk by other ranking systems. These are: the Lilac-bordered Copper (*Lycaena nivalis*), California Hairstreak (*Satyrrium californica*), Western Green Hairstreak (*Callophrys affinis*) and Great Arctic (*Oeneis nevadensis*).

The area of southern Vancouver Island and the adjacent mainland British Columbia coast, where Garry Oak used to be the predominant tree cover, is a butterfly conservation hotspot. In addition to some of the species of national interest listed above, the area supports eight subspecies that are considered extinct or at some level of risk by the province of British Columbia. These are discussed in the subnational section.

A final mention should be made here about the recent discovery of the Great Basin Fritillary (*Speyeria egleis*) in southeastern British Columbia. This widespread species in the United States should be considered with an undetermined status in Canada until more is known about its distribution.

FIGURE 4

GARRY OAK DISTRIBUTION (CAROLYN CALLAGHAN)



SUBNATIONAL STATUS: SPECIES OF PROVINCIAL/ TERRITORIAL CONCERN

There are many butterfly species found in Canada that are secure in most or at least a part of their Canadian range, but may be at some level of risk at a provincial/territorial level or at a subspecies level. These cannot be assessed fully in this overview of species status in Canada. However, a few of the more noteworthy examples will be outlined. All of these are considered as extirpated to may be at risk in some part of their Canadian range.

Three species of butterflies are now considered extirpated from one province but still exist in one or more other provinces. These extirpations include Edwards' Fritillary (*Speyeria edwardsii*) and Ridings' Satyr (*Neominois ridingsii*) from Manitoba - both of which may also have disappeared from Saskatchewan - and Viceroy (*Limnitis archippus*) which was last seen in British Columbia in 1930.

As can be expected, most of the species with some provincial/territorial level of risk are at the edge of their range, either to the west, the east or to the north. The three provincially at risk species, assessed as secure nationally, are Dun Skipper (*Euphyes vestris*) and Grey Copper (*Lycaena dione*) in British Columbia, and Uncas Skipper (*Hesperia uncas*) in Manitoba. All are secure in other parts of their range.

A number of species are considered as secure nationally, but may be at risk in one or more provinces. Of these, three are from British Columbia, including Eastern Tailed Blue (*Cupido comyntas*), Afranius Duskywing (*Erynnis afranius*), and Bronze Copper (*Lycaena hyllus*). Eight subspecies in the lower mainland and adjacent southern Vancouver Island are

TABLE 4
NUMBER OF BUTTERFLIES AT RISK BY PROVINCE
(COSEWIC ACCEPTED AND CANDIDATE LISTS)

British Columbia	20
Alberta	8
Saskatchewan	5
Manitoba	4
Ontario	5
Quebec	3
New Brunswick	2
Nova Scotia	1
P.E.I.	1
Newfoundland	0
Territories	0

The Monarch is not included in the above listings because it is found in all provinces.

considered extinct to vulnerable (Guppy, 1994). These include an undescribed subspecies of the Large Marble (*Euchloe ausonides*), named the Island Marble, that disappeared from this area but has subsequently been found on several of the San Juan Islands in nearby Washington State. It also includes the following subspecies, many of which are now known from only a few locations: *Euphydryas colon paradoxa*, *Euphydryas editha taylori* (see case study - Taylor's Checkerspot), *Speyeria zerene bremneri*, *Plebejus saepiolus insulanus*, *Plebejus icariodes blackmorei*, *Callophrys mossii mossii*, and *Coenonympha tullia insulana*.

One other butterfly in British Columbia should also be included with those species of provincial interest, although it does not currently receive any at risk ranks. Barry's Hairstreak (*Callophrys gryneus plicataria*), a juniper feeder in southern British Columbia, is considered endangered by the British Columbia government (Guppy, 1994). It was formerly considered a separate species called *Incisalia barryi*.

In Saskatchewan there are two skipper species that may be at risk: Pahaska Skipper (*Hesperia pahaska*) and Rhesus Skipper (*Polites rhesus*). As well, the Saskatchewan population of Mormon Metalmark (*Apodemia mormo*) and Western Branded Skipper (*Hesperia colorado*) are considered as may be at risk under some ranking systems. The Mormon Metalmark is already listed by COSEWIC as threatened.



The Gorgone Checkerspot is a species mainly of western North America, but with a few ephemeral populations in eastern Ontario where its adopted larval foodplant, Black-eyed Susan, is common.

Manitoba lists ten species as possibly at risk in that province. These include: Afranius Duskywing (*Erynnis afranius*), Columbine Duskywing (*Erynnis lucilius*), Olympia Marble (*Euchloe olympia*), Baltimore Checkerspot (*Euphydryas phaeton*), Variable Checkerspot (*Euphydryas colon*), Nevada Skipper (*Hesperia nevada*), Common Sootywing (*Pholisora catullus*), Ottoe Skipper (*Hesperia ottoe*), Garita Skipperling (*Oarisma garita*) and Broad-winged Skipper (*Poanes viator*). These are mainly widespread eastern and/or western butterflies that reach the limit of their range in Manitoba.

Ontario has a provincial list of seven species that may possibly be at risk. These are: Bog Elfin (*Callophrys lanoraieensis*), Gorgone Checkerspot (*Chlosyne gorgone*), Giant Sulphur (*Colias gigantea*), Grey Copper (*Lycaena dione*), Garita Skipperling (*Oarisma garita*), Machaon Swallowtail (*Papilio machaon*) and Persius Duskywing (*Erynnis persius*). Two of these are worth special mention. Persius Duskywing larvae feed on lupines and the species is probably now extirpated from its few known sites. The Gorgone Checkerspot has been known in seemingly

ephemeral colonies that appear and then disappear. The latest of these, and the only known location in Ontario, is in dryland areas of eastern Ontario south of Ottawa (Layberry et al., 1998).

In Quebec, at least nine species are considered as may be at some risk there even though they are secure nationally. These species include Tawny Emperor (*Asterocampa clyton*), Juniper Hairstreak (*Callophrys grynea*), Palaeno Sulphur (*Colias palaeno*), Ross's Alpine (*Erebia rossii*), Variegated Fritillary (*Euptoieta claudia*), White-veined Arctic (*Oeneis bore*), Macoun's Arctic (*Oeneis macounii*), Old World Swallowtail (*Papilio machaon*) and Checkered White (*Pontia protodice*). The Mottled Duskywing (*Erynnis martialis*), once considered at risk in Quebec, is probably now extirpated from that province.

In the Atlantic provinces, New Brunswick and/or Nova Scotia list five species that may be at risk: Henry's Elfin (*Callophrys henrici*), Bog Elfin (*Callophrys lanoraieensis*), Dorcas Copper (*Lycaena dorcas*), Bronze Copper (*Lycaena hyllus*), and Jutta Arctic (*Oeneis jutta*). These all tend to be highly localized wetland or woodland species. In recent years, frequent butterfly surveys have resulted in the discovery of many new species for Prince Edward Island. Of these, a number are noteworthy as possibly having some provincial level of risk. These include Bog Elfin (*Callophrys lanoraieensis*), Early Hairstreak (*Erora laeta*), Harvester (*Feniseca tarquinius*), Maritime Copper (*Lycaena dospassosi*) and Jutta Arctic (*Oeneis jutta*). The Monarch (*Danaus plexippus*) in Prince Edward Island may be more at risk than in other parts of Canada.

The territories are still poorly known in terms of the distribution and numbers of butterfly species because of vast distances and limited access, although some butterfly specialists have been visiting more often in recent years. Only Yukon has identified some species that may be at risk there. These are Pacific Fritillary (*Boloria epithore*), Western Pine Elfin (*Callophrys eryphon*), Northern Crescent (*Phyciodes cocyta*), Oreas Comma (*Polygonia oreas*), Satyr Comma (*Polygonia satyrus*) and Atlantis Fritillary (*Speyeria atlantis*).

POPULATION EXPANSIONS: BUTTERFLIES BENEFITTING FROM HUMAN ACTIVITY

A number of butterfly species in Canada have benefitted from habitat alterations, usually as a result of human activities. Certain species, in particular those that are more common, require open, sunny, weedy locations, especially those feeding as larvae on grasses or open field plants. For many, the ideal habitats are roadsides or wood edges with plenty of flowering plants for nectar and proximity to larval foodplants in the woodlands or fields. The results of

many human activities present opportunities for such species, including transportation corridors, woodland clearings, abandoned agricultural fields and cultivated larval foodplants.

It was certainly human activity that resulted in the now widespread distribution of two of the most common butterflies in Canada. Both started out as immigrants in previous centuries. The European Skipper (*Thymelicus lineola*) first found its way to London, Ontario in or before 1910 as eggs on imported Timothy Grass (*Phleum pratense*), the main larval foodplant in its temperate Eurasian homeland. It is the only skipper in North America that overwinters as an egg on its foodplant, a widely grown forage for livestock. From Manitoba eastward, it often occurs in enormous numbers associated with Timothy and other grasses. Scattered colonies are now present in western agricultural areas and even up new highways into the James Bay area of Quebec. The Cabbage White (*Pieris rapae*) appeared in North America even earlier. It was first recorded in Quebec City in the 1860s. It feeds on cultivated members of the mustard family (Brassicaceae) as larvae, and spread rapidly across the continent in agricultural areas and even city gardens in the following decades.

A number of butterfly species in Canada have benefitted from habitat alterations, usually as a result of human activities.

These are notably the only two alien invasive butterfly species that have become widespread in Canada. However, two additional European species have made brief appearances here. The Small Tortoiseshell (*Nymphalis urticae*) showed up in 1970 in Halifax, Nova Scotia, from a box packed in Oxford, United Kingdom. No further records were obtained. As well, the Peacock (*Nymphalis io*) was collected near some Montreal docks in 1997 and has been seen near Montreal in subsequent years.

Several native Canadian butterfly species have expanded their distributions and numbers in recent years. An interesting record of a butterfly increasing its range in Canada due to an expanding alien plant is the Henry's Elfin (*Callophrys henrici*). In southern



The invasive Cabbage White (above) and European Skipper (below) are now two of Canada's most abundant butterflies.



Ontario and Quebec, the Glossy Buckthorn (*Rhamnus frangula*), an invasive alien shrub, has become an alternate hostplant for the elfin in wooded areas where the shrub has become a major understory plant (Catling et al., 1997).

In addition to Henry's Elfin, in southern Ontario, three butterfly species that were relatively common in the southwestern part of the province have rapidly expanded into eastern Ontario where they either did not previously exist or were rarely encountered. The Delaware Skipper (*Anatrytone logan*) had never been recorded in eastern Ontario until one was discovered south of Ottawa in 1998. In subsequent years, it has established numerous colonies in areas where its grass foodplants are found. The Eastern Tailed Blue (*Cupido comyntas*) and Pearl Crescent (*Phyciodes tharos*) were considered rare in the Ottawa area until the late 1990s when they began to be observed in numbers at certain locations (Layberry, 2007; Crolla, 1996). The most likely explanation for the growing abundance of these species is warmer winters in recent years, perhaps in combination with an increase of abandoned agricultural areas. The spread of butterfly species northward is a phenomenon that has also been widely reported in Europe for certain species of butterflies due to climate change (Kerr, 2001; Parmesan et al., 1999).

The Wild Indigo Duskywing (*Erynnis baptisiae*) has recently expanded its distribution in Ontario due to the planting of Crown-vetch (*Coronilla varia*) as a ground cover along new highways (see case study - Wild Indigo Duskywing). Similarly, the Silvery Blue (*Glaucopsyche lygdamus*) has been expanding its distribution in Ontario and Quebec using Cow Vetch (*Vicia cracca*) as a foodplant planted along roads for the same reason (Layberry et al., 1998).

Two other species have been expanding their ranges in eastern Canada but the reasons for these expansions are not clear. The Common Ringlet (*Coenonympha tullia*), which feeds on a variety of grasses, has been moving into southern Ontario since the 1960s and through New Brunswick to the Atlantic Coast and south into New England. The Olympia Marble (*Euchloe olympia*), which is featured on the cover, is a mostly western prairie species but, at about the same time, it was moving through Ontario as far as western Quebec. It feeds on mustards and rock cresses.

Another factor in apparent range expansions is increased reporting on butterflies. The number of butterfly observers has been increasing steadily in recent years and many of their records are now available on the Internet. This has resulted in more reports from sometimes inaccessible or unreported locations.

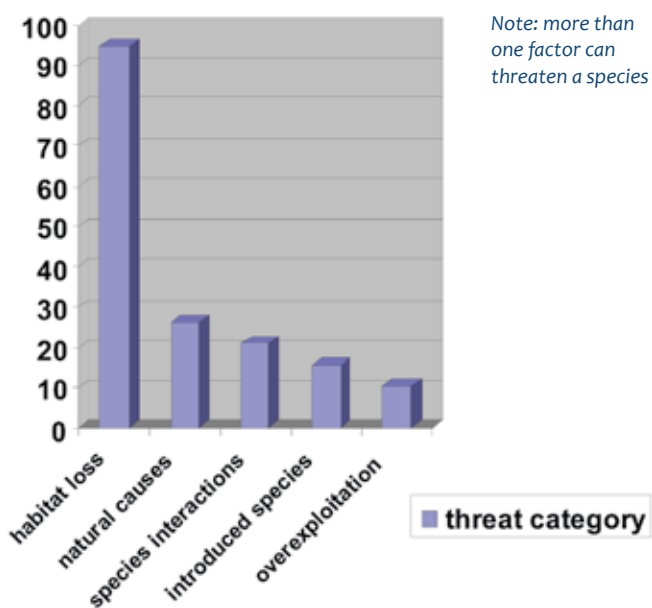
A positive result of this increased reporting has been the records of three new species for Canada in the

past five years that had previously been recorded only in the United States. All of these have now been found in southern Alberta. As previously noted, Strecker's Giant Skipper (*Megathymus streckeri*) was discovered in the Milk River area of Alberta near the United States border. Edith's Copper (*Lycaena editha*), which is widespread in the areas just south of the border, was also discovered recently. Finally, the Great Basin Fritillary (*Speyeria egleis*) also widespread just south of the border, has been found in the Cypress Hills region (Lafontaine, 2006).

Finally, for certain butterfly species, increased quantities of some weeds that are major nectar sources will likely have contributed to increased population size of these butterflies. An example is the hairstreaks which have benefitted from increased amounts of the alien White Sweet Clover (*Trifolium repens*).

FIGURE 5

COMPARISON OF RISK FACTORS AFFECTING THREATENED LEPIDOPTERA BY PERCENT OF SPECIES FOR EACH THREAT CATEGORY (VENTER ET AL., 2006)



Factors affecting butterfly populations - threats and opportunities

Butterflies are in many ways excellent bellwethers of the state of health of our ecosystems. Their often colourful wings and love of flying in the sunshine makes them easily noticed and widely monitored over the years. Like most insects, they usually reproduce rapidly, making shifts in population numbers fairly noticeable. They have been well studied in the past in comparison to many other invertebrates. Most importantly, they are sensitive to many factors in their environment, from chemicals to climate change, and these have been documented over many years. This chapter will identify and review these factors to determine their effects on the status and trends of butterfly populations in Canada.

