

ON GUARD FOR THEM



SPECIES OF GLOBAL CONSERVATION CONCERN IN CANADA

APRIL 2017



All human societies depend in countless ways upon life-supporting gifts from the diversity of life. Yet many of us are unaware of this simple fact. Biodiversity is like the magic carpet ride of life that we don't even know we are on. That carpet we ride is a beautifully intricate pattern, with each species contributing its colorful, interwoven fiber to the strength of the magic.

The interaction species have with one another creates beautiful patterns, patterns that we see in our everyday existence and that are part of our natural heritage, but of which we are not fully aware. Our magic carpet of life is the foundation of food production, medicines, nutrient cycling, water and air purification, pollination, soil creation, biotechnology, cultural survival, and spiritual renewal. All these are gifts from the diversity of life, derived from the pattern of species interacting with each other and the Earth.

With little awareness, we have been pulling individual fibers out of that magic carpet. As it unravels, the patterns weaken, diminish, and eventually disintegrate before our eyes, no longer able to offer their life-sustaining gifts. Humanity needs our magic carpet to keep flying. It is our responsibility, and essential to our journey, to keep it intact, intricate, colorful, and vibrant.

Healy Hamilton, Chief Scientist, NatureServe



***Orca Rising (Roy Henry Vickers)*^a**

^a Roy Henry Vickers is a renowned First Nations artist from British Columbia: www.royhenryvickers.com/.

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Front Cover Photographs

Top left: Klaza Draba (*Draba bruce-bennettii*)^b—Critically Imperilled (G1)

Top right: Johnson’s Hairstreak (*Callophrys johnsoni*)—Vulnerable to Apparently Secure (G3G4)

Bottom left: Mountain Plover (*Charadrius montanus*)—Vulnerable (G3)

Bottom right: Dwarf Coastal Maidenhair Fern (*Adiantum aleuticum* var. *subpumilum*)—Critically Imperilled to Imperilled (G5?T1T2)

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About NatureServe Canada (www.natureserve.ca)

A registered Canadian charity, NatureServe Canada and its network of Canadian Conservation Data Centres (CDCs) work together and with other government and non-government organizations to develop, manage, and distribute authoritative knowledge regarding Canada’s plants, animals, and ecosystems. NatureServe Canada and the Canadian CDCs are members of the international NatureServe Network, spanning over 80 CDCs in the Americas. NatureServe Canada is the Canadian affiliate of NatureServe, based in Arlington, Virginia, which provides scientific and technical support to the international network.

39 McArthur Ave, Level 1-1, Ottawa, ON K1L 8L7 CANADA
(613) 986-1535; info@natureserve.ca



^b Klaza Draba (*Draba bruce-bennettii*) was discovered in 2012 by Bruce Bennett, Coordinator of the Yukon Conservation Data Centre and present Chair of the Board of NatureServe Canada. The species’ scientific name was subsequently named after Mr. Bennett. A species endemic to Canada, Klaza Draba is known only from high elevations on Langham and Tritop mountains of the Dawson Range in Yukon.

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In Gratitude to Our Members and Partners

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- Fisheries and Oceans Canada
- Manitoba Conservation Data Centre
- Nature Conservancy of Canada
- NatureServe
- Northwest Territories Conservation Data Centre
- Nunavut Conservation Data Centre
- Ontario Natural Heritage Information Centre
- Parks Canada Agency
- Saskatchewan Conservation Data Centre
- Western Canada SFI Implementation Committee
- Yukon Conservation Data Centre



An Invitation to Contribute to Biodiversity Science

NatureServe Canada welcomes financial support of our business—biodiversity science. As well, *Associate* membership in NatureServe Canada is available to organizations that support our mission, that manage data of conservation value, and/or that are active in promoting science-based conservation action nationally or subnationally.

To learn more, to donate in support of our work, or to inquire about *Associate* membership, please contact us:

NatureServe Canada (www.natureserve.ca)
 39 McArthur Ave, Level 1-1, Ottawa, ON K1L 8L7 CANADA
 (613) 986-1535; info@natureserve.ca

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

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Notes to the Text

Biodiversity: the variability of life at all scales, from genes to species to ecosystems

Citizen scientists: people who may not have formal scientific credentials but who engage in scientific study and documentation, including monitoring the location and condition of species and their ecosystems

Ecological footprint: “A measure of how much area of biologically productive land and water an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates, using prevailing technology and resource management practices”¹

Ecosystem: a biological community of interacting organisms and their physical environment

Element record: In NatureServe’s methodology, an element record refers to the basic record for a species that documents the species’ taxonomy and distribution. Element records for ecosystems contain a description and distributional notes for an ecosystem.

Element occurrence record (EO): In NatureServe’s methodology, an element occurrence is the basic unit of record for documenting and delimiting the presence and extent of a species (or ecosystem) on the landscape. An element occurrence (EO) is defined as an area of land and/or water where a species is (or was) present and which has practical conservation value.

Endemic: (a species) native or restricted to a certain country or area

Extant: a population of a species observed within the past 20 years

Extirpation: a species or infraspecies no longer found within a certain country or area

Infraspecies: organisms (e.g., subspecies and varieties) which rank below the level of species

Keystone species: a plant or animal that plays a unique and crucial role in the way an ecosystem functions

Locational record: a record showing the geographical location of where a species occurs

Natural capital: the world's stocks of natural assets which include geology, soil, air, water, and all living things

Species: In this report, *species* refers to organisms which are eukaryotic (i.e., organisms whose cells contain a nucleus and other organelles enclosed within membranes, as compared to the less complex cells of the microscopic prokaryotic organisms belonging to the other two domains of life—Bacteria and Archaea).²

Species at risk: In general, *species at risk* means species which could become extinct (no longer existing on Earth) or extirpated (no longer existing within a country or region). In Canada’s federal *Species at Risk Act*, *species at risk* “means an extirpated, endangered or threatened species or a species of special concern,” and *species of special concern* “means a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.”³

Subspecies: “a category in biological classification that ranks immediately below a species and designates a population of a particular geographic region genetically distinguishable from other such populations of the same species and capable of interbreeding successfully with them where its range overlaps theirs”⁴

Variety: In botanical nomenclature, *variety* is a taxonomic rank below that of species and subspecies.