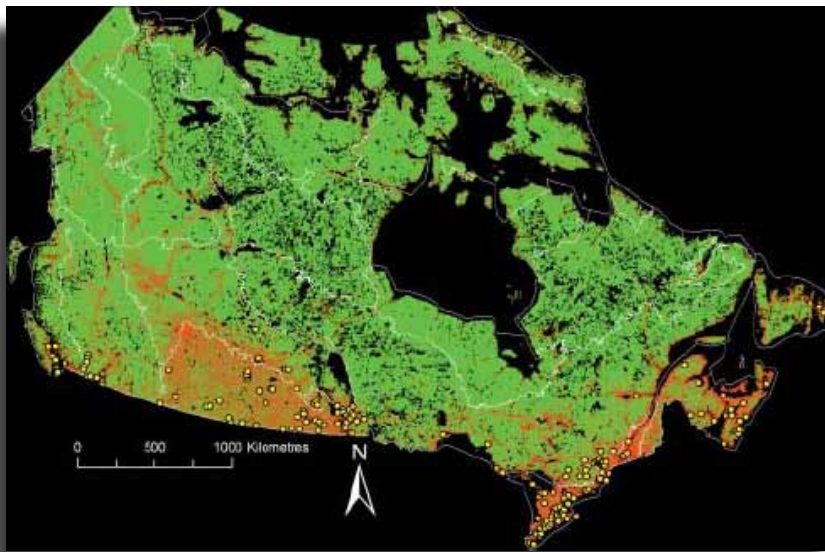
A study of threats to endangered plants and animals in Canada (Venter et al., 2006) quantified the potential threats to 488 species in Canada which faced some level of threat. In a table, the authors compared the threats facing the different faunal groups expressed as the percentage of endangered species affected by a particular threat category. For the 19 lepidopteran species listed under the COSEWIC status reports, as in all other groups, habitat loss was by far the greatest threat (94.7%), followed by natural causes, such as storms (26.3%), native species interactions (21.1%), introduced species (15.8%), and

overexploitation (10.5%). (See Figure 5.) Pollution (which included use of chemicals for crop protection) was shown as a 0% threat, which may simply reflect the lack of data. Another, ever-looming factor not touched on in the article is climate change and its potential impact on all species, including butterflies.

Another intriguing study (White and Kerr, 2007) analyzed variation in species richness patterns of Canadian butterflies in relation to climate and natural habitat variation, and human activities. The study used a distributional modelling program called GARP (Genetic Algorithms for Rule-set Production) and a database based mainly on federal and provincial museum specimens consisting of 120,000 butterfly records of the most commonly collected 102 species from across Canada. These data are available through the Canadian Biodiversity Information Facility website. The butterfly data were combined with environmental and human activity data layers.

White and Kerr found that temperature is the best indicator of butterfly species richness while elevation is a strong secondary factor. In their review of human-dominated regions versus natural areas, they also found that three specific human-related factors (insecticide application, paved roads, and the hu-

FIGURE 6



Yellow dots show observation points for butterflies listed under Canada's Species At Risk Act including those that have recently been extirpated from Canada. These observation locales are overlaid on a map of 'human footprint' (Sanderson et al., 2002), showing gradients of relative intensity of human activities (where green is the lowest and red the highest intensity). With the exception of Monarch butterflies, species have been pushed toward extinction only in areas of intensive human activities, which provides corroborative support for range modelling results. / White and Kerr, 2007

man footprint, i.e., habitat loss and human density, exerted significant negative effects on butterfly species richness within human-dominated regions. Notable among these factors was the expansion of more widespread and common species, and the loss of rare species.

This study revealed that most butterfly species considered at risk in Canada are located where human activity is at its highest. Consistent with this, they also found that no butterfly species in Canada with significant distributions outside areas of high human impact is currently considered at risk.

HABITAT LOSS AND DEGRADATION

There is a general consensus among butterfly organizations and individuals who monitor butterfly populations that the main factor leading to species declines, and even losses, is habitat alteration or destruction (Opler and Malikul, 1998; Pyle, 1984). Butterflies are creatures of habits and habitats, and even minor changes to where they live can affect their ability to survive and reproduce.

The extent of habitat changes due to urbanization in Canada is evident to all of us, although it varies in severity depending on location. Dense urban areas can still support a few common species if some green areas remain, but urban and suburban development usually replaces wild spaces with houses, roads and shopping centres without adequate planning of green spaces suitable for wildlife. Many butterfly observers can remember good butterfly fields near their homes when they were younger that fell to the bulldozer.

...the main factor leading to species declines, and even losses, is habitat alteration or destruction.

Some Canadian butterfly species are particularly threatened by encroaching urban development. For example, the largest population of the Maritime Ringlet (*Coenonympha nipisiquit*), which lives only in salt marshes on the coast of Chaleur Bay in New Brunswick and Quebec, is in danger of encroachment from the city of Bathurst, New Brunswick. Similarly in British Columbia, several endangered subspecies, such as Moss's Elfin (*Callophrys mossii mossii*) and Taylor's Checkerspot (*Euphydryas editha taylori*), which rely solely on meadows associated with Garry Oaks, are declining as this habitat disappears in the city of Victoria and a few other urban areas on Vancouver Island. The Garry Oaks often remain or are planted as ornamentals, but the natural understory supported by Garry Oak which these butterflies require, is disappearing quickly (Guppy et al., 1994).

The most diverse Canadian butterfly habitats tend to lie close to the United States border where warmer climates and niche ecosystems, such as the Carolinian forest in Ontario, the tall-grass prairie in Manitoba, and the Antelope-brush dryland of interior British Columbia, exist. These also happen to be among the richest agricultural lands in Canada. Even though Canada is large, only about 7% of the land is arable. That arable land is also the richest in species and holds most of the species under threat.

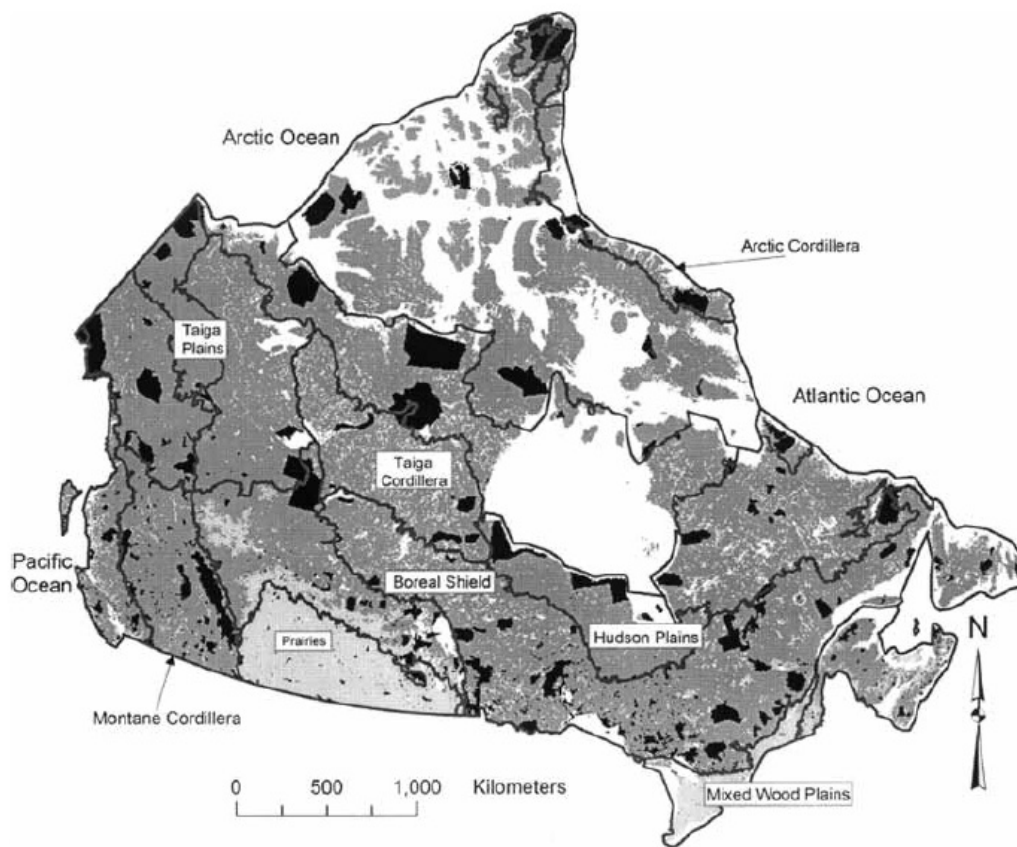
The southern Okanagan valley in British Columbia is an example which quickly reveals the challenges involved in establishing butterfly conservation measures in the face of human demands for the land. Population growth in the valley has increased dramatically in recent years. It has become a haven for retirees looking for a warmer climate within Canada. Urban growth has risen dramatically in cities and towns such as Kamloops. Agricultural production, particularly of fruits and vegetables which grow well in the valley, has been an economic staple for years, and much of the valley bottom was cleared of Antelope-brush and sage which were the predominant natural vegetation. Of the estimated 30,000 hectares of potential agricultural land in the valley, half is already under cultivation and most of the remaining is anticipated to be converted to agriculture in the near future (Olson, 2001). More recently, grape production for the wine industry has meant conversion of a great deal of the fruit-producing area, and has also resulted in the clearing of hillsides where the remaining Antelope-brush and sage still existed. Butterflies, such as Behr's Hairstreak (*Satyrium behrii*) and Sooty Hairstreak (*Satyrium semiluna*) now find their ecosystem and larval foodplants disappearing from the Okanagan (Guppy et al., 1994; Lafontaine, 2006).



The antelope-brush/sage brush habitat of the Okanagan Valley in south-central BC is disappearing to increased grape production for wines.

FIGURE 7

PROTECTED AREAS AND BUTTERFLIES AT RISK (DEGUISE AND KERR, 2006)



Protected areas (black), ecozones (black lines), extent of human-dominated lands (light gray), or lands with limited human dominance (dark gray) in Canada. Areas in white are water or outside Canadian territory. Human-dominated lands were detected using satellite-based land-use data. More information about Canada's ecozones can be found at <http://www.ccea.org/ecozones/terr.html>

HABITAT PROTECTION AND WILDLIFE GARDENING

Canada has been developing an extensive park system and other protected areas for more than a century. According to the World Database on Protected Areas (UNEP-WCMC, 2006), more than 10% of Canada's total land area falls under some form of protection for wildlife (IUCN categories I-VI). These protected areas, ranging from one square kilometre to 50,000 square kilometres, are scattered among the ecozones in Canada with many of the smaller ecoregions having at least one protected area within their limits. While the protection of habitat within these areas is important, more protection is needed and must be integrated into areas where human demands are growing. The contribution of these spaces to butterfly species conservation, indeed to species at risk conservation more broadly, is suspect.

Canada's continued diversity of butterflies is partially dependent on protection of habitats across the country. Some species rely heavily on existing protected areas. These tend to be the localized species found in

vulnerable habitats. If these habitats fall in protected areas then the species occupying them should have a greater chance of survival than those in areas with no protection. Examples of this are Duke's Skipper (*Euphyes dukesi*) in Point Pelee National Park and other reserves in southwestern Ontario, and Indra Swallowtail (*Papilio indra*) in Manning Provincial Park, southern British Columbia.

Deguisse and Kerr, in their provocative 2006 study of protected areas in Canada and the prospects of these places for protecting endangered species, concluded that for terrestrial species the existing reserves rarely protected endangered species better than a randomly generated electronic reserve network by ecosystems with comparative areas. Of particular significance, several key reserves included fewer endangered species than expected by chance, particularly in the most biologically imperiled regions. Of course, most reserves were not originally set up to protect particular endangered species, but rather to protect spectacular scenery (see Figure 7).

A large number of parks and reserves have been established in the southern Okanagan Valley, but the locations for these parks tend to be higher in the mountainside valleys where recreational activities occur and not down in the valley bottom where the species under threat live. This situation needs review in the Okanagan region as well as elsewhere in Canada.

Deguisse and Kerr (2006) argue that although reserves will continue to play an important role in preserving species, future conservation strategies will require integration of agricultural and urban land-use plans outside formally protected areas. For most endangered species, protected areas and their surrounding regions will protect these species only if management practices are put in place to accomplish this objective.

Future conservation strategies will require integration of agricultural and urban land-use plans outside formally protected areas.

More and more people are taking an interest in butterflies in different ways. For some Canadians, travelling widely to see a variety of species, much like birdwatchers, has become an enjoyable hobby. These people have a strong interest in preserving Canadian species and protecting their habitats. It also adds to the experience of eco-tourists travelling to Canada from abroad.

For still others, it is combining butterfly watching with gardening and, in the process, creating butterfly gardens on their property. Many butterfly books now contain chapters or sections on butterfly gardening and there are even whole books on the topic (see Xerces Society, 1990). These gardens are especially designed to attract butterflies with the right combination of larval foodplants, nectaring sources, shelter and moisture. The actual effect this may have on overall butterfly numbers is difficult to quantify, although those gardens that have monitored the



Butterfly gardening, such as at the Fletcher Wildlife Garden in Ottawa, is becoming a rapidly growing hobby that is aiding a number of butterfly species in Canada.

numbers over the years almost always show an increase in species seen and numbers of individuals. At the Fletcher Wildlife Garden in Ottawa, the number of species has been monitored from its establishment in 1990 on land relatively poor in vegetation cover. In 1990, only nine species of butterfly were recorded. By 2007, following extensive plantings of a wide variety of wildlife-friendly vegetation, the total number that had been sighted over the 17 years had risen to more than 40 species (<http://www.ofnc.ca/fletcher/research/inventories/butterflies.html>).

In areas like southwestern Ontario where butterfly gardens have been established close to Carolinian forests, some of the associated butterfly species that visit these gardens, such as Giant Swallowtail (*Papilio cresphontes*) and Spicebush Swallowtail (*Papilio troilus*), have definitely benefitted.



The Dion Skipper is being found more often in southern Ontario and now Quebec in roadside sedge patches.

TRANSPORTATION ACTIVITIES

The establishment of transportation routes throughout Canada over the centuries has been a mixed blessing for butterflies and other wildlife.

Following the early exploration of Canada by Europeans starting in the sixteenth century, most travel took place along river systems by boat which had little effect on habitats. Only where residences were built and the land cleared was there any alteration in habitats and then this was on a very local scale. Butterfly populations were largely undisturbed until in the 19th century when large scale agriculture and urban development occurred, along with new road development.