Preface

The mandate of NatureServe Canada and its network of Canadian Conservation Data Centres (CDCs) is to serve as the primary repository for knowledge about the *biodiversity* of Canada and to make that knowledge available for decision-making, education, and research.^c **In that context, the purpose of this report is to identify *species* and *infraspecies* native to Canada that are of global conservation concern—animals and plants deemed by the NatureServe Network to be Possibly Extinct (GH/TH), Critically Imperilled (G1/T1), Imperilled (G2/T2), or Vulnerable (G3/T3) within their global range.** In so doing we draw upon the best available information resident within the NatureServe Network to which NatureServe Canada and the Canadian CDCs are members.



Cliff Paintbrush (*Castilleja rupicola*) is known from British Columbia, Washington, and Oregon and is Vulnerable to Apparently Secure (G3G4).

NatureServe Canada's 2005 report—*Our Home and Native Land: Canadian Species of Global Conservation Concern*—was the first overview of the status of Canadian wild species in a global context.⁵ This report updates that work. As we did in the 2005 report, we focus on species in 13 taxonomic groups that are comparatively well known to science.^d Unlike in 2005, we also identify *infraspecies* from among the 13 groups that are of global conservation concern and other species and *infraspecies* that are endemic to Canada and globally *at risk* but which do not belong to these groups. *On Guard for Them: Species of Global Conservation in Canada* thus reflects expanding biodiversity knowledge within the NatureServe Network—a process that is updated as data about animals, plants, lichens, fungi, and *ecosystems* continues to be gathered.

Many species and *infraspecies* are at risk of *extirpation* at national or provincial/territorial levels but yet remain common or otherwise are not threatened elsewhere in the world (i.e., they are not of global conservation concern). As for the 2005 report, we do not identify the status of native flora and fauna at these national or subnational levels. Rather, the spotlight is on the native animals, plants, and lichens closer than any others to being lost to extinction—including those found only within Canada (i.e., *endemic* to Canada), and those shared between Canada and other nations (notably, the United States).

^c NatureServe Canada member CDCs represent British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, Yukon, Northwest Territories, and Nunavut. The CDC representing Québec is a member of NatureServe.

^d Mammals, birds, reptiles, amphibians, freshwater fishes, freshwater mussels, crayfishes, butterflies and skippers, tiger beetles, dragonflies and damselflies, ferns and relatives, conifers, and flowering plants

INTRODUCTION

At the time of Canada's Confederation in 1867, most of the 3.5 million people⁶ populating the new nation likely had limited scientific understanding of the animals and plants in their midst, other than species used for food or within commerce. The primary exceptions were First Nations, Métis, and Inuit whose deep knowledge about native species—their habitats, life histories, and interconnectedness, and how species could be used for food, medicine, and more—had been shaped by observing and working with nature over many generations.

Scientific knowledge was developing, however, such as from efforts like the Palliser Expedition of 1857-1860, which generated botanical and much other information about the West,⁷ and the work of Abbé Léon Provancher (1820-1892)⁸ and Louis-Ovide Brunet (1826-1876),⁹ priests and naturalists from Québec who helped pioneer the study of the animals and plants of Canada during the 1800s (and for whom ecological reserves in Québec are named to help honour their legacy).

Today, all Canadians have access to greatly expanded knowledge about the lands, waters, and biodiversity of Canada. We also know more about how biodiversity supports us (e.g., the role of pollinating insects in food production) and, in turn, how we can better support biodiversity (e.g., maintaining migratory corridors between protected areas). Indeed, the more we study and learn about biodiversity, the more we realize our interdependence with it.

We have also made progress in cataloguing this natural heritage, including understanding it in the contexts of North America and the world, and in identifying and establishing the means by which biodiversity and ecosystem services can be maintained—for nature's sake and for our own. Just as a responsible homeowner strives to know as much about their dwelling as they can, and to look after it as best they can, we Canadians, too, are gradually learning (or relearning) to better care for the nature in our trust. Like a responsible homeowner, we too can draw on the best available knowledge to inform decisions concerning where and how we live so that we do not cause undue or irreparable damage to a precious asset—the *natural capital* of Canada.

This report identifies species and infraspecies that occur in Canada and that are at risk of being lost forever to extinction—including animals, plants, and lichens which occur only in Canada. In 2017, 150 years after Confederation and with an ever-growing body of scientific knowledge for protecting and conserving these species, will Canadians draw on the spirit of our national anthem to proclaim: *We stand on guard for them?*



Left: Pihtokahanapiwiyyin (Poundmaker, c. 1842-1886) was a chief of the plains Cree who was named after his grandfather who had special ability in the hunting of American Bison (*Bos bison*). The Poundmaker First Nation, in Saskatchewan, is named after Pihtokahanapiwiyyin. Right: explorer John Palliser and botanist James Hector of the 1857-1860 Palliser Expedition

CANADA'S BIODIVERSITY

Canada is the world's second largest country by area, after Russia, and covers seven percent of the Earth's surface.¹⁰ With 9.1 million square kilometres of land, nearly 900,000 square kilometres of freshwater (eight percent of Earth's¹¹), about 202,000 kilometres of coastline (the longest in the



Caribou (*Rangifer tarandus*) are emblematic of Canada's world-renowned wilderness and wildlife.

world), and almost six million square kilometres of territorial seas, one might expect Canada to have a breadth of biodiversity to match. However, whereas the number of species worldwide (one measure of Earth's biodiversity) was estimated in 2011 at 8.7 million (± 1.3 million),¹² Canada itself hosts less than two percent of the total: roughly 70,000 native species have been described. This number is believed to account for about half the total number of the native species of Canada.¹³

The reason for Canada's relative paucity of species has much to do with latitude and cold. Canada's northern positioning, with its shorter growing season compared to, for example, the United States, and the fact that most of the land was ice-covered until the end of the Pleistocene Epoch (about 11,700 years ago¹⁴), mean that, from a global perspective, Canada's biota is modest in size.

Nonetheless, Canada is a global leader when it comes to certain aspects of biodiversity. For example, Canada contains:

- Twenty-five percent of Earth's wetlands,¹⁵ ecosystems supporting distinct biodiversity richness
- Nine percent of Earth's forests,¹⁶ including about a quarter of rare, old-growth temperate rainforests which "have exceptionally high biological production and biological diversity"¹⁷
- Large tracts of boreal forest and tundra which include a high diversity of mosses, liverworts, and hornworts (plants collectively known as *bryophytes*)¹⁸
- Some of the world's largest populations of large mammals such as Caribou (*Rangifer tarandus*), wolves, and bears—including two-thirds of the global Polar Bear (*Ursus maritimus*) population¹⁹
- A dozen, globally significant areas of plant endemism, largely places that escaped the last glaciation, where relict populations of once wide-ranging plant species endure,²⁰ and where groups of special species are found—species found nowhere else in the world
- More than 500 species of macroalgae off the coast of British Columbia, comprising about 4.5% of the world's total marine algal species²¹

While about half of Canada's wild species have been described, the ones that remain to be catalogued are principally those that belong to diverse groups of small organisms, or otherwise are difficult to detect and document. Information on many of these species is highly fragmentary or nonexistent. Nonetheless, scientists and citizen scientists are expanding knowledge about Canada's species and the ecosystems to which they belong. This report is a synthesis of that growing body of knowledge.



Staff from the British Columbia Conservation Data Centre undertaking fieldwork at the Nature Conservancy of Canada's Sparrow Grasslands Conservation Area

NATURESERVE CANADA AND CANADA'S CONSERVATION DATA CENTRES

Protecting and responsibly using land, water, and natural resources requires the best available knowledge to support decision-making—including knowledge about biodiversity. As the Canadian Councils of Resource Ministers recognized in 2010: “Long-term, standardized, spatially complete, and readily accessible monitoring information, complemented by ecosystem research, provides the most useful findings for policy-relevant assessments of status and trends....Biodiversity monitoring is important because it provides a basis for evaluating the integrity of ecosystems, their responses to disturbances, and the success of actions taken to conserve or recover biodiversity.”²²

To help meet this need, in 1988 The Nature Conservancy, in partnership with the Nature Conservancy of Canada, began creating a network of Canadian Conservation Data Centres (CDCs). The first CDC was established in Québec that year. With the founding of the Nunavut CDC in late 2015, there are now 10 centres. With the exception of the Atlantic Canada CDC, the centres are housed within their respective provincial or territorial government (e.g., within a department responsible for wildlife management and conservation). The Atlantic Canada CDC operates as a non-government, charitable entity, with representation from the federal government, the four Atlantic provinces, and several non-government organizations.

The international NatureServe Network is made up of the Canadian CDCs and over 70 other similar organizations throughout the United States, Mexico, and much of the Caribbean, Central America, and South America. This network is centrally supported by NatureServe, a U.S.-based non-government organization headquartered in Arlington, Virginia. Each CDC serves as a source for reliable and current scientific information about species and ecosystems. They employ people with expertise and a passion

On Guard for Them: Species of Global Conservation Concern in Canada

for scientific investigation of biodiversity. These biologists, ecologists, and information management specialists use the latest technologies for generating new information from the field. They also deploy an array of tools for sharing biodiversity knowledge.

The CDCs strive to answer four key questions: What species and ecosystems exist in each province or territory? What is the condition and conservation status of their populations? Which species or ecosystems are at risk of extinction (global) or extirpation (from Canada or a province or territory)? Where precisely are species at risk and rare ecosystems found?

To answer these questions, CDCs:

- List the species and ecosystems (biodiversity elements) present in given jurisdictions
- Determine the rarity of and threats to these elements
- Gather information from available sources on occurrences of elements of conservation concern
- Conduct fieldwork to improve the occurrence and status information
- Process, map, and manage the collected data
- Assess the geographic distribution of species and ecosystems, at multiple geographic scales
- Distribute knowledge in aid of decision-making concerning land use development, natural resources management, biodiversity conservation, education, and research

The NatureServe Canada Network currently maintains information on over 38,000 species and 2200 ecosystems. The Network steadily adds new knowledge about biodiversity—including about species newly documented for Canada or species or infraspecies newly described to science, and where they are found and their conservation status. The Network also helps document the most important places for biodiversity in Canada, to aid in management decisions concerning them.