This is when vulnerable ecoregions, such as the Carolinian forest in southwestern Ontario, were cleared in a significant way that would affect wildlife, including butterflies. Most of this land conversion would be assumed to be detrimental with cleared or altered

habitats. In addition, more paved roads are generally associated with a drop in butterfly species richness, likely as a result of habitat fragmentation or related urbanization (White and Kerr, 2007). However, many butterflies are sun-loving, and wood- or road-edge open habitat has benefitted some butterfly species with the development of many roadside fields and ditches. Certainly, numbers of butterflies such as the Common Wood-Nymph (*Cercyonis pegala*) and grass-feeding skippers have increased over the years along roads as forests have been cleared.



Roadside sedge patch in Eastern Ontario.

In some cases, roadside ditches have filled with sedges and other suitable butterfly larval foodplants which have thus become restricted to these narrow, continuous wetlands. A number of Ontario skippers that feed on sedges have become more widespread, including Dion Skipper (*Euphyes dion*) and Broad-winged Skipper (*Poanes viator*). Duke's Skipper (*Euphyes dukesi*), which has always been considered rare and local in southwestern Ontario, may actually be increasing its numbers and distribution in roadside ditches in the area (Lafontaine, 2006).

As mentioned in the previous section, several species of butterflies have even expanded their Canadian distribution recently in areas where certain vetches have been seeded to stabilize new roadsides in Ontario and Quebec. Both Wild Indigo Duskywing (*Erynnis baptisiae*) and Silvery Blue (*Glaucopsyche lygdamus*) have been following new road developments as their larvae successfully switched over to these vetches.

While it is true that some species have expanded their distributions by utilizing newly created roadside habitats, a great many individual butterflies are likely killed by passing vehicles. This mortality appears never to have been quantified and would make an excellent topic for future studies.

Railway building, even though it opened up the

country to agriculture and development, has also had a beneficial effect on localized butterfly populations across the country over the centuries. As the railways moved west across the country, they offered rights-of-way on both sides of the lines. These rights-of-way were often left intact and preserved the native plants in existence there. Some of these were foodplants for butterflies and the railway lines have provided limited but continuous native habitats for butterflies in areas such as the prairies where they are surrounded by agricultural crops.

PESTICIDES AND GENETICALLY MODIFIED ORGANISMS

The use of pesticides in agricultural and residential areas has also had a direct effect on butterfly populations. It is difficult to assess the overall impact, but some cases have been documented.

The Viceroy (*Limenitis archippus*) formerly occurred in the southern interior of British Columbia but was last collected in the province at Lillooet in 1930. The Viceroy uses cultivated apple trees as a larval foodplant, as well as other shrubs near orchards, and its decline in numbers in British Columbia parallels the increased use of pesticide spraying in apple orchards. Combined with the loss of riparian habitat favoured by the Viceroy, the increased use of pesticides is believed to be a contributing factor to its decline (Guppy et al., 1994).

In more modern times, the largest concern about the effect of pesticides on butterflies involves the use of the bacterium *Bacillus thuringiensis* (Bt). While considered safer from a human perspective than chemical pesticides, it does target most lepidoptera, and not just Gypsy Moth (*Lymantria dispar*) larvae and other pest species for which the biological pesticide was developed. Widespread use of Bt pesticides in eastern North America to combat the alien Gypsy Moth has resulted in the drop in numbers of most lepidopterans in the east. During a butterfly diversity study carried out in Peterborough County, Ontario, there was a ten-fold decrease in abundance of Canadian Tiger Swallowtails (*Papilio canadensis*) following an aerial spraying for Gypsy Moth conducted by some cottagers (Schappert, 2000).

A genetically modified organism (GMO) is a living plant, animal, or microbe that has been altered by the addition or modification of a gene through the process of genetic engineering. GMOs typically incorporate genes or portions of genes from unrelated organisms.

Controversy arose from comments in a letter to the editor of *Nature* magazine (Losey et al., 1999) concerning GMOs. Cornell University scientists reported

European Common Blue: new alien butterfly to Canada and North America



The European Common Blue was recently discovered by Ara Sarafian (bottom centre) near Mirabel airport in Quebec as an introduced species



Ara Sarafian wasn't sure what blue butterfly he was observing in old fields and ditches around Mirabel Airport, north of Montreal, where he worked. A butterfly enthusiast, he thought it might be a Northern Blue (*Lycaeides idas*) or possibly a Karner Blue (*Lycaeides melissa samuelis*), but neither has ever been recorded from his area and it seemed different from both. Images sent to the Canadian National Collection in Ottawa, were identified as a European Common Blue (*Polyommatus icarus*), one of the most widespread of European butterflies.

Mr. Sarafian had been seeing the butterflies for four years starting in 2005. After a number of butterfly specialists were informed of the find, a further search showed that by later in 2007, the alien butterfly was being seen regularly in an area in southwestern Quebec with a diameter of at least 30 kilometres.

In its widespread European locations, it feeds regularly as a larva on a variety of legume plants, particularly Common Bird's-foot Trefoil (*Lotus corniculatus*). Many of the major clover and trefoil larval foodplants were introduced from Europe and are now found as alien invasives along just about every roadside in North America. Potential sites for the butterfly are particularly easy to find as all it takes is perusal of roadside vegetation patches for the conspicuous yellow Common Bird's-foot Trefoil.

It will be very informative to track this newly introduced species through time and watch its spread. When the European Skipper (*Thymelicus lineola*) first showed up in London, Ontario, about 1910, there were very few butterfly specialists around to track its spreading distribution. Now it is one of the most common butterflies in North America feeding on Timothy Grass (*Phleum pratense*) and other grasses associated with hay fields. Today, there are many more butterfly enthusiasts who can lend a hand in monitoring the European Common Blue.

Peter Hall, Canadian National Collection of Insects, Agriculture and Agri-food Canada, Ottawa, ON.

preliminary results from the effects of Bt corn pollen on Monarchs (*Danaus plexippus*). A Bt gene has been introduced to corn hybrids to protect the crop from the larva of the European Corn Borer (*Ostrinia nubilalis*) moth. The lines of the Bt hybrid corn represent about 95% of the corn planted in North America. The Cornell researchers concluded that the larvae of the Monarch reared on milkweed leaves dusted with pollen from Bt corn, ate less, grew more slowly and suffered higher mortality than larvae reared on leaves heavily dusted with untransformed corn pollen or on leaves without pollen. The lab studies showed that 40% of butterflies died after exposure to the highest concentration of pollen from Bt corn.



Larvae of the Monarch near corn fields have been the subject of controversial studies on the effects of GMOs.

However, further risk assessments conducted by the USDA-APHIS (Animal Plant and Health Inspection Service) and others showed that the probability of occurrence in the field is low. The USDA study said: "Corn pollen is produced for only a short time during the growing season. Corn pollen is heavy and is not blown far from corn fields by the wind. Farmers control the Monarch's primary host plant, milkweed, in and around their fields, just as they control other weeds." Other researchers reported preliminary results that only one of the several types of Bt corn has a significant impact on Monarch survival. This type is being phased out. So it appears that the risks to Monarchs are relatively low and corn hybrid selection can reduce these risks further (Auman-Bauer, 2003).

INVASIVE SPECIES

Canada has many invasive alien species, mainly from Europe and Pacific Rim countries. The list of mammals, birds, beetles, plants, etc. that have made their way here through human activities, in particular, is lengthy and disheartening. Brown Rats, European Starlings, Asian Long-horned Beetles and Purple

Loosestrife have all become unpleasant or damaging fixtures of the Canadian fauna and flora. Some were deliberately introduced, while others arrived accidentally.

Interestingly, with regards to alien butterfly species themselves, only four butterfly species that arrived in Canada from offshore have persisted as invasives. The two most famous cases were European butterflies that arrived through human activities. Several butterfly species have also arrived from the United States, but these newcomers to Canada have been range extensions of species found already in North America. The increasing observations of these butterflies in Canada may have resulted due to increased monitoring and/or because they are species expanding northwards due to factors such as weather conditions or climate change.

With regard to European invasive butterfly species, the Cabbage White (*Pieris rapae*) was first accidentally introduced into North America at Quebec City in the 1860s. Because the caterpillar fed on a wide variety of members of the mustard family, including cabbage, cauliflower and broccoli, it spread rapidly in the next few decades throughout the continent. It was reported as a resident by Alexander Ross in his early book, *The Butterflies and Moths of Canada* (1873). It is now found coast to coast and is one of the most common butterflies in the country, ranging to northern Quebec and the Northwest Territories (Layberry et al., 1998).

...only four butterfly species that arrived in Canada from offshore have persisted as invasives.

The only Canadian butterfly that challenges the Cabbage White as the most common species in Canada is another alien, the European Skipper (*Thymelicus lineola*). It came later, arriving in the London, Ontario area about 1910 in contaminated imported seed of Timothy Grass, its favoured larval foodplant. Timothy is the major plant used for hay production. The European Skipper, too, spread rapidly east and west and became incredibly abundant west to Manitoba and east into the Maritimes. There are also isolated colonies in Saskatchewan, Alberta and British Columbia. In and around a single hayfield throughout its North American range, there can be thousands of individuals at one location. This is somewhat surprising because in England - the most likely origin for this invading butterfly - it is called the Essex Skipper and it tends to be uncommon and local, although it is increasing in numbers and distribution in recent years (Asher et al., 2001). The limiting factors for its abundance in England are clearly not as significant in Canada, or are absent.

In recent years, several other European butterflies have appeared in eastern Canada, mostly in the

Montreal area. A female from Europe of the Peacock (*Nymphalis io*), a striking species with large vivid eyespots on the wings, was collected in 1997 on an island in the St. Lawrence River near the Montreal shipping docks. It likely escaped from one of the incoming ships (Layberry et al., 1998). Surprisingly, the species seems to be continuously distributed in low numbers, east and southeast of Montreal in a 30-square-kilometre area.

The most recent arrival is that of the European Common Blue (*Polyommatus icarus*) which is widespread and common throughout Europe (see case study - European Common Blue). Following its first appearance sometime before 2005, likely in an airplane at the Mirabel Airport north of Montreal, it has been moving steadily outward from the airport and is common throughout its expanding range. Its reliance on a wide variety of introduced legume plants, including Common Bird's-foot Trefoil (*Lotus corniculatus*), should allow it to continue its rapid expansion of range. As a larva it feeds on many of the same weedy or crop legume plants as some of the native blues, such as the Silvery Blue (*Glaucopsyche lygdamus*) and Greenish Blue (*Plebejus saepiolus*). A close eye should be kept on this species and how it might affect our native species (Hall, 2007).

One other near-introduction is worth reporting. In 1970, a Small Tortoiseshell (*Nymphalis urticae*) flew out of a box being unpacked in Halifax, Nova Scotia. The box had been packed in Oxford, United Kingdom. The specimen was caught immediately and is in the Nova Scotia Museum at Halifax (Scott and Wright, 1972).

Some of the introduced butterflies may have had a detrimental effect on the populations of other native butterflies. The Mustard White (*Pieris oleracea*) was noted in the 19th century for being very abundant in its eastern North American range. Following the introduction of the Cabbage White, it disappeared or its numbers were greatly reduced east of the Appalachian Mountains in the United States (Klots, 1951). This was probably because the Mustard White was not able to compete with the Cabbage White. This situation was most likely also true in the Canadian range of the Mustard White.

Alien invasive plants are another important factor related to the distribution and abundance of butterflies in Canada. The introduction of crops from other continents to Canada, from wheat in the prairies to orchards in Nova Scotia, and the subsequent agricultural practices adopted over the centuries, have replaced native habitats and sometimes whole regions to the certain detriment of numbers of many native butterfly species. However, this is very hard to quantify, except where records have been kept in certain localities over the years, particularly for more localized, and more vulnerable, species.

As wheat replaced native grasslands in the prairies, those butterfly species dependent on grasslands, were largely displaced. With only about two percent of tall-grass prairie still remaining in North America, many grassland butterflies are now threatened or endangered. In Canada, these include Dakota Skipper (*Hesperia dacotae*) and Poweshiek Skipperling (*Oarisma poweshiek*) as well as Regal Fritillary (*Speyeria idalia*).

The remaining native habitats, such as tall-grass prairie reserves, must be protected from further agricultural growth and efforts should be made to eliminate or decrease, where possible, the invasion of foreign plant species that would take over the native habitats.

With only about two percent of tall-grass prairie still remaining in North America, many grassland butterflies are now threatened or endangered.

The number of plant species accidentally or deliberately introduced from abroad is increasing at an alarming rate. For most, it is not understood what their effect might be on native plant populations, or their direct or secondary effect on butterfly populations. Some butterfly species will decline; others may prosper. Despite having what may be one of the best understood butterfly faunas in the world, our knowledge is still just at the "tip of the iceberg" stage for understanding and managing these ever-increasing risks or opportunities of introduced plants to our butterflies.

Below are a few examples of butterflies in Canada being directly affected by non-agricultural alien plant species.

The West Virginia White (*Pieris virginianensis*) is a delicate, normally uncommon woodland species occurring from the Appalachian Mountains to southern Ontario. Once considered threatened in southern Ontario, it was subsequently taken off the provincial endangered list as new colonies were found farther north. However, it has been subsequently determined in the United States that Garlic Mustard (*Alliaria petiolata* = *A. officinalis*), a European mustard which has for many years been invading the eastern United States, inhibits the larvae. While West Virginia White females readily lay eggs on the plant, the caterpillars do not survive. Where Garlic Mustard is increasingly common, the white butterfly is disappearing (Cech and Tudor, 2005).

In southern British Columbia, in the Okanagan and Lower Similkameen Valleys, wholesale habitat conversion and aggressive weeds are primary threats to several butterflies (Kondla et al., 1999). These

specific butterflies are Behr's Hairstreak (*Satyrium behrii*), Mormon Metalmark (*Apodemia mormo*) and Sooty Hairstreak (*Satyrium semiluna*).



The Delaware Skipper and the Eastern Tailed Blue have become common in eastern Ontario in recent years, likely due to warming winters.



In 1849, a Scotch immigrant planted some Scotch Broom near Sooke on southern Vancouver Island. It spread rapidly and has now taken over much of the native understory in the Garry Oak woodlands, eliminating native plants upon which rare butterflies, such as Propertius Duskywing (*Erynnis propertius*) and Moss's Elfin (*Callophrys mossii*), depend (British Columbia Ministry of Environment, 1999).

Of course, there are a few butterfly species that have benefitted by the introduction of alien plants as their larvae have been able to switch over to some of these invaders (see case study - Wild Indigo Duskywing). Henry's Elfin (*Callophrys henrici*) in eastern Canada has benefitted from its recent adoption of the introduced Glossy Buckthorn (*Rhamnus frangula*) as a larval foodplant.

CLIMATE CHANGE

The recent attention to the effects of greenhouse gas production on our climate has moved this phenomenon from being an obscure theory to a front-row reality. Much of the focus has been on approaches to monitor and mitigate the effects on humans. However, in the past ten years a great deal more attention has gone into assessing the effects of climate change on a wide variety of plants and animals, including butterflies.