John Klymko, a zoologist with the Atlantic Canada Conservation Data Centre, searching for rare insects in the field

Canada's CDCs: Expanding Biodiversity Information

NatureServe Canada and its network of CDCs are continually expanding their information holdings—adding to the body of knowledge available for conservation decision-making. This has been aided by many factors including:

- The compilation of species lists, especially for lesser known taxonomic groups (greatly aided by the national *General Status of Wildlife in Canada* program^e)
- The work of taxonomic specialists who name and classify species, and who assist others with identification of specimens
- The advent of online data publishing that has greatly increased the availability of species distributional data based on specimen collections
- Field work by CDC staff and by many non-CDC personnel (including *citizen scientists*^f), generating new information on the presence, distribution, and abundance of species
- The founding of the Northwest Territories and Nunavut CDCs, in 2011 and 2015, respectively, thereby completing Canada-wide CDC coverage



Eastern Massasauga (*Sistrurus catenatus catenatus*) is known from southwestern Ontario and 10 American states, and is Vulnerable (G4T3Q).

Examples of CDCs that have significantly increased their information holdings include:

- Atlantic Canada: There were 200,000 species *locational records* on file with the Atlantic Canada CDC in 2005. By mid-2016 there were nearly 1.3 million such records—a six-fold increase. For species the CDC is tracking (i.e., monitoring their conservation status), the number of these records grew from 52,789 in 2005 to 283,485 by mid-2016—a five-fold increase.
- Northwest Territories: As of 2005 (prior to the founding of the Northwest Territories CDC), there were only 708 *element records* for the territory; by mid-2016 there were 5340—a seven-fold increase. As well, by mid-2016 the number of species locational records maintained by the Northwest Territories CDC had increased to 986,406.
- Saskatchewan: As of 2005 the Saskatchewan CDC had 7698 *element occurrence records* on file; by mid-2016 the number was 11,845—a 54% increase.
- Yukon: As of 2005 there were 2652 element records for Yukon; by mid-2016 that number had increased to 5318—a two-fold increase. As well, whereas in 2005 the Yukon CDC had but 94 element occurrence records, by mid-2016 it held 1089.

^e The *Program on the General Status of Wildlife in Canada* is mandated under the 1996 federal-provincial-territorial *Accord for the Protection of Species at Risk*. From it and every five years is produced the *General Status of Wildlife in Canada* report, a “snapshot of each species' status; their population size and distribution, the threats that each species faces in Canada, and any trends in these factors.” Source: <http://www.wildspecies.ca/>

^f The NatureServe Network deploys a strategy for “collaborating with citizen scientists [as] an important, cost-effective means for documenting patterns of biodiversity in a rapidly changing world.” For more information see: www.natureserve.org/sites/default/files/publications/files/citizen-science-execsummary-web.pdf

Canada's CDCs: Working With Partners to Build Biodiversity Knowledge

Canada's CDCs work with government and non-government partners to add to the body of knowledge concerning the biodiversity of Canada, and to advance biodiversity science. For example, in 2012 Ontario's Natural Heritage Information Centre (NHIC) assisted Parks Canada Agency with botanical studies in Point Pelee National Park. Mike Oldham, NHIC's lead botanist, worked closely with Parks Canada biologists to update the inventory of two significant sites at the Park—Middle Island (the southernmost land in Canada) and the Lake Erie Sand Spit Savannah where Parks Canada has initiated a major habitat restoration project.



Biologists from Parks Canada Agency and Ontario's Natural Heritage Information Centre in the field on Middle Island, Point Pelee National Park

Middle Island and the other islands in western Lake Erie support significant populations of rare flora and fauna. However, many native plant species on Middle Island have declined in recent years due to dramatically increased numbers of Double-crested Cormorants (*Phalacrocorax auritus*) nesting on the island. Droppings from the cormorants are changing the island's soil chemistry, as well as directly killing plants beneath nesting trees and the trees themselves. Further, opening of the forest canopy and changes in soil chemistry have enabled a number of large, aggressive, invasive alien plants to dominate portions of the island, thereby excluding native species.

Since 2008, Parks Canada has been controlling nesting cormorant numbers on the island to protect and recover significant populations of rare native plants. Vegetation plots have been established to monitor the effects of changing cormorant numbers on the island's flora, including populations of a number of plants that are provincially or nationally at risk.

As well, Parks Canada and NHIC biologists have conducted botanical surveys and vegetation monitoring of habitat at Lake Erie Sand Spit Savannah. This rare vegetation community type is found at only a few sites along Lake Erie's shoreline. The habitat at Point Pelee is being degraded by vegetation succession due to the absence of disturbance (e.g., fire) and by invasion of non-native plants. Through measures such as localized controlled burns, removal of exotic plant species, and the reintroduction of species associated with the habitat, Parks Canada is restoring this area to ensure it continues to support a characteristic assemblage of plants and animals. Monitoring plots in the Savannah have also been established to document changes in the vegetation as a result of management efforts.

Many of the park's most imperilled plant and animal species, including some federally and provincially listed species at risk, occur in Savannah habitat. Parks Canada and NHIC biologists have located populations of these species to ensure that they have not been inadvertently damaged during habitat management work, and to use various plants as seed sources for re-planting efforts. As well, a number of plant species not previously known to have occurred at Point Pelee have been documented.

Advancing the Canadian National Vegetation Classification: A Tool for Conserving Ecosystems

Why classify ecosystems? Ecosystems have a diverse set of species interacting with each other and their habitat, to which a name can be given. By describing, classifying, and tracking ecosystems, ecologists support ecosystem-based conservation—conservation encompassing not only species at risk but also common species, the interactions among all species (general ecological functioning), and the protection of ecological services that humanity depends upon (e.g., flood control by forests, water filtration by wetlands).

Addressing the need: In Canada, this scientific need is being advanced through the Canadian National Vegetation Classification (CNVC). Begun in the late 1990s, the CNVC aims to classify all the natural and semi-natural terrestrial and aquatic vegetation in Canada. Led by Natural Resources Canada–Canadian Forest Service and key provincial partners, the CNVC collaboration involves many governmental and non-governmental agencies, including NatureServe, NatureServe Canada, and several Canadian CDCs.