Studies on the looming effects of climate change on butterfly populations, including distribution changes and likely extinctions, have occurred in countries as far apart as Australia and Egypt (Beaumont and Hughes, 2002; Hoyle and James, 2005). However, the most attention to this phenomenon has developed in Europe where many studies have emerged. The most comprehensive was that led by Camille Parmesan that reported in *Nature* on poleward shifts of a range of resident butterfly species associated with regional warming. Parmesan and her team reached the conclusion that in a sample of 35 non-migratory European butterflies, 63% have shifted their distribution to the north by 35-240 km during the 20th century, and only 3% shifted to the south (Parmesan et al., 1999).

In 2007 the London, England, newspaper, *The Independent*, reported that of the 59 resident butterfly species in England, 37 appeared earlier than normal and 11 broke all records for early emergence, some by more than a month. Other reported effects of climate change on butterflies include larger bodies in some species and second generations in the same year of some species that normally produce only one generation near the northern edge of their range.

North America, including Canada, has also some documented changes to butterfly distributions and habits as a result of climate change. The Jasper Ridge, California, populations of the Edith's Checkerspot (*Euphydryas editha*) have been subjected to several studies since the 1960s. However, these populations disappeared in the 1990s due to increased rainfall variability in the region (McLaughlin et al., 2002).

Canadian butterflies will undoubtedly continue to be affected by changes to the Canadian climate resulting from greenhouse gas emissions. Rising temperatures, greater variation in precipitation, and other effects are already changing species distributions and habits. To date observations of these changes have been mostly anecdotal in this country, but the evidence is building.

In eastern Ontario, a region that has been intensely studied for a century, observers have recorded several noteworthy changes to the butterfly fauna in the last decade. As a possible result of climate warming, new species have appeared in the region, populations of formerly rare species have increased

Giant Swallowtail: northern incursion of a southern belle



The Giant Swallowtail has been moving northeastward across Ontario in recent years.

The Giant Swallowtail (*Papilio cresphontes*) is our largest, and one of our showiest, butterflies, even among swallowtails, but until recently to be assured of seeing this butterfly in Canada one had to travel to Point Pelee National Park, Pelee Island, or a few other locations in the Carolinian zone of southwestern Ontario - Canada's "Deep South". The clearly southern affinities of this butterfly are embodied in the name of its caterpillar, the Orange Dog, a reference to this species' fondness for orange and other citrus trees as a larval foodplant. At its northern limit in Canada it has to content itself with less exotic members of the citrus family (Rutaceae), including Hop Tree (*Ptelea trifoliata*), Prickly-ash (*Zanthoxylum americanum*), and occasionally in gardens Common Rue (*Ruta graveolens*) and Gas Plant (*Dictamnus*).

In the early 21st century, the Giant Swallowtail has expanded northward dramatically in southern Ontario, well beyond the Carolinian zone, with numerous reports from areas north of Lake Ontario where it was previously known only as a very occasional rare stray. Observations of this recent influx extend from Owen Sound and Port Elgin on the eastern shore of Lake Huron to Awenda Provincial Park and Norland near Georgian Bay, and along Lake Ontario from Toronto to Kingston. Breeding colonies have been established on Prickly-ash as far north as Minesing Swamp near Barrie, and in Prince Edward County at the eastern end of Lake Ontario where the butterflies have become a common sight in late summer. Many reports of this expansion have come from gardens in cities and towns, where the adults frequently pause to nectar in flower beds. There have also been numerous observations of females laying eggs on ornamental Hop Trees or patches of Common Rue in gardens, a testament to the ability of these butterflies to seek out and find isolated hostplants.

Although it is tempting to ascribe the northward expansion of the Giant Swallowtail to climate change, this species has long been known to expand and contract its range periodically. Its propensity to wander is well illustrated by a few stray individuals that have occurred over the years in such unexpected places as Winnipeg, Manitoba, Montreal, Quebec (where it bred briefly in the late 1800s), and Windsor Junction, Nova Scotia. The celebrated 19th-century American lepidopterist Samuel Scudder observed that the Giant Swallowtail was once even more southern than it is today, and that it expanded significantly into northeastern North America in the mid-to-late 1800s. Nevertheless, the expansion of this species in Ontario may be a bellwether of things to come, as southern species are expected to expand gradually northward in response to a warming climate.

Jeff Crolla, Ontario/Quebec Zone Coordinator, The Lepidopterists' Society

Rocky Mountain Parnassian: shrinking high-altitude meadows



As more trees invade high mountain valleys due to climate change, species such as the Rocky Mountain Parnassian are becoming more reproductively isolated.



The Rocky Mountain Parnassian (*Parnassius smintheus*) is a beautiful black and white member of the swallowtail butterfly family that lives mainly at higher elevations in alpine meadows in western Canada. Availability of these meadows is critical to this species' survival as it requires plenty of sunlight and access to its larval foodplant – stonecrops (*Sedum* spp.) which thrive in high meadows.

Jens Roland from the University of Alberta (Smith, 2005) began studying butterfly dispersal and genetic variability in the Kananaskis region of the Alberta Rockies. Looking into the situation with the Rocky Mountain Parnassian, he found a direct correlation between decreased genetic diversity and the diminishing size of the meadows. He attributed this to rising treelines in the mountains due to global warming and suppression of fires outside of national parks.

The parnassians tend to avoid flying in shady, wooded areas; so they stick to their now diminishing meadows which translates into increased inbreeding in these areas and decreased diversity in the gene pool. Roland concluded that this trend leaves such species more vulnerable to a range of mortality factors which then lead to a lowering of survival rates. He recommends that more prescribed forest burning be practised to increase meadow sizes.

Peter Hall, Canadian National Collection of Insects, Agriculture and Agri-food Canada, Ottawa, ON.

and several generations for one species has occurred (Layberry, 2007).

Canadian butterflies will undoubtedly continue to be affected by changes to the Canadian climate resulting from greenhouse gas emissions.

The most noteworthy of the new species, the Delaware Skipper (*Anatrytone logan*), went from no record to common throughout the Ottawa district, including the Quebec side of the Ottawa River in less than five years. Also now recorded as resident in the Ottawa district, but highly localized, are the more typical Carolinian species – Hackberry Emperor (*Asterocampa celtis*), Pearl Crescent (*Phyciodes tharos*) and Eastern Tiger Swallowtail (*Papilio glaucus*). The last is likely a transitional form between the Eastern and the Canadian Tiger Swallowtails, but looks identical to, and has the second generation of the Eastern Tiger Swallowtail. As well, certain other Carolinian species have strayed in recent years into the Ottawa district.

These include Giant Swallowtail (*Papilio cresphontes*), Spicebush Swallowtail (*Papilio troilus*) and Fiery Skipper (*Hylephila phyleus*). The Giant Swallowtail, in particular, because it is a large, roving species, has now produced in recent years sizable breeding populations in Prince Edward County on the north shore of Lake Ontario (see case study - Giant Swallowtail).

Those species in eastern Ontario that have gone from a rare stray to common resident in recent years include the Eastern Tailed Blue (*Cupido comyntas*) which can now be found commonly in many old field habitats and cultivated legume fields throughout the region. Also showing increased population numbers is the Common Roadside Skipper (*Amblyscirtes vialis*).

Another species with the newly recorded second generation for eastern Ontario is the Tawny-edged Skipper (*Polites themistocles*). It was always relatively common from early June to mid-July, but was first noticed for its second breeding event in late August, 1999, in the Rideau Lakes area and subsequently has been seen in late August in the Ottawa area.

For all of the species noted above, it is important to note there is as yet no substantiated proof that climate change is the main factor for their appearance or increased numbers in eastern Ontario. However, climate change and other possible factors, such as habitat alteration or climate variability, are now being studied more closely by scientists at the University of Ottawa to try to shed more light on this situation.

In other parts of Canada, studies on climate change and species distributions are also being conducted. Studies at the University of Alberta have shown that Parnassius butterflies that breed in high mountain meadows are losing their genetic diversity due to increased inbreeding (Smith, 2005). As the treeline moves up the mountains and woody plants in the form of trees and shrubs encroaches more and more into the meadows, these meadow habitats shrink and become isolated from each other resulting in less genetic mixing in the Parnassian butterfly populations (see case study - Rocky Mountain Parnassian).

Ecological niche modelling has become a new tool for ecologists to strive for a more quantitative, validated and predictive approach for estimating future potential geographic distributions of animals, including butterflies, in the face of climate change and other factors. In general, depending on the severity of the climate change calculated and the distribution modelling tool chosen, butterfly species richness would take a northward shift in Canada. As well, some species would lose a percentage of their present distribution. Some butterflies will not be able to move north if their habitat or larval foodplants are not able to move north simultaneously due to soil differences or other factors. Several species, such as Polixenes Arctic (*Oeneis polixenes*) in eastern Canada and Harvester (*Feniseca tarquinius*) in western Canada, could end up as disjunct populations with distribution changes (Peterson et al., 2004; White and Kerr, 2006; Kerr, 2001).

NATURAL LOSSES (SPECIES INTERACTIONS AND NATURAL EVENTS)

Butterflies, as with all animals, are part of predator-prey relationships that will impact on the ability of butterflies to successfully reproduce. Most butterflies fall into the prey category at all stages of their lifecycle. [For much more on butterfly behaviour, including predators, see Schappert (2000) and Pyle (1984)]. Birds, spiders, dragonflies, ambush bugs, ants, parasitic wasps and flies, and many other smaller predators regularly take butterflies as food. As well, various fungi and disease pathogens also take their toll, particularly among larvae. However, the overall impact of this predation on individual species is very hard to quantify.

While Venter et al. (2006) state that 20% of the but-

terfly species assessed as at risk by COSEWIC face specific endangerment threats from species interactions, including predators and pathogens, this may be difficult to establish clearly.



Crab spiders are one of the most efficient of butterfly predators as they hide on flower heads awaiting their prey.

Some butterfly species are better equipped through evolution to avoid predation than others. Loss avoidance adaptations include mimicry, camouflage, distastefulness, and flight behaviour. While much has been written on these factors, the long-term effect on population numbers is again difficult to quantify. In evolutionary terms, those with the best adaptations to avoid predators are most likely to be successful in reproducing. However, there are well-camouflaged species that are still quite rare. Also, there are gaudy, non-distasteful species that are common. Suffice it say that the accumulated effects of all these factors on species survival is unknown and much research still needs to be done.

The same is true of the effects of weather and other natural conditions. Storms, frosts, fires, droughts and floods must take a huge toll. The elements are likely to account for as big a loss of butterfly numbers as predators, parasites and diseases put together (Pyle, 1984).

In 2000, Monarch (*Danaus plexippus*) over-wintering sites in the valleys of central Mexico were devastated after three tremendous storms hit the region. The valleys were ankle deep in dead Monarchs. Estimates of Monarch losses in these, their largest winter sites, ranged up to 80%. However, Monarch numbers had returned to near normal population sizes during the next two years. Their ability to recover to normal numbers is astounding. The same may likely be true of many species facing such challenges.

Species in which existing populations are very small and/or local are at greater risk. In these situations, storms, fires or disease could wipe out local populations with no chance of recovery if there are no neighbouring populations to re-populate the sites. This is a situation to monitor carefully in areas such as the Garry Oak woodlands of British Columbia, the Carolinian forests of southern Ontario, and the tidal marshes of the Maritimes with their remnant populations of species at risk.

Fires can be both a risk and an opportunity for some butterfly populations. While fires of high intensity could wipe out local populations, they are also required periodically to suppress trees and shrubs from encroaching upon meadow, savannah and other open habitats that some species depend on. The loss of several Carolinian butterfly species -Karner Blue, Frosted Elfin and Persius Duskywing- in southern Ontario was largely due to fire suppression in the oak savannas where lupines, their larval foodplants, grow. The lupines were eventually shaded out and largely disappeared.

Species in which existing populations are very small and/or local are at greater risk.

First Nations used to set fires regularly to clear brush for agricultural purposes. Because of this activity, certain butterflies, such as the Gorgone Checkerspot (*Chlosyne gorgone*) in eastern Ontario and Garry Oak butterfly species on southern Vancouver Island were able to maintain their populations through time.

OBSERVING, COLLECTING, EXHIBITING AND OTHER EXPLOITATIVE ACTIVITIES



The increasingly frequent release of butterflies at weddings and other events could pose threats to some butterfly species.

People have collected butterflies for pleasure or science for centuries, and this activity has created a certain controversy in recent years. The same was true of bird collectors up until the early part of the last century and cases are known of bird species that became extinct due to over-collecting when the species had declined to only a few individuals in the wild. Legislation has ended bird collecting in many parts of the world.

There are no known cases of butterflies going extinct due to human collecting. Butterfly collecting and observation have also been the sources of most of our present knowledge on butterfly distributions and

numbers, as this information is based on specimens in museum and private collections, and observation records maintained by many amateur lepidopterists. The Canadian Biodiversity Information Facility hosts a butterfly database of about 300,000 records largely based on the Canadian National Collection of Insects and provincial museum collections.

With modern binoculars and cameras, butterfly observation has been made infinitely more precise and appealing for many people. However, many species still require close viewing by an expert to establish an accurate identification. Few of us can identify the rarer duskywings in situ and even fewer in flight, and a voucher specimen in an accessible collection sometimes is required for scientific purposes. It's difficult to protect a species through conservation efforts if you don't know its full range, cannot define its habitat requirements precisely, and cannot identify it with certainty. This is particularly true in northern Canada where our present knowledge of butterfly distributions is meager.

An exploitation trend that should be monitored carefully in Canada is the use of butterflies as embellishment to human social and recreational activities. The release of butterflies at weddings, birthday parties and other events has become very popular in recent years. The butterflies are supplied by companies that raise them as livestock and then deliver them to the event as pupae or adults. As these are usually common species such as Monarchs (*Danaus plexippus*) and Painted Ladies (*Vanessa cardui*) that are not usually taken from the wild, the risk to the species from this activity is probably negligible. However, if the released butterflies are from a different population than the local butterflies in the area of release, there are risks.

It is important to note that the genetics of cultured butterflies may be different from the local population at the point of release. For instance, Monarchs captured or raised in the west, should not be released in eastern Canada, for this may result in a mingling of genes in subsequent pairings of members of the



Live butterfly exhibits have become more popular around the world in recent years.

two different populations that may affect the species' knowledge of where and how to migrate. Another risk is that of importing diseases and parasites from one population to the next.

A growing trend for tourism purposes is the establishment of live butterfly exhibits under glass. These have become very popular, particularly in Europe and North America, and there are several in Canada including a large one, the Niagara Parks Butterfly Conservatory, at Niagara Falls. As an educational and awareness tool to increase appreciation of butterflies, they are very useful. If they are well managed and rely on butterflies raised on butterfly farms or at the exhibits themselves for that purpose, then they are a positive force in butterfly conservation. However, species should never be released or allowed to escape in areas where they do not normally live, as this could potentially introduce an invasive species.

LEGISLATION AND REGULATIONS

The Species at Risk Act (SARA), which came into force in June 2003, protects wildlife found on Canadian federal lands as well as their critical habitat. Under the Accord for the Protection of Species at Risk, the Government of Canada works collaboratively with the provinces and territories in the development of a joint species-at-risk protection approach in Canada, including laws and complementary programs for the protection of habitats and the recovery of species. Federal, provincial and territorial governments agreed to co-ordinate activities by creating the Canadian Endangered Species Conservation Council. The Council is made up of federal ministers of Environment, Fisheries and Oceans, and Heritage, in addition with the provincial and territorial ministers who are responsible 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.

Given an important role in making recommendations regarding a species status under SARA, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is responsible to evaluate the status of wildlife at risk in Canada. Established in 1977, it brings together wildlife experts who assess scientific reports on the status of species suspected to be at risk.

According to the Species at Risk Act, the Government of Canada takes COSEWIC's classification into consideration when establishing the List of Wildlife Species at Risk. See Table 2 for a detailed account



The beautiful Black Swallowtail is protected from over collection in Ontario under the Fish and Wildlife Conservation Act (1999) but is not considered "at risk" and is therefore not listed under Ontario's Endangered Species Act (2007).

of butterflies listed under SARA and the COSEWIC candidate list. For further information on federal efforts concerning species at risk in Canada see www.speciesatrisk.gc.ca.

Among the provinces, only four (Ontario, New Brunswick, Alberta and Manitoba) have specific provincial legislation to protect some butterfly species considered at risk. Other provinces have listed species of butterflies at-risk but have not yet engaged provincial legislation for their protection.

In Ontario, there are two pieces of legislation that protect butterflies, including the Fish and Wildlife Conservation Act (1999) and the Endangered Species Act (2007). Prior to 1999, Ontario had an endangered species list that included a few butterflies, but there was no protection for these species. The first on this list was the West Virginia White (*Pieris virginiensis*), but it was withdrawn in 1990 after new, more widespread populations were found in Ontario. Later in the '90s, the Frosted Elfin (*Callophrys irus*) and the Karner Blue (*Lycaeides melissa samuelis*) were added to the list, though they had already been extirpated from the province (Layberry et al., 1998; Schappert, 2000).

In 1999, Ontario passed a new Fish and Wildlife Conservation Act that includes protection for some butterfly species. There are 11 butterfly species designated as Specially Protected Invertebrates in Schedule 11 of the Ontario Fish and Wildlife Conservation Act. These include: The Karner Blue; the West Virginia White; the Mottled Duskywing (*Erynnis martialis*); the Bog Elfin (*Callophrys lanoraieensis*); the Monarch (*Danaus plexippus*); and the six species of swallowtails recorded in Ontario, all of which are "attractive" but none of which is at risk; these are the Black (*Papilio polyxenes*), Giant (*Papilio cresphontes*), Pipevine (*Battus philenor*), Old World (*Papilio Machaon*), Zebra (*Eurytides Marcellus*) and Eastern Tiger (*Papilio glaucus*)—not the Canadian Tiger (*Papilio canadensis*). The Act carries a number of restrictions.

Legal Tools to Protect Butterfly Habitat

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. As an example, in British Columbia, a range of instruments including the Wildlife Act, the Municipal Act, the Forest and Range Practices Act, the development of Agricultural Land Reserves, the Environmental Assessment Act, the Ecological Reserve Act and the BC Park Act can be used to protect butterfly habitat. Through many of these acts, specific guidelines and best practices must be followed and can work to ensure that important natural habitats are conserved. On privately owned lands, a range of planning tools, agreements and covenants on title can be used to protect habitat. In British Columbia, the Municipal Act can control what areas are developed and what areas remain natural through zoning controls, for example through the designation of environmentally sensitive areas. In addition, the Wildlife Act allows the government to establish agreements to protect wildlife habitat. The Land Title Act and the Land Title Amendment Act of 1994 allow for the creation of conservation covenants, which are use-restrictions placed directly on the deed for a property and which can protect in perpetuity areas of importance to butterflies on private land. Similar tools exist in all Canadian jurisdictions and have the potential to support butterfly conservation.

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It prohibits collecting for any purpose, other than scientific with permits, of any of the named species and the keeping of any of these butterflies in captivity except one per person for educational purposes.

In 2007, Ontario passed the Endangered Species Act that provides additional protection for butterfly species at risk. The Act includes species assessed by the Committee on the Status of Species at Risk in Ontario (COSSARO) and reported to the Minister of Natural Resources in Ontario. COSSARO members also review national status reports and assessments for those species that occur in Ontario. In addition to a large number of other plant and animal species, the ESA currently lists several butterfly species, including the Eastern Persius Duskywing (*Erynnis persius persius*), Frosted Elfin (*Callophrys irus*), Karner Blue (*Lycaeides melissa samuelis*), Monarch (*Danaus plexippus*), and West Virginia White (*Pieris virginiensis*). In addition to placing restrictions related to individual butterfly species listed in the Act, the ESA provides protection

for their habitats.

New Brunswick has also enacted protective legislation. The province placed the Maritime Ringlet (*Coenonympha nipisiquit*) on its endangered species list because of its limited range and specialized salt marsh habitat. The province has set up a monitoring program for the butterfly and is working with local landowners on stewardship programs to protect these important salt marshes.

The Manitoba government enacted a Species at Risk Act in 1990. It lists three butterfly species, including Dakota Skipper (*Hesperia dacotae*) now endangered, Ottoe Skipper (*Hesperia ottoe*) threatened, and Riding's Satyr (*Neominois ridingsii*) which has been extirpated from the province.

Alberta has an Endangered Species Conservation Committee (ESCC) that advises the provincial government and produces periodic reports which include species recently assessed and species listed under the Wildlife Act. Currently Weidemeyer's Admiral (*Limenitis weidemeyeri*) is awaiting regulation development and a provisional management plan will be prepared.

In British Columbia, the government, working with NGOs such as the Nature Conservancy 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. Private landowners are encouraged to save appropriate habitat. Most of these are contained in the Garry

Oak ecosystem of this region. However, none of these species is contained in any provincial legislation aimed at protecting them.

It should also be noted that an international treaty exists which is meant to control the trade of rare species of plants and animals. Called the Convention on the International Trade in Endangered Species (CITES), this treaty, signed by Canada, lists a number of butterfly species for which restrictions on international trade have been placed, but no butterfly species found in Canada are on the list.

Recommendations

OVERVIEW

While a large number of Canada's butterfly populations may be under pressure and some species are definitely at risk, this report illustrates efforts by individuals and organizations to better understand and protect Canada's butterflies.

With respect to understanding butterflies, monitoring and research on butterfly species, their distribution and their habitats continues across the country, particularly related to climate change and habitat loss. Taxonomic work, especially involving DNA studies, also continues and is helping to demonstrate more clearly the relationships among species. A basic understanding of butterfly biology is needed to focus conservation and protection efforts.

While some species are offered legal protection through federal and in some cases provincial legislation, more work to protect butterfly species at risk is critical. Many conservation organizations and governments have set aside or improved lands critical to species at risk; however, butterflies are usually incidental beneficiaries of this protection. They are rarely the direct focus of conservation and protection efforts, though education and awareness programs concerning butterflies are becoming more common.

It is important to note that much of the harm that we do in this country to butterflies is not deliberate, but rather the result of not being aware that activities can be injurious to butterflies. As examples, the riding of all-terrain vehicles through sensitive habitats, the spraying of pesticides or the release of butterflies at special events can all have an impact on butterfly health. Basic education and outreach can help to address these pressures as either complements to legislation or as activities to conserve in their own right.

As for other species of plants and animals, Canadians need to do much more to understand, conserve and protect butterfly species in Canada. The following recommendations may help educators as well as decision makers in governments, NGOs, and the private sector to take more interest in butterfly conservation and to develop more focussed projects that will benefit all Canada's butterfly species.

RESEARCH

Issue: Many Canadian butterflies now have well-known life histories. However, there are some, particularly arctic/alpine species in remote and isolated habitats, of which there is little known. Biologists need a basic understanding of the life history of all known species to understand any threats to their survival, to support good conservation, and to be able to understand the status of a species in Canada.

Recommendation: Support research for those butterfly species for which there are gaps or inconsistencies in the knowledge of their life histories and taxonomy.

Issue: Key to butterfly protection in Canada is a solid understanding of what species are found where in Canada. Over the years, observers have been building data and maps based on field work that reveal a picture of what butterfly species are in Canada (300 species) and provide information on where they occur. Many of these data have been amassed into the CBIF database publicly available at http://www.cbif.gc.ca/portal/digir-class.php?p_classid=1&p_lang=en. For some species, the depiction of their distribution is probably pretty accurate. For others it is, at best, only a partial picture. There may also be butterflies that have not yet been documented by science, and their distribution is completely unknown.

Recommendation: Continue to carry out fieldwork on butterfly distributions in Canada and ensure results are deposited in long-term databases such as those maintained on the CBIF website and by NatureServe Canada's Conservation Data Centres. Ensure data are readily available to support and focus future research.

Issue: It is evident from this report that butterflies, like other species, are vulnerable to climate change. In many ways, butterflies are similar to "the canary in the coal mine", as they are relatively well known compared to other insects and extensive data are already available which are now being used for climate change studies. It is imperative that the important changes to butterfly distributions and life histories be monitored and recorded, and that the resulting data be made available for continued and expanded scientific research related to climate change. This is particularly important for butterflies in the arctic/alpine regions, as those regions are among the most heavily impacted in the world by climate change.

Recommendation: Increase the number of scientific studies on butterflies known to be at risk from climate change and make all resulting data available to specialists in other disciplines, such as conservationists, climatologists and distribution modellers, for work on climate change.

MONITORING AND ASSESSMENT

Issue: Monitoring activities that target butterfly populations in Canada are largely concentrated on the relatively small numbers of species that are considered highly at risk, particularly those requiring a recovery strategy and action plan or a management plan under the federal Species at Risk Act. This monitoring should continue with the support of COSEWIC and its partners. However, there are some species that are not yet considered at risk officially, but are starting to show signs that their populations are diminishing, or will likely diminish due to human-related factors.

Recommendation: Those species potentially at some level of risk in the future or that could be harmful aliens should be monitored in the field by the appropriate organizations.

Issue: At present, there are many butterfly species assessed at some level of risk in Canada (see Appendix B). These assessments have been completed by different levels of government or conservation NGOs. While some butterfly species are recognized by all or most of these assessments as requiring some level of protection, there are differences among the status rankings.

Recommendation: Develop a consensus list of Canadian butterflies that are at risk at the national and subnational levels based on scientific facts and work with international organizations on global lists.

Issue: A list of proposed butterfly species has been submitted by COSEWIC to SARA for further study and possible listing. Monitoring and survey work for many of these species is spotty at best and it is known that some of these species are disappearing from known sites in their range.

Recommendation: Formalize butterfly and other species ranking activities with appropriate funding as soon as possible. Where necessary, follow through with timely development of strategic plans for species preservation.

SPECIES PROTECTION

Issue: While there is federal legislation under the Species at Risk Act that can be called upon to protect butterfly species at risk, only four provinces currently have similar provincial legislation that is protecting butterflies.

Recommendation: All provinces and territories should enact appropriate legislation for species at risk that will be used to protect butterflies of special concern in those jurisdictions.

Issue: The best known of Canadian butterflies, the Monarch, is now the subject of management plans under both SARA and the North American Free Trade Agreement (NAFTA). As an “endangered phenomenon”, the Monarch has become a symbol of butterfly, and more broadly, insect preservation activities in North America.

Recommendation: Adopt the recommendations from the two Monarch strategy plans as soon as they are completed. Specifically, review provincial and municipal weed control legislation to ensure the preservation of their larval foodplant, i.e., milkweed species.

Issue: In a number of countries, protective legislation for butterflies has been adopted that is not based on science, but purely on human aesthetics. The principle adopted appears to protect the most beautiful of a nation’s butterflies, not those most at risk. This well-meaning but ineffectual approach often sets up legal obstacles to further scientific work on these more charismatic species, such as life history rearing and scientific collections, that may impede protection down the road if required based on scientific knowledge.

Recommendation: Base any protective legislation on scientific facts and avoid blanket restrictions on collecting for scientific purposes. In addition, do not make applications for scientific work on potential species at risk so onerous that scientists will avoid making such applications.

Issue: There are certain butterfly species that would not currently be candidates for protective legislation in Canada because their numbers or distribution appears unaltered in this country. However, evidence is mounting that they are disappearing from known sites in the United States. These include species such as the Tawny Crescent (*Phyciodes batesii*) and Harris’s Checkerspot (*Chlosyne harrisii*).

Recommendation: Encourage protection for Canadian populations of butterfly species that are becoming at risk in the United States.

HABITAT PROTECTION/ENHANCEMENT

Issue: Certain butterfly species mentioned in this report inhabit restricted and vulnerable ecosystems that are at great risk such as the Garry Oak woodlands and southern Okanagan brushlands in British Columbia, tall-grass prairies in Manitoba, Carolinian forests in southern Ontario, and salt marshes in the Maritimes. These ecosystems require protection or enhancement in order that many butterfly species within them will not disappear. Without adequate conservation, these areas will continue to deteriorate until species will start to disappear.

Recommendation: Set aside, protect and enhance where necessary as much area in these vulnerable ecosystems and butterfly hotspots as possible.

Issue: About 10% of Canada has been set aside as protected areas for wildlife (UNEP-WCMC, 2006), taking into account a large number of factors such as human needs and economic viability. These protected areas should be monitored for butterflies, and where necessary expanded or adjusted, to reflect emerging new factors such as climate change.

Recommendation: Review the viability of protected areas in vulnerable ecosystems or butterfly hotspots and make the necessary adjustments to ensure continued preservation of species that may alter their distributions over time with climate change.

HABITAT PROTECTION/ENHANCEMENT CONT'D

Issue: With increased trade globalization, more potentially weedy or damaging plant species from other countries are entering this country. These alien invasive species have the potential to displace native plant and animal species over time. This is happening already with a variety of weeds, such as Scotch Broom (*Cytisus scoparius*) in British Columbia and Dog-strangling Vine (*Cynanchum rossicum*) in Ontario that are replacing many native butterfly foodplants.

Recommendation: Continue to be vigilant in preventing alien invasive species from entering this country and move as quickly as possible to eradicate weedy invasives when they first get established in Canada. Support implementation of an Alien Invasive Species Strategy for Canada, considering butterflies as a key indicator of weedy invasives.

Issue: While existing protected areas may be important to preserve our native species, many at risk Canadian butterfly species do not occur within these areas. In reality, many of our most vulnerable butterfly species exist on the edge or entirely outside our protected areas, particularly in agricultural lands.

Recommendation: Ensure conservation strategies protect areas where vulnerable butterfly species are resident and where lands are actively managed for other uses and build habitat corridors between nearby protected areas for species to intermingle and expand their genetic base.

Issue: Railway rights-of-way have become some of the best native habitat areas in Canada. Many also act as corridors between butterfly hotspots. They could also be conduits for invasive plants and animals that could affect butterfly populations.

Recommendation: Continue to preserve and protect existing railway rights-of-way as species corridors and protect and enhance where possible the production of native plants in these rights-of-way. These areas should also be monitored regularly for possible invasive plants and animals.