Currently, the upper five levels of the eight-level CNVC hierarchy characterize all terrestrial and aquatic vegetation in Canada.⁶ For the lower three levels, the focus to date has been on forested vegetation, notably for boreal and temperate forests. Classification of non-treed vegetation (e.g., grasslands) is not as advanced.

Applying the classification: Completing the CNVC will enable NatureServe Canada and the Canadian CDCs to collect scientific information on terrestrial and aquatic ecosystems in a standardized manner. This information can then be shared across the CDC network and throughout the western hemisphere. The CNVC (and its compatibility with the U.S. National Vegetation Classification) will help NatureServe Canada and the Canadian CDCs to identify provincial or territorially rare ecosystems, intact ecosystems and landscapes, and biodiversity hotspots per the international Key Biodiversity Areas partnership (<http://www.keybiodiversityareas.org/home>), and to support continental-scale conservation efforts such as the North American Intergovernmental Committee on Cooperation for Wilderness and Protected Areas Conservation (<http://nawpaccommittee.org/>).

For more information on the CNVC, see: <http://www.cnvc-cnvc.ca/>



This photo depicts representation of a globally Vulnerable (G3) vegetation association found on the west coast of Canada: CNVC00001 Western Hemlock - Western Redcedar / Salal - Alaskan Blueberry / Stairstep Moss (*Tsuga heterophylla* - *Thuja plicata* / *Gaultheria shallon* - *Vaccinium alaskaense* / *Hylocomium splendens*)

⁶ The eight levels in the hierarchy are, in order from highest (coarsest scale) to lowest (finest scale), Class–Subclass–Formation–Division–Macrogroup–Group–Alliance–Association.

ASSESSING CONSERVATION STATUS: NATURESERVE’S METHODOLOGY^h

Information about species and ecosystem conservation status is crucial for setting priorities for biodiversity conservation. Over the past 40+ years, the NatureServe Network (with origins dating to the founding of the first CDCs in South Carolina and Mississippi, in 1974), has developed standardized methods and tools for assessing such status at global, national, and subnational scales. NatureServe collects and evaluates data for species and ecosystems using these methods and tools to ensure that assigned status ranks are accurate and consistent, based on current field and remote sensing information.

NatureServe has developed a rank calculator to increase the repeatability and transparency of its ranking process. The calculator computes a numeric score, based on weightings assigned to each factor and some conditional rules, and that is translated to a calculated status rank. This calculated rank is reviewed and adjusted (if deemed appropriate) before it is recorded as the final assigned conservation status rank.

NatureServe uses 10 status factors to assess the conservation status of species or ecosystems (Table 1). Based on these factors, conservation status is assigned on a scale from 1 (Critically Imperilled) through 5 (Secure). These ranks may be derived at global, national, or subnational levels. Range-ranks may also be produced to transparently reveal the degree of uncertainty in a status when the available information does not permit a single status rank (e.g., G1G3 = globally Critically Imperilled to Vulnerable).ⁱ

Table 1: Summary of NatureServe conservation status factors

Factor Category	Factor
Rarity	Range Extent
	Area of Occupancy
	Population
	Number of Occurrences
	Number of Occurrences or Percent Area with Good Viability/Ecological Integrity
	Environmental Specificity
Trends	Long-Term Trend
	Short-Term Trend
Threats	Threats
	Intrinsic Vulnerability

^h For details on NatureServe’s methodology for assessing conservation status see: Master, L.L., Faber-Langendoen, D., Bittman, R., Hammerson, G.A., Heidel, B., Ramsay, L., Snow, K., Teucher, A. & Tomaino, A. 2012. NatureServe Conservation Status Assessments: Factors for Evaluating Species and Ecosystem Risk. NatureServe: Arlington, VA.

ⁱ Range-ranks may also be reported as rounded ranks. For example, a species with a range-rank of G2G3 has a rounded rank of G2, as does a species with a range-rank of G1-G3.

On Guard for Them: Species of Global Conservation Concern in Canada

Species or ecosystems that no longer exist or are believed to no longer exist are classified as Presumed Extinct (X). Species or ecosystems that are Possibly Extinct (H) are of highest conservation concern, followed by species which are Critically Imperilled (1), Imperilled (2), or Vulnerable (3) (Table 2).

Table 2: NatureServe global conservation status ranks

Rank	Conservation Status	Definition
GX	Presumed Extinct (Species)	Not located despite intensive searches and virtually no likelihood of rediscovery
	Presumed Eliminated (Ecosystems)	Eliminated throughout its range, due to loss of key dominant and characteristic taxa and/or elimination of the sites and ecological processes on which the type depends
GH	Possibly Extinct (Species)	Known from only historical occurrences but still some hope of rediscovery: examples of evidence include (1) that a species has not been documented in approximately 20–40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is extinct or eliminated throughout its range
	Possibly Eliminated (Ecosystems)	
G1	Critically Imperilled	At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors
G2	Imperilled	At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors
G3	Vulnerable	At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors
G4	Apparently Secure	At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors
G5	Secure	At very low risk of extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats
GU	Unrankable	Currently unrankable due to lack of information or due to substantially conflicting information about status or trends
GNR	Unranked	Global conservation status not yet assessed
GNA	Not Applicable	A conservation status rank is not applicable because the species is not a suitable target for conservation activities

The methodology:

- Considers all of the status factor data collectively in assigning a status
- Explicitly considers threats in the assessment

- Assesses conservation status for both species and ecosystems
- Is sufficiently complete for many North American species such that global, national, and subnational ranks are routinely linked to facilitate conservation priority setting

Infraspecies are also given an equivalent “T” ranking. For example, the conservation status ranking for a globally Secure plant species would be G5; an Imperilled *subspecies* of the same plant would be ranked G5T2.