Issue: Private, corporate and public landowners invest annually in gardens to help beautify their properties, which may also act as butterfly habitat. Many private landowners in recent years have been incorporating wildlife gardening techniques to enhance their properties and make them attractive to species such as butterflies. Private sector enterprises, educational institutions and governments have also been encouraging their employees to establish wildlife gardens on institutional properties.

Recommendation: Individuals and organizations should be encouraged to adopt wildlife gardening approaches on their properties as a means to create butterfly habitat.

Issue: In the past, many individuals and organizations have adopted blanket spraying of insecticides in an effort to protect their property investments. Certain of these pesticides, such as Bt, are detrimental to all lepidoptera, in addition to the other invertebrate target species. Such blanket spraying has eliminated most of the lepidopterous insects in the sprayed areas, including vulnerable species.

Recommendation: Make blanket spraying of pesticides illegal.

EDUCATION AND AWARENESS

Issue: People, children in particular, are naturally attracted to butterflies. This natural interest represents an opportunity to share information concerning butterflies and their well-being, and to engage in butterfly conservation. In particular, a combination of butterfly watching and gardening holds many attractions.

Recommendation: Promote and support public butterfly education activities such as wildlife and butterfly festivals and publicize butterfly and wildlife gardening efforts wherever possible.

Issue: The possible effects of climate change and the resulting impact on biodiversity are very much in the public mind these days through the media. Climate change and biodiversity have also become major topics for science studies in schools.

Recommendation: Develop curricula for schools in Canada that are drawn from studies on climate change and its effects on butterfly populations, and develop media guidelines to explain the links between butterfly conservation and climate change.

Issue: To minimize the human effects on butterfly populations, the public should be aware of the effects of activities such as butterfly releases at special events, introduction of alien invasive species (plants, other butterflies) and pesticide spraying.

Recommendation: Educate the public on the impact of certain human activities that will negatively affect butterfly populations and health.

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Appendices

APPENDIX A RECENT NAME CHANGES AND NEW BUTTERFLIES IN CANADA (J.D. Lafontaine)

Butterflies of Canada (1998)

Pelham list (2008)

Name changes to species due to return to original spelling

<i>Papilio multicaudatus</i>	<i>Papilio multicaudata</i>
<i>Lycaena cuprea</i>	<i>Lycaena cupreus</i>
<i>Lycaena rubida</i>	<i>Lycaena rubidus</i>
<i>Satyrium acadicum</i>	<i>Satyrium acadica</i>
<i>Satyrium californicum</i>	<i>Satyrium californica</i>
<i>Satyrium sylvanicum</i>	<i>Satyrium sylvanica</i>
<i>Satyrium caryaevorum</i>	<i>Satyrium caryaevora</i>
<i>Callophrys grynea</i>	<i>Callophrys gryneus</i>
<i>Callophrys polia</i>	<i>Callophrys polios</i>
<i>Phyciodes pallidus</i>	<i>Phyciodes pallida</i>

Name changes from generic transfers

<i>Amblyscirtes simius</i>	<i>Notamblyscirtes simius</i>
<i>Eurema lisa</i>	<i>Pyrisitia lisa</i>
<i>Eurema nicippe</i>	<i>Abaeis nicippe</i>
<i>Everes comyntas</i>	<i>Cupido comyntas</i>
<i>Everes amyntula</i>	<i>Cupido amyntula</i>
<i>Hemiargus isola</i>	<i>Echinargus isola</i>
<i>Lycaeides</i> (2 species)	<i>Plebejus</i> (becomes 3 species)
<i>Icaricia</i> (3 species)	<i>Plebejus</i> (3 species)
<i>Vacciniina optilete</i>	<i>Plebejus optilete</i>
<i>Agriades glandon</i>	<i>Plebejus glandon</i>
<i>Nymphalis milberti</i>	<i>Aglais milberti</i>
<i>Enodia anthedon</i>	<i>Lethe anthedon</i>
<i>Satyrodes eurydice</i>	<i>Lethe eurydice</i>
<i>Satyrodes appalachia</i>	<i>Lethe appalachia</i>

Changes to species names or status of species

<i>Anthocaris stella</i>	<i>Anthocaris sara</i> (tentative re-synonymy as ssp.)
<i>Satyrium fuliginosum</i>	<i>Satyricum semiluna</i> (species split)
<i>Callophrys rosneri</i>	<i>Callophrys gryneus</i> ssp. <i>rosneri</i>
<i>Callophrys barryi</i>	<i>Callophrys gryneus</i> ssp. <i>plicataria</i> (syn.)
<i>Celastrina ladon lucia</i>	<i>Celastrina lucia</i> (species split)
<i>Celastrina ladon echo</i>	<i>Celastrina echo</i> (species split)
<i>Celastrina species</i>	<i>Celastrina serotina</i> (species split)
<i>Lycaeides idas anna</i>	<i>Plebejus anna</i> (species split)
<i>Icaricia acmon</i>	<i>Plebejus lupini</i> (taxonomic change)
<i>Boloria napaea</i>	<i>Boloria alaskensis</i> (species split)
<i>Nymphalis vaualbum</i>	<i>Nymphalis l-album</i> (taxonomic change)
<i>Euphydryas chalcedona perdiccas</i>	<i>Euphydryas colon colon</i> (= <i>perdiccas</i>) (tentative re-split)
<i>Euphydryas chalcedona paradoxa</i>	<i>Euphydryas colon paradoxa</i> (tentative re-split)
<i>Euphydryas chalcedona anicia</i>	<i>Euphydryas anicia</i> (tentative re-split)
<i>Phyciodes pratensis</i>	<i>Phyciodes pulchella</i> (taxonomic change)
<i>Coenonympha nipisiquit</i>	<i>Coenonympha tullia nipisiquit</i> (unexplained re-lump)
<i>Erebia theano</i>	<i>Erebia pawloskii</i> (species split)
<i>Erebia anyuica</i>	<i>Erebia occulta</i> (species split)
<i>Oeneis rosovi</i>	<i>Oeneis philipi</i> (mixed type series issue)

Valid species removed from Canadian list

<i>Satyrium fuliginosum</i>	Southern
<i>Celastrina ladon</i>	Southern
<i>Icaricia acmon</i>	Southern
<i>Boloria napaea</i>	Old World
<i>Euphydryas chalcedona</i>	Southern
<i>Erebia theano</i>	Old World
<i>Erebia anyuica</i>	Old World

Additional species recorded since publication of The Butterflies of Canada in 1998

<i>Megathymus streckeri</i>	AB
<i>Lycaena editha</i>	BC, AB
<i>Speyeria egleis</i>	AB
<i>Nymphalis io</i>	QC (introduced; established)
<i>Polyommatus icarus</i>	QC (introduced; established)

APPENDIX B CANADIAN BUTTERFLY STATUS ASSESSMENT RANKS NATURESERVE AND GENERAL STATUS 2009

Assessing status of a species evaluates how rare or common it is, or its level of extinction risk. Status can be analyzed at different geographic levels, from global, national to subnational, and is reported as a 'Conservation Status Rank'. This table provides the global rank assessed by NatureServe and the Canada rank assessed by General Status for all butterfly species recorded in Canada.

NatureServe Global Ranks: GX=Presumed Extinct; GH=Possibly Extinct; G1=Critically Imperiled; G2=Imperiled; G3=Vulnerable; G4=Apparently Secure; G5=Secure; GNR=NonRanked; GU=Unrankable with current data. Range Ranks (i.e., G3G4) indicate conditions of uncertainty where more information is needed to assign a more precise rank.

General Status Canada Ranks: 0.1=Extinct; 0.2=Extirpated; 1=At Risk; 2=May be at Risk; 3=Vulnerable; 4=Secure; 5=Undetermined; 6=Not Assessed; 7=Exotic/Alien; 8=Accidental

Scientific Name	English Common Name	Nature-Serve Global Rank	General Status Canada Rank	Distribution
<i>Abaeis nicippe</i>	Sleepy Orange	G5	8	ON
<i>Achalarus lyciades</i>	Hoary Edge	G5	5	ON
<i>Aglais milberti</i>	Milbert's Tortoiseshell	G5	4	YT, NT, BC, AB, SK, MB, ON, NB, NS, PE, NL
<i>Agraulis vanillae</i>	Gulf Fritillary	G5	8	MB
<i>Amblyscirtes hegon</i>	Pepper And Salt Skipper	G5	4	SK, MB, ON, QC, NB, NS
<i>Amblyscirtes oslari</i>	Oslar's Roadside Skipper	G4	2	AB, SK
<i>Amblyscirtes vialis</i>	Common Roadside Skipper	G5	4	NU, BC, AB, SK, MB, ON, QC, NB, NS
<i>Anatrytone logan</i>	Delaware Skipper	G5	4	AB, SK, MB, ON, QC
<i>Ancyloxypha numitor</i>	Least Skipper	G5	4	AB, SK, MB, ON, QC, NB, NS, PE
<i>Anthocharis sara</i>	Pacific Orangetip	G5	4	YT, BC
<i>Apodemia mormo</i>	Mormon Metalmark	G5	1	BC, SK
<i>Ascia monuste</i>	Great Southern White	G5	8	ON
<i>Asterocampa celtis</i>	Hackberry Emperor	G5	3	MB, ON, QC
<i>Asterocampa clyton</i>	Tawny Emperor	G5	2	ON, QC
<i>Atalopedes campestris</i>	Sachem	G5	5	BC, MB, ON
<i>Atrytonopsis hianna</i>	Dusted Skipper	G4G5	3	SK, MB, ON
<i>Battus philenor</i>	Pipevine Swallowtail	G5	8	SK, MB, ON
<i>Boloria alaskensis</i>	Mountain Fritillary	G5	4	YT, NT, NU, BC, AB
<i>Boloria alberta</i>	Alberta Fritillary	G3	4	BC, AB
<i>Boloria astarte</i>	Astarte Fritillary	G5	4	YT, NT, BC, AB
<i>Boloria bellona</i>	Meadow Fritillary	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NL
<i>Boloria chariclea</i>	Arctic Fritillary	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, NL
<i>Boloria epithore</i>	Pacific Fritillary	G5	4	YT, BC, AB
<i>Boloria eunomia</i>	Bog Fritillary	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NL
<i>Boloria freija</i>	Freija Fritillary	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NL
<i>Boloria frigga</i>	Frigga Fritillary	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NL
<i>Boloria improba</i>	Dingy Fritillary	G5	4	YT, NT, NU, BC, AB
<i>Boloria natazhati</i>	Beringian Fritillary	G3	3	YT, NT, NU, BC
<i>Boloria polaris</i>	Polaris Fritillary	G5	4	YT, NT, NU, BC, MB, QC, NL
<i>Boloria selene</i>	Silver-bordered Fritillary	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Callophrys affinis</i>	Western Green Hairstreak	G5	3	BC
<i>Callophrys augustinus</i>	Brown Elfin	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Callophrys eryphon</i>	Western Pine Elfin	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB
<i>Callophrys gryneus</i>	Juniper Hairstreak	G5	4	BC, SK, ON, QC
<i>Callophrys gryneus ssp. gryneus</i>	Olive Juniper Hairstreak	G5T5	2	ON, QC
<i>Callophrys gryneus ssp. plicataria</i>	Barry's Hairstreak	G5TU	4	BC
<i>Callophrys gryneus ssp. rosneri</i>	Rosner's Hairstreak	G5T3T4	4	BC
<i>Callophrys gryneus ssp. siva</i>	Siva Juniper Hairstreak	G5T5	4	BC
<i>Callophrys henrici</i>	Henry's Elfin	G5	4	MB, ON, QC, NB, NS, PE

Scientific Name	English Common Name	Nature-Serve Global Rank	General Status Canada Rank	Distribution
<i>Callophrys irus</i>	Frosted Elfin	G3	0.1	ON
<i>Callophrys johnsoni</i>	Johnson's Hairstreak	G3G4	2	BC
<i>Callophrys lanoraieensis</i>	Bog Elfin	G3G4	4	ON, QC, NB, NS, PE
<i>Callophrys mossii</i>	Moss's Elfin	G4	4	BC, AB
<i>Callophrys niphon</i>	Eastern Pine Elfin	G5	4	NT, BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Callophrys polios</i>	Hoary Elfin	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS
<i>Callophrys sheridanii</i>	Sheridan's Hairstreak	G5	4	BC, AB
<i>Callophrys spinetorum</i>	Thicket Hairstreak	G5	4	BC, AB
<i>Calpododes ethlius</i>	Brazilian Skipper	G5	8	ON
<i>Calycopis cecrops</i>	Red-banded Hairstreak	G5	8	SK
<i>Carterocephalus palaemon</i>	Arctic Skipper	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Celastrina echo</i>	Spring Azure	G5	4	NT, NU, BC, AB, SK, MB, ON, NS, PE, NL
<i>Celastrina lucia</i>	Lucia Azure	G5	4	YT, NT, BC, AB, SK, MB, ON, NS, PE, NL
<i>Celastrina neglecta</i>	Summer Azure	G5	4	AB, SK, MB, ON, QC, NB, NS, PE
<i>Celastrina serotina</i>	Cherry Gall Azure	G5	4	ON, QC, NB, NS, PE
<i>Cercyonis oetus</i>	Small Wood-nymph	G5	4	BC, AB, SK
<i>Cercyonis pegala</i>	Common Wood-nymph	G5	4	BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Cercyonis sthenele</i>	Great Basin Wood-nymph	G5	4	BC
<i>Chlosyne acastus</i>	Sagebrush Checkerspot	G4G5	4	AB, SK
<i>Chlosyne damoetas</i>	Damoetas Checkerspot	G4G5	4	BC, AB
<i>Chlosyne gorgone</i>	Gorgone Checkerspot	G5	4	AB, SK, MB, ON
<i>Chlosyne harrisii</i>	Harris's Checkerspot	G4	4	SK, MB, ON, QC, NB, NS, PE
<i>Chlosyne hoffmanni</i>	Hoffmann's Checkerspot	G4	3	BC
<i>Chlosyne nycteis</i>	Silvery Checkerspot	G5	4	SK, MB, ON, QC, NB, NS
<i>Chlosyne palla</i>	Northern Checkerspot	G5	4	BC, AB
<i>Coenonympha nipisiquit</i>	Maritime Ringlet	G1	1	QC, NB
<i>Coenonympha tullia</i>	Common Ringlet	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Colias alexandra</i>	Queen Alexandra's Sulphur	G5	4	BC, AB, SK, MB
<i>Colias canadensis</i>	Canada Sulphur	G4G5	4	YT, NT, BC, AB
<i>Colias christina</i>	Christina Sulphur	G5	4	YT, NT, BC, AB, SK, MB
<i>Colias eurytheme</i>	Orange Sulphur	G5	4	BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Colias gigantea</i>	Giant Sulphur	G5	4	YT, NT, BC, AB, SK, MB, ON
<i>Colias hecla</i>	Hecla Sulphur	G5	4	YT, NT, NU, BC, MB, QC, NL
<i>Colias interior</i>	Pink-edged Sulphur	G5	4	NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Colias johanseni</i>	Johansen's Sulphur	G1G3	2	NU
<i>Colias meadii</i>	Mead's Sulphur	G4G5	4	BC, AB
<i>Colias nastes</i>	Labrador Sulphur	G5	4	YT, NT, NU, BC, AB, MB, QC, NL
<i>Colias occidentalis</i>	Western Sulphur	G3G4	4	BC
<i>Colias palaeno</i>	Palaeno Sulphur	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NL
<i>Colias pelidne</i>	Pelidne Sulphur	G5	4	YT, NT, NU, BC, AB, MB, ON, QC, NL
<i>Colias philodice</i>	Clouded Sulphur	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Colias tyche</i>	Booth's Sulphur	G5	4	YT, NT, NU, MB
<i>Cupido amyntula</i>	Western Tailed Blue	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, NB
<i>Cupido comyntas</i>	Eastern Tailed Blue	G5	4	BC, SK, MB, ON, NB
<i>Danaus plexippus</i>	Monarch	G5	3	NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Echinargus isola</i>	Reakirt's Blue	G5	8	SK, MB
<i>Epargyreus clarus</i>	Silver-spotted Skipper	G5	4	BC, AB, SK, MB, ON, QC, NB
<i>Erebia disa</i>	Disa Alpine	G5	4	YT, NT, NU
<i>Erebia discoidalis</i>	Red-disked Alpine	G5	4	YT, NT, BC, AB, SK, MB, ON, QC
<i>Erebia epipsodea</i>	Common Alpine	G5	4	YT, BC, AB, SK, MB, QC
<i>Erebia fasciata</i>	Banded Alpine	G5	4	YT, NT, NU
<i>Erebia lafontainei</i>	Reddish Alpine	G3G4	4	YT, NT

Scientific Name	English Common Name	Nature-Serve Global Rank	General Status Canada Rank	Distribution
<i>Erebia mackinleyensis</i>	Mt. Mckinley Alpine	G4	4	YT, NT, BC
<i>Erebia magdalena</i>	Magdalena Alpine	G5	3	NT, BC, AB
<i>Erebia mancinus</i>	Taiga Alpine	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NL
<i>Erebia occulta</i>	Scree Alpine	G4G5	3	YT, NT
<i>Erebia pawloskii</i>	Yellow-dotted Alpine	G5	4	YT, NT, BC, MB
<i>Erebia rossii</i>	Ross's Alpine	G5	4	YT, NT, NU, BC, AB, MB, QC, NL
<i>Erebia vidleri</i>	Vidler's Alpine	G4G5	4	BC
<i>Erebia youngi</i>	Four-dotted Alpine	G5	4	YT, NT
<i>Eroria laeta</i>	Early Hairstreak	GU	3	ON, QC, NB, NS, PE
<i>Erynnis afranius</i>	Afranius Duskywing	G5	3	BC, AB, SK, MB
<i>Erynnis baptisiae</i>	Wild Indigo Duskywing	G5	2	ON
<i>Erynnis brizo</i>	Sleepy Duskywing	G5	3	SK, MB, ON
<i>Erynnis funeralis</i>	Funereal Duskywing	G5	8	ON
<i>Erynnis horatius</i>	Horace's Duskywing	G5	8	ON
<i>Erynnis icelus</i>	Dreamy Duskywing	G5	4	NT, BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Erynnis juvenalis</i>	Juvenal's Duskywing	G5	4	SK, MB, ON, QC, NB, NS
<i>Erynnis lucilius</i>	Columbine Duskywing	G4	4	MB, ON, QC
<i>Erynnis martialis</i>	Mottled Duskywing	G3	4	MB, ON, QC
<i>Erynnis pacuvius</i>	Pacuvius Duskywing	G5	4	BC
<i>Erynnis persius</i>	Persius Duskywing	G5	4	YT, NT, NU, BC, AB, SK, MB, ON
<i>Erynnis propertius</i>	Propertius Duskywing	G5	3	BC
<i>Erynnis zarucco</i>	Zarucco Duskywing	G5	8	ON
<i>Euchloe ausonides</i>	Large Marble	G5	4	YT, NT, NU, BC, AB, SK, MB, ON
<i>Euchloe creusa</i>	Northern Marble	G5	4	YT, NT, NU, BC, AB, SK, MB
<i>Euchloe lotta</i>	Desert Marble	G4G5	4	BC
<i>Euchloe naina</i>	Green Marble	GU	3	YT, BC
<i>Euchloe olympia</i>	Olympia Marble	G4G5	4	AB, SK, MB, ON, QC
<i>Euphilotes ancilla</i>	Rocky Mountain Dotted Blue	G5	3	AB, SK
<i>Euphilotes battoides</i>	Square-spotted Blue	G5	4	BC
<i>Euphydryas anicia</i>	Anicia Checkerspot	G5	4	YT, BC, AB, SK, MB
<i>Euphydryas colon ssp. colon</i>	Colon Checkerspot	G5T4T5	4	AB, SK, MB
<i>Euphydryas colon ssp. paradoxa</i>	Contrary Checkerspot	G5T4	4	BC, AB, SK, MB
<i>Euphydryas editha</i>	Edith's Checkerspot	G5	4	BC, AB, SK
<i>Euphydryas gillettii</i>	Gillette's Checkerspot	G2G3	3	BC, AB
<i>Euphydryas phaeton</i>	Baltimore Checkerspot	G4	4	MB, ON, QC, NB, NS, PE
<i>Euphyes bimacula</i>	Two-spotted Skipper	G4	4	ON, QC, NB
<i>Euphyes conspicua</i>	Black Dash	G4	3	ON
<i>Euphyes dion</i>	Dion Skipper	G4	4	ON, QC
<i>Euphyes dukesi</i>	Duke's Skipper	G3	2	ON
<i>Euphyes vestris</i>	Dun Skipper	G5	4	BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Euptoieta claudia</i>	Variegated Fritillary	G5	4	NU, BC, AB, SK, MB, ON, QC, NB
<i>Euptoieta hegesia</i>	Mexican Fritillary	G5	8	MB
<i>Eurema mexicanum</i>	Mexican Yellow	G5	8	SK, MB, ON
<i>Eurytides marcellus</i>	Zebra Swallowtail	G5	5	ON
<i>Feniseca tarquinius</i>	Harvester	G4	4	MB, ON, QC, NB, NS, PE
<i>Fixsenia favonius</i>	Southern Hairstreak	G4	8	ON
<i>Glaucopsyche lygdamus</i>	Silvery Blue	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Glaucopsyche piasus</i>	Arrowhead Blue	G5	4	BC, AB, SK
<i>Hesperia assinihoia</i>	Plains Skipper	G5	4	BC, AB, SK, MB
<i>Hesperia colorado</i>	Western Branded Skipper	G5	4	BC, SK
<i>Hesperia comma</i>	Common Branded Skipper	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Hesperia dacotae</i>	Dakota Skipper	G2	2	SK, MB

Scientific Name	English Common Name	Nature-Serve Global Rank	General Status Canada Rank	Distribution
<i>Hesperia juba</i>	Juba Skipper	G5	4	BC
<i>Hesperia leonardus</i>	Leonard's Skipper	G4	4	AB, SK, MB, ON, QC
<i>Hesperia nevada</i>	Nevada Skipper	G5	4	BC, AB, SK, MB
<i>Hesperia ottoe</i>	Ottoe Skipper	G3G4	2	MB
<i>Hesperia pahaska</i>	Pahaska Skipper	G5	2	SK
<i>Hesperia sassacus</i>	Indian Skipper	G5	4	SK, MB, ON, QC, NB
<i>Hesperia uncas</i>	Uncas Skipper	G5	4	AB, SK, MB
<i>Hylephila phyleus</i>	Fiery Skipper	G5	5	ON, PE
<i>Junonia coenia</i>	Common Buckeye	G5	5	MB, ON, QC
<i>Leptotes marina</i>	Marine Blue	G5	8	SK, ON
<i>Lerema accius</i>	Clouded Skipper	G5	8	ON
<i>Lethe anthedon</i>	Northern Pearly-eye	G4	4	AB, SK, MB, ON, NB, NS, PE
<i>Lethe appalachia</i>	Appalachian Brown	G4	4	ON
<i>Lethe eurydice</i>	Eyed Brown	G4	4	NT, AB, SK, MB, ON, NB, NS, PE
<i>Libytheana carinenta</i>	American Snout	G5	5	ON, QC
<i>Limenitis archippus</i>	Viceroy	G5	4	NT, BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Limenitis arthemis</i>	White Admiral	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Limenitis lorquini</i>	Lorquin's Admiral	G5	4	BC, AB
<i>Limenitis weidemeyerii</i>	Weidemeyer's Admiral	G5	2	AB, ON
<i>Lycaena cupreus</i>	Lustrous Copper	G5	4	BC, AB
<i>Lycaena dione</i>	Grey Copper	G5	4	BC, AB, SK, MB, ON
<i>Lycaena dorcas</i>	Dorcas Copper	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NL
<i>Lycaena dospassosi</i>	Maritime Copper	G2	4	QC, NB, PE
<i>Lycaena editha</i>	Edith's Copper	G5	No Rank	BC, AB
<i>Lycaena epixanthe</i>	Bog Copper	G4G5	4	MB, ON, QC, NB, NS, PE, NL
<i>Lycaena helloides</i>	Purplish Copper	G5	4	BC, AB, SK, MB, ON
<i>Lycaena heteronea</i>	Blue Copper	G5	4	BC, AB
<i>Lycaena hyllus</i>	Bronze Copper	G5	4	NT, BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Lycaena mariposa</i>	Mariposa Copper	G5	4	YT, BC, AB, SK
<i>Lycaena nivalis</i>	Lilac-bordered Copper	G5	3	BC
<i>Lycaena phlaeas</i>	American Copper	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Lycaena rubidus</i>	Ruddy Copper	G5	4	AB, SK
<i>Megathymus streckeri</i>	Strecker's Giant Skipper	G5	5	AB
<i>Megisto cymela</i>	Little Wood-Satyr	G5	4	SK, MB, ON, QC, NB, NS
<i>Nathalis iole</i>	Dainty Sulphur	G5	8	SK, MB, ON
<i>Neominois ridingsii</i>	Ridings' Satyr	G5	4	AB, SK, MB
<i>Neophasia menapia</i>	Pine White	G5	4	BC, AB
<i>Notamblyscirtes simius</i>	Simius Roadside Skipper	G4	2	SK
<i>Nymphalis antiopa</i>	Mourning Cloak	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Nymphalis californica</i>	California Tortoiseshell	G5	4	BC, AB, SK, MB
<i>Nymphalis io</i>	European Peacock Butterfly	GNR	No Rank	QC
<i>Nymphalis l-album</i>	Compton Tortoiseshell	G5	4	YT, NT, BC, AB, SK, MB, ON, NB, NS, PE, NL
<i>Oarisma garita</i>	Garita Skipperling	G5	4	BC, AB, SK, MB, ON
<i>Oarisma poweshiek</i>	Poweshiek Skipperling	G2G3	2	MB
<i>Ochlodes sylvanoides</i>	Woodland Skipper	G5	4	BC, AB, SK
<i>Oeneis alberta</i>	Alberta Arctic	G4	4	BC, AB, SK, MB
<i>Oeneis alpina</i>	Sentinel Arctic	G3G4	4	YT, NT
<i>Oeneis bore</i>	White-veined Arctic	G5	4	YT, NT, NU, BC, AB, MB, QC, NL
<i>Oeneis chryxus</i>	Chryxus Arctic	G5	4	YT, NT, BC, AB, SK, MB, ON, QC
<i>Oeneis jutta</i>	Jutta Arctic	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Oeneis macounii</i>	Macoun's Arctic	G5	4	NT, BC, AB, SK, MB, ON, QC
<i>Oeneis melissa</i>	Melissa Arctic	G5	4	YT, NT, NU, BC, AB, MB, ON, QC, NL

Scientific Name	English Common Name	Nature-Serve Global Rank	General Status Canada Rank	Distribution
<i>Oeneis nevadensis</i>	Great Arctic	G5	3	BC
<i>Oeneis philipi</i>	Philip's Arctic	G3G5	4	YT, NT, BC
<i>Oeneis polixenes</i>	Polixenes Arctic	G5	4	YT, NT, NU, BC, AB, MB, ON, QC, NL
<i>Oeneis uhleri</i>	Uhler's Arctic	G5	4	YT, NT, BC, AB, SK, MB
<i>Panoquina ocola</i>	Ocola Skipper	G5	8	ON
<i>Papilio brevicauda</i>	Short-tailed Swallowtail	G3G4	4	QC, NB, NS, NL
<i>Papilio canadensis</i>	Canadian Tiger Swallowtail	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Papilio cresphontes</i>	Giant Swallowtail	G5	2	MB, ON, QC
<i>Papilio eurymedon</i>	Pale Swallowtail	G5	4	BC, AB
<i>Papilio glaucus</i>	Eastern Tiger Swallowtail	G5	4	ON
<i>Papilio indra</i>	Indra Swallowtail	G5	2	BC
<i>Papilio machaon</i>	Old World Swallowtail	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC
<i>Papilio multicaudata</i>	Two-tailed Swallowtail	G5	4	BC, AB, SK
<i>Papilio polyxenes</i>	Black Swallowtail	G5	4	SK, MB, ON, QC, NB, NS, PE
<i>Papilio rutulus</i>	Western Tiger Swallowtail	G5	4	BC, SK
<i>Papilio troilus</i>	Spicebush Swallowtail	G5	4	ON
<i>Papilio zelicaon</i>	Anise Swallowtail	G5	4	BC, AB, SK
<i>Parnassius clodius</i>	Clodius Parnassian	G5	4	BC, AB
<i>Parnassius eversmanni</i>	Eversmann's Parnassian	G5	4	YT, NT, NU, BC
<i>Parnassius phoebus</i>	Phoebus Parnassian	G5	3	YT, NT, BC
<i>Parnassius smintheus</i>	Rocky Mountain Parnassian	G5	4	YT, BC, AB, SK
<i>Parrhasius m-album</i>	White-m Hairstreak	G5	8	ON
<i>Phoebis philea</i>	Orange-barred Sulphur	G5	8	ON
<i>Phoebis sennae</i>	Cloudless Sulphur	G5	8	ON
<i>Pholisora catullus</i>	Common Sootywing	G5	4	BC, SK, MB, ON, QC
<i>Phyciodes batesii</i>	Tawny Crescent	G4	4	NT, BC, AB, SK, MB, ON, QC
<i>Phyciodes cocyta</i>	Northern Crescent	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Phyciodes mylitta</i>	Mylitta Crescent	G5	4	BC
<i>Phyciodes pallida</i>	Pale Crescent	G5	4	BC
<i>Phyciodes pulchella</i>	Field Crescent	G5	4	YT, NT, BC, AB
<i>Phyciodes tharos</i>	Pearl Crescent	G5	4	AB, SK, MB, ON, QC
<i>Pieris angelika</i>	Arctic White	G5	4	YT, NT, BC
<i>Pieris marginalis</i>	Margined White	G5	4	YT, BC, AB, SK
<i>Pieris oleracea</i>	Mustard White	G4G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Pieris rapae</i>	Cabbage White	G5	7	NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Pieris virginiana</i>	West Virginia White	G3G4	3	ON, QC
<i>Plebejus anna</i>	Anna Blue	GNR	4	BC
<i>Plebejus glandon</i>	Arctic Blue	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NL
<i>Plebejus icarioides</i>	Boisduval's Blue	G5	4	BC, AB, SK
<i>Plebejus idas</i>	Northern Blue	G5	4	YT, NT, NU, AB, SK, MB, ON, NB, NS, PE, NL
<i>Plebejus lupini</i>	Acmon Blue	G5	4	BC
<i>Plebejus melissa</i>	Melissa Blue	G5	4	BC, AB, SK, MB, ON
<i>Plebejus optilete</i>	Cranberry Blue	G5	4	YT, NT, NU, BC, AB, SK, MB
<i>Plebejus saepiolus</i>	Greenish Blue	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NL
<i>Plebejus shasta</i>	Shasta Blue	G5	4	AB, SK
<i>Poanes hobomok</i>	Hobomok Skipper	G5	4	AB, SK, MB, ON, QC, NB, NS, PE
<i>Poanes massasoit</i>	Mulberry Wing	G4	3	ON, QC
<i>Poanes viator</i>	Broad-winged Skipper	G5	4	MB, ON, QC
<i>Poanes zabulon</i>	Zabulon Skipper	G5	5	ON
<i>Polites draco</i>	Draco Skipper	G5	4	YT, BC, AB, SK
<i>Polites mystic</i>	Long Dash Skipper	G5	4	NT, BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Polites origines</i>	Crossline Skipper	G5	4	ON, QC