There are three qualifiers that may be appended to conservation status ranks to provide additional information:

- Q = questionable taxonomy
- ? = imprecision: The addition of a “?” qualifier to a 1–5 conservation status rank denotes that the assigned rank is imprecise.
- C = occurrence presently limited to captive or cultivated individuals (for species only)

Combining global, national, and subnational conservation status ranks also provides perspective and scale for placing risk levels in a geographic context and for setting conservation priorities. These assessments are continually reviewed, refined, and updated to reflect advances in knowledge. NatureServe Network specialists rely on the best available information from natural history museum collections, scientific literature, research projects, and knowledgeable observers, including those involved in citizen science, to determine conservation status. This information is augmented by field inventories targeting species of conservation concern and those for which little information exists or are only known historically. Many shifts in conservation status ranks reflect improved scientific understanding of the condition of species, rather than changes in the actual status of species in the wild.



Left: Western Prairie White-fringed Orchid (*Platanthera praeclara*)—Vulnerable (G3)—is found within remnant tallgrass prairie habitat in southern Manitoba (see page 34) and in eight American states.

Right: The Monarch (*Danaus plexippus*) is perhaps North America’s most iconic butterfly and an international symbol for species at risk. The subspecies that reaches Canada, *Danaus plexippus plexippus*, which returns to Mexico to overwinter and begin the Monarch’s annual breeding cycle, is Vulnerable (G4T3).

Fieldwork Yields Knowledge about a Species of Concern—and Helps Prioritize Conservation Efforts



Visitors to New Brunswick’s biggest summer party spot, Parlee Beach east of Moncton, probably don’t realize it but scattered within the beach habitat is a mysterious kleptoparasitic wasp waiting to slip in and lay its eggs on spiders captured and paralyzed by other related wasp species. Fieldwork in 2015 by the Atlantic Canada Conservation Data Centre (AC CDC), in dune and beach habitat at Parlee Beach and many other locations along New Brunswick’s eastern shore, documented 21 new occurrences of a poorly understood spider wasp species, known only by its scientific name—*Ceropales bipunctata*.

Prior to 2015, this species had been seen at only five Canadian locations in the previous decade, and had apparently declined across the eastern United States. *Ceropales bipunctata* was feared to be at risk of extirpation in Canada based on its apparent loss at many Ontario locations. This led the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to list the species as a high priority candidate for assessment under the federal *Species at Risk Act*.

The wasp was known in the Maritimes from three specimens collected in 1939-1940 at seaside locations, and from two recent photographic records from dunes along New Brunswick’s eastern coast. The AC CDC received funding from the New Brunswick Wildlife Trust Fund to conduct focused surveys looking for *C. bipunctata* on coastal dunes throughout the province’s eastern shore. The AC CDC found the species to be rather frequent and widespread, occurring at 21 of 33 survey sites over more than 200 km from the Nova Scotia border almost to the Gaspé Peninsula of Quebec. Given this abundance, there is also a strong likelihood that the wasp is widespread on dunes in adjacent areas of Nova Scotia and Prince Edward Island.

The AC CDC’s fieldwork has changed the understanding of the conservation status of this species in Canada. *Ceropales bipunctata* is now unlikely to be put forward for further status assessment. In turn, this allows scarce conservation resources to be allocated to other species that truly need them. The confirmation of wider distribution of *C. bipunctata* exemplifies how much remains to be learned about Canada’s biodiversity, even in long-settled regions. Further, it demonstrates the conservation value of well-planned, focused, and professional field surveys such as those conducted by CDCs across Canada.

***Ceropales bipunctata*, a species of spider wasp, is known to have occurred in southern Ontario, southern Québec, New Brunswick, Prince Edward Island, and in the United States as far south as Arkansas. It appears to have declined significantly throughout its range. However, not enough information yet exists for a global conservation status rank to be assigned. The species was recently documented by the Atlantic Canada Conservation Data Centre to occur in 21 wide-ranging locations along New Brunswick’s eastern shore.**



Aiding Species at Risk Recovery in Ontario

Increasing the size of a plant or animal's population or improving population viability requires an understanding about where the organism has occurred in the past, where it occurs now, and where it could occur in the future. Information about the integrity of habitat at those locations factors into the recovery picture, as does information about the existing or potential threats to the species and its habitat.



Canada's CDCs inform decisions, plans, responses, and reports throughout species at risk recovery processes. For example, Ontario's Natural Heritage Information Centre (NHIC) assists the government in meeting its responsibilities for reviewing and publically reporting progress on protecting and recovering species at risk. To illustrate, NHIC contributed to the government's *Five-Year Review of Progress Towards the Protection and Recovery of Species at Risk*.²³ That work reviewed species listed under the provincial *Endangered Species Act* for which recovery strategies had been approved in 2010.

Three of those species are of global conservation concern:

- Eastern Prairie White-fringed Orchid (*Platanthera leucophaea*), a tall orchid known only from southern Ontario and 12 states, and that is globally Imperilled to Vulnerable (G2G3)
- Redside Dace (*Clinostomus elongatus*), a small, brightly coloured minnow known only from Ontario and 11 states, and that is Vulnerable to Apparently Secure (G3G4)
- Wood Turtle (*Glyptemys insculpta*), a rare, medium-sized turtle known from Ontario, Québec, New Brunswick, Nova Scotia, and 18 states, and that is Vulnerable (G3)

For each of these species and the other nine covered in the five-year report, NHIC provided information drawing on the Centre's ever-growing store of biodiversity data. For example, for the Eastern Prairie White-fringed Orchid, NHIC reported on the number of populations that were historical, *extant*, or extirpated, and noted that 621 records of the orchid, based on observations from 1984 to 2012, had been received since 2008. These records, NHIC reported, "have helped to redefine where the species is known or has been known to occur, and can provide additional information on the species' habitat and threats....in addition to the new location where [Eastern Prairie White-fringed Orchid] is now known to occur, observations of the species have been made at five of the populations since 2008, confirming the plants' continued persistence and providing indications of the population's size and condition."²⁴

Similarly, NHIC reported 3200 "newly-submitted" observations of the Wood Turtle since 2008. That information—illustrating the value of inventory in helping set priorities for conservation action—has "re-confirmed the existence of four populations in eastern Ontario, and [has] resulted in the addition of 15 newly-discovered, extant populations."²⁵

The Wood Turtle (*Glyptemys insculpta*) —Vulnerable (G3)—is known from New Brunswick, Nova Scotia, Ontario, Québec, and 18 American states.



Rediscovering a Species Once Thought Possibly Extinct

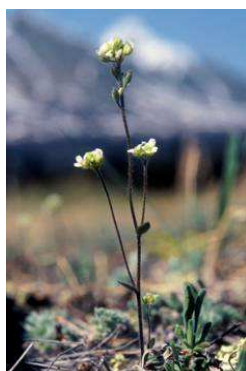


By 2004, despite five years of surveys, Yukon Draba (*Draba yukonensis*) was ranked as Possibly Extinct (GH). Fifty years had passed since this member of the mustard family had last been recorded, making it one of the rarest plants in Canada. Moreover, of 45 flowering plant species endemic to Canada which were listed by the NatureServe Network as of global conservation concern in 2005, Yukon Draba was the only one listed as Possibly Extinct.²⁶

Yukon Draba—short-lived, intolerant of warmer conditions, and with apparently limited ability for seed dispersal—is an ecological specialist able to thrive or persist only in a narrow range of environmental conditions. Its limited distribution suggests it “may be a relict species associated with ancient beaches and spits” left behind following glacial retreat.²⁷

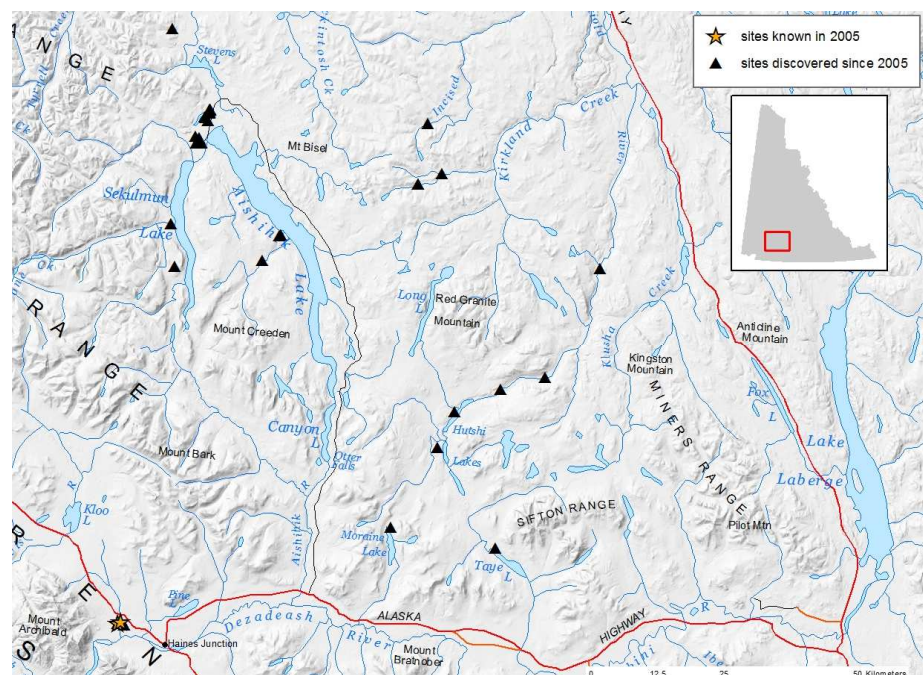
Originally known from only one meadow in southwestern Yukon, Yukon Draba was rediscovered in 2005 in what is believed to be the meadow where the species was originally documented. Three years later it was found in two adjacent meadows.²⁸ Growing awareness of Yukon Draba led to a chance discovery of a single plant over 100 kilometres away. This, in turn, led to further search effort targeting similar habitats in lowland meadows of southwestern Yukon. Yukon Draba is now known from 19 sites in Yukon, as documented by the Yukon Conservation Data Centre.²⁹

Accordingly, Yukon Draba is now considered to be globally Imperilled to Vulnerable (G2G3). The Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which in 2011 had determined Yukon Draba as nationally Endangered, is reassessing this finding. Protecting Yukon Draba from threats including encroaching industrialization, invasive species, and habitat shift exacerbated by climate change,³⁰ could allow this biological rarity to persist.



Yukon Draba (*Draba yukonensis*), known only from Yukon and Imperilled to Vulnerable (G2G3)

Right: Documented locations of Yukon Draba



Lost Forever: Species in Canada That Have Gone Extinct Since 1844

Life on Earth began some 3.8 to 4.1 billion years ago.³¹ However, of all the species that have ever existed, more than 99% are extinct.³² They disappeared at a natural background rate of one to five species per year.³³ Extinction, therefore, is a natural phenomenon.