Scientific Name	English Common Name	Nature-Serve Global Rank	General Status Canada Rank	Distribution
<i>Polites peckius</i>	Peck's Skipper	G5	4	NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Polites rhesus</i>	Rhesus Skipper	G4	5	AB, SK
<i>Polites sabuleti</i>	Sandhill Skipper	G5	2	BC
<i>Polites sonora</i>	Sonoran Skipper	G4	2	BC
<i>Polites themistocles</i>	Tawny-edged Skipper	G5	4	BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Polites vibex</i>	Whirlabout	G5	8	ON
<i>Polygonia comma</i>	Eastern Comma	G5	4	SK, MB, ON, QC, NB, NL
<i>Polygonia faunus</i>	Green Comma	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Polygonia gracilis</i>	Hoary Comma	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, NL
<i>Polygonia interrogationis</i>	Question Mark	G5	4	AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Polygonia oreas</i>	Oreas Comma	G5	4	YT, BC, AB
<i>Polygonia progne</i>	Grey Comma	G4G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Polygonia satyrus</i>	Satyr Comma	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Polyommatus icarus</i>	European Common Blue	GNR	No Rank	QC
<i>Pompeius verna</i>	Little Glassywing	G5	3	ON, QC
<i>Pontia beckerii</i>	Becker's White	G5	4	BC
<i>Pontia occidentalis</i>	Western White	G5	4	YT, NT, NU, BC, AB, SK, MB, ON
<i>Pontia protodice</i>	Checkered White	G4	4	BC, AB, SK, MB, ON, QC, NL
<i>Pontia sisymbrii</i>	Spring White	G5	4	YT, NT, NU, BC, AB
<i>Pyrgus centaureae</i>	Grizzled Skipper	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NL
<i>Pyrgus communis</i>	Common Checkered Skipper	G5	4	BC, AB, SK, MB, ON
<i>Pyrgus ruralis</i>	Two-banded Checkered Skipper	G5	4	BC, AB
<i>Pyrgus scriptura</i>	Small Checkered Skipper	G5	2	AB, SK
<i>Pyrisitia lisa</i>	Little Yellow	G5	5	MB, ON, NB, NS
<i>Satyrium acadica</i>	Acadian Hairstreak	G5	4	AB, SK, MB, ON, QC, NB, NS, PE
<i>Satyrium behrii</i>	Behr's Hairstreak	G5	1	BC
<i>Satyrium calanus</i>	Banded Hairstreak	G5	4	SK, MB, ON, QC, NB, NS
<i>Satyrium californica</i>	California Hairstreak	G5	3	BC
<i>Satyrium caryaevora</i>	Hickory Hairstreak	G4	4	ON, QC
<i>Satyrium edwardsii</i>	Edwards' Hairstreak	G4	4	SK, MB, ON, QC
<i>Satyrium liparops</i>	Striped Hairstreak	G5	4	BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Satyrium saepium</i>	Hedgerow Hairstreak	G5	4	BC
<i>Satyrium semiluna</i>	Halfmoon Hairstreak	G4	1	BC, AB
<i>Satyrium sylvanica</i>	Sylvan Hairstreak	GNR	4	BC
<i>Satyrium titus</i>	Coral Hairstreak	G5	4	BC, AB, SK, MB, ON, QC
<i>Speyeria aphrodite</i>	Aphrodite Fritillary	G5	4	BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Speyeria atlantis</i>	Atlantis Fritillary	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Speyeria callippe</i>	Callippe Fritillary	G5	4	BC, AB, SK, MB
<i>Speyeria cybele</i>	Great Spangled Fritillary	G5	4	BC, AB, SK, MB, ON, QC, NB, NS, PE
<i>Speyeria edwardsii</i>	Edwards' Fritillary	G5	3	AB, SK, MB
<i>Speyeria egleis</i>	Great Basin Fritillary	G5	No Rank	AB
<i>Speyeria hesperis</i>	Northwestern Fritillary	G5	4	YT, NT, BC, AB, SK, MB
<i>Speyeria hydaspe</i>	Hydaspe Fritillary	G4G5	4	BC, AB, SK
<i>Speyeria idalia</i>	Regal Fritillary	G3	8	SK, MB, ON
<i>Speyeria mormonia</i>	Mormon Fritillary	G5	4	YT, NT, BC, AB, SK, MB
<i>Speyeria zerene</i>	Zerene Fritillary	G5	4	BC, AB, SK
<i>Staphylus hayhurstii</i>	Hayhurst's Scallopwing	G5	2	ON
<i>Strymon melinus</i>	Grey Hairstreak	G5	4	BC, AB, SK, MB, ON, QC, NB, NS
<i>Thorybes bathyllus</i>	Southern Cloudywing	G5	2	ON
<i>Thorybes pylades</i>	Northern Cloudywing	G5	4	NT, BC, AB, SK, MB, ON, QC, NB, NS
<i>Thymelicus lineola</i>	European Skipper	G5	7	BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Urbanus proteus</i>	Long-tailed Skipper	G5	8	ON

Scientific Name	English Common Name	Nature-Serve Global Rank	General Status Canada Rank	Distribution
<i>Vanessa annabella</i>	West Coast Lady	G5	4	BC, AB, SK, MB
<i>Vanessa atalanta</i>	Red Admiral	G5	4	YT, NT, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Vanessa cardui</i>	Painted Lady	G5	4	YT, NT, NU, BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Vanessa virginiensis</i>	American Lady	G5	4	BC, AB, SK, MB, ON, QC, NB, NS, PE, NL
<i>Wallengrenia egeremet</i>	Northern Broken-dash	G5	4	ON, QC
<i>Zerene cesonia</i>	Southern Dogface	G5	8	AB, MB, ON



Adopted by the Executive Council: 13 June 1996, Houston, Texas

The Lepidopterists' Society affirms that collecting Lepidoptera is one of many legitimate activities enabling professional and avocational lepidopterists to further the scientifically sound and progressive study of Lepidoptera and education about Lepidoptera as well as encouraging interaction between professional and avocational lepidopterists.

The foregoing Statement of The Lepidopterists' Society is accompanied by the following Collecting Guidelines. The Guidelines elucidate the manner in which collecting should be conducted. Practitioners are encouraged to adopt these Guidelines and to use the Guidelines for the instruction of others.

COLLECTING GUIDELINES

PREAMBLE:

Our responsibility to assess and preserve natural resources, for the increase of knowledge, and for the maintenance of biological diversity in perpetuity, requires that lepidopterists examine the practices of collecting Lepidoptera for the purpose of governing their own activities.

To this end, the following guidelines are outlined, based on these premises:

- 0.1 Lepidoptera is one of the largest order of insects. Lepidopterans are an important component of biological diversity.
- 0.2 Lepidoptera are conspicuous and scientifically well known, thus they are frequently used as indicator groups for conservation programs.
- 0.3 The collection of Lepidoptera
 - 0.31 is a means of introducing children and adults to awareness and study of their natural environment;
 - 0.32 has an essential role in the elucidation of scientific information, both for its own sake and as a basis from which to develop rational means for protecting the environment, its resources, human health, and the world food supply;
 - 0.33 is an educational activity which generally can be pursued in a manner not detrimental to the resource involved.

PURPOSES OF COLLECTING:

(consistent with the above):

- 1.1 To create a reference collection for study and appreciation.
- 1.2 To document regional diversity, frequency, and variability of species, and as voucher material for published records.
- 1.3 To document faunal representation in environments undergoing or threatened with alteration by humans or natural forces.
- 1.4 To participate in development of regional checklists and institutional reference collections.
- 1.5 To complement a planned research endeavor.
- 1.6 To aid in dissemination of educational information.
- 1.7 To augment understanding of taxonomic and ecologic relationships for medical and economic purposes.

COLLECTING METHODS:

- 2.1 Collecting adults or immature stages should be limited to sampling, not depleting, the population concerned.
- 2.2 Numbers collected should be consistent with the purposes outlined in sections 1.1 through 1.7.
- 2.3 Where the extent and/or the fragility of the population is unknown, caution and restraint should be exercised.

DATA SHARING:

- 3.1 All data should be recorded, and the data should be made available to appropriate interested parties.

LIVE MATERIAL:

- 4.1 Rearing to elucidate life histories and to obtain series of immature stages and adults is to be encouraged, provided that collection of the rearing stock is in keeping with these guidelines.
- 4.2 Reared material in excess of need should be released only in the region where it originated, and in suitable habitat.

ENVIRONMENTAL:

- 5.1 Protection of the supporting habitat must be recognized as the sine qua non of protection of a species.
- 5.2 Collecting should be performed in a manner such as to minimize trampling or other damage to the habitat or to specific foodplants.
- 5.3 Property rights and sensibilities of others must be respected.
- 5.4 Collectors must comply with regulations relating to publicly controlled areas, to individual species, and to habitats.

RESPONSIBILITY FOR COLLECTED MATERIAL:

- 6.1 All material should be preserved with all known data attached.
- 6.2 All material should be protected from physical damage and deterioration, e.g. light, molds, and museum pests.
- 6.3 Collections should be made available for examination by qualified researchers.
- 6.4 Collections or specimens, and their associated written and photographic records, should be willed or offered to the care of an appropriate scientific institution, if the collector lacks space or loses interest, or in anticipation of death.
- 6.5 Type specimens, especially holotype or allotype, should be deposited in appropriate scientific institutions.

RELATED ACTIVITIES OF COLLECTORS:

- 7.1 Collecting should include permanently recorded field notes regarding habitat, conditions, and other pertinent information.
- 7.2 Recording of observations of behavior and of biological interactions should receive as high priority as collecting.
- 7.3 Photographic records, with full data, are to be encouraged.
- 7.4 Education of the public regarding collecting and conservation, as reciprocally beneficial activities, should be undertaken whenever possible.
- 7.5 All known data should be recorded with the specimens, e.g. date, location, collector, habitat, larval host plant data, and parentage of immatures, when known.

TRAFFIC IN LEPIDOPTERAN SPECIMENS:

- 8.1 Collection of specimens for exchange or sale should be performed in accordance with these guidelines.
- 8.2 Rearing of specimens for exchange or sale should be from stock obtained in a manner consistent with these guidelines, and so documented.
- 8.3 Mass collecting of Lepidoptera for commercial purposes and collection of specimens for creation of saleable artifacts are not included among the purposes of the Society.

LEGAL CONSIDERATIONS:

- 9.1 Collectors should comply with local, state or provincial, federal and national, and international laws and regulations that govern collecting and possession, commerce and exchange, import and export, and protection of species. Collectors should comply with additional local, state or provincial, federal and national, and international laws and regulations governing live material.

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Alberta Natural Heritage Information Centre

Alberta Tourism, Parks and Recreation
2nd Floor, Oxbridge Place
9820-106 Street
Edmonton, Alberta T5K 2J6
780-427-0350
<http://tpr.alberta.ca/parks/heritageinfocentre/default.aspx>

Atlantic Canada Conservation Data Centre

P.O. Box 6416
146 Main Street
Mount Allison University
Sackville, New Brunswick E4L 1G6
506-364-2661
<http://www.accdc.com>

Centre de données sur le patrimoine naturel du Québec

Flora/Flore
Ministère du Développement durable, de
l'Environnement et des Parcs
Edifice Marie-Guyart, 4e étage, Bte 21
675 René-Lévesque Est, Québec, Québec G1R 5V7
418-521-3907 x4794
www.cdpnq.gouv.qc.ca/

Fauna/Faune

Ministère des Ressources naturelles et de la Faune
Direction du développement de la faune
880, chemin Ste-Foy, 2e étage
Québec, Québec G1S 4X4
418-627-8694
www.cdpnq.gouv.qc.ca

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K.W. Neatby Bldg, 960 Carling Ave.

Ottawa, Ontario K1A 0C6

www.natureserve.ca

1-888-277-5265

British Columbia Conservation Data Centre

Biodiversity Branch
Ministry of Environment
P.O. Box 9358
Station Provincial Government
Victoria, British Columbia V8W 9M2
250-356-0928
<http://www.env.gov.bc.ca/cdc>

Manitoba Conservation Data Centre

Biodiversity Conservation Section
Wildlife and Ecosystem Protection Branch
Manitoba Conservation
P.O. Box 24 (200 Saulteaux Crescent)
Winnipeg, Manitoba R3J 3W3
204-945-7775
<http://web2.gov.mb.ca/conservation/cdc/>

Saskatchewan Conservation Data Centre

Saskatchewan Environment
3211 Albert Street
Regina, Saskatchewan S4S 5W6
306-787-9038
www.biodiversity.sk.ca

NatureServe Yukon

Fish and Wildlife Branch
Yukon Department of the Environment
P.O. Box 2703
Whitehorse, Yukon Y1A 2C6
867-667-3684
www.environmentyukon.gov.yk.ca

Ontario Natural Heritage Information Centre

Ministry of Natural Resources
P.O. Box 7000 (300 Water Street, 2nd Floor, North
Tower)
Peterborough, Ontario K9J 8M5
705-755-1960
http://nhic.mnr.gov.on.ca/nhic_.cfm



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