There have been at least five times in Earth's history when there were surges in species loss. These mass extinctions, from 65 million to 440 million years ago, are believed to have been caused by factors such as climate change and related effects, or asteroid hits upon Earth. Each time, they caused three quarters to nearly all species to be eliminated.³⁴ Biodiversity recovered but the process took up to 10 million years.³⁵

However, scientific consensus now places us in a new geological epoch known as the *Anthropocene*—*the age of humans*. The Anthropocene refers to a period in which human beings are exerting a substantial and growing influence on global ecosystems, one consequence of which is the acceleration of species extinction rates.³⁶ Indeed, we now live in what is being called “the sixth extinction,” this one almost entirely due to human activity.³⁷ Today, worldwide, species are being lost at 1000 to 10,000 times the natural background rate.³⁸ Ninety-nine percent of species at risk are in trouble because of human activity and by the middle of the 21st century some 30% to 50% of all species could disappear.³⁹ “Moreover, even in species that are not currently threatened, the extirpation of populations is frequent and widespread, with losses that far outstrip species-level extinctions. Population-level extinction directly threatens ecosystem services and is the prelude to species-level extinction.”⁴⁰

There are regions of Canada where large numbers of species and infraspecies have disappeared but continue to exist elsewhere within the country. For Canada as a whole, at least 109 species and infraspecies have vanished but continue to exist in the United States and/or elsewhere.⁴¹ **In terms of outright extinction, when all species and infraspecies in Canada that are included thus far in NatureServe's databases are considered, 10 species (three of which were endemic to Canada) and six subspecies (three of which were endemic to Canada) have been lost since 1844 and are Presumed Extinct (Appendix A).** (Note: Table 3 totals 13 of these species and infraspecies from among the 13 species groups which are the principal focus of this report.)

Habitat loss, overhunting, overfishing, pollution, and/or invasive species led to the loss of most of these extinct animals and plants. The causes are unclear as to why the others vanished. Extinction is inherently difficult to document. A species' disappearance must often be deduced from evidence of its absence. Judgment as to when to declare a species extinct depends upon how easy it would be to find it, were it still alive. In practice, confirmation of extinction is usually based on multiple unsuccessful searches of suitable habitat and long periods without evidence of the species' presence.⁴²

The extinct Passenger Pigeon (*Ectopistes migratorius*) once numbered in the billions and possibly represented up to 40% of all birds in North America.



SPECIES OF GLOBAL CONSERVATION CONCERN IN CANADA

This report presents findings regarding the global conservation status of 5457 species and 1751 infraspecies native to Canada (Table 3), within the same 13 scientifically better-known species groups that were the focus of NatureServe Canada's 2005 report *Our Home and Native Land: Canadian Species of Global Conservation Concern*.⁴³ To enlarge the picture of species and infraspecies of global conservation concern, other invertebrates, mosses, and lichens that are not among the 13 groups but that are endemic to Canada and at risk of extinction are also identified.^j

Of the animals and plants studied for this report, from the 13 species groups, sufficient data and information exist for 97% of the species (5266) and 92% of the infraspecies (1605) to have assigned them global conservation status ranks, ranging from Presumed Extinct to Secure. The remaining species and infraspecies do not yet have global ranks assigned due to insufficient information and/or a lack of confidence in their national and subnational ranks. Throughout this report these latter species and infraspecies are excluded from calculations of percentages of global conservation concern.

Of the animals and plants from the 13 groups, 333 species (6.3%) and 184 infraspecies (11.5%) are of global conservation concern: their ranks range from Possibly Extinct to Vulnerable (Table 3). In addition, 48 species and four infraspecies that are not among the 13 groups and that are endemic to Canada are also of global concern.^k Thus, this report identifies 381 species and 188 infraspecies that occur in Canada as being globally at risk (Appendix B).

Sei Whale (*Balaenoptera borealis*)—Vulnerable (G3)—occurs off Canada's Pacific and Atlantic coasts, is widespread elsewhere in the world's oceans, but is relatively rare. Its global population declined by about 80% over the last three generations of the species, primarily due to commercial whaling (fully banned as of 1989).⁴⁴



^j This report does not identify specific populations of species which may be considered at risk of disappearance, and which may be recognized by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as at risk.

^k Many species and infraspecies endemic to Canada (invertebrates, notably) remain to be fully documented and their status assessed.

Table 3: Global conservation status of native animals and plants in Canada, from 13 species groups

	Species (G) and Intraspecies (T) Ranked Possibly Extinct (GH/TH) to Secure (G5/T5)																Species of Global Concern (GH–G3) ^b	Intraspecies of Global Concern (TH–T3) ^b
	Total Species Analyzed ^a	Total Intraspecies Analyzed ^a	GX	TX	GH	TH	G1	T1	G2	T2	G3	T3	G4	T4	G5	T5		
Vertebrates	951	170	7	5	2	1	24	7	5	10	45	22	126	35	743	73	76 (8.0)	40 (27.0)
Mammals	193	54	1	2	0	1	5	5	2	5	17	2	37	16	131	15	24 (12.5)	13 (29.5)
Birds	448	59	3	0	1	0	2	2	1	4	11	17	49	15	381	15	15 (3.4)	23 (43.4)
Reptiles and Turtles	45	32	0	0	0	0	0	0	1	1	3	1	5	1	36	29	4 (8.9)	2 (6.3)
Amphibians	47	10	0	0	0	0	0	0	1	0	0	0	9	0	37	10	1 (2.1)	0 (0.0)
Freshwater Fishes	218	15	3	3	1	0	17	0	0	0	14	2	26	3	158	4	32 (14.8)	2 (22.2)
Invertebrates	594	331	0	0	0	1	3	10	6	10	27	25	86	55	467	174	36 (6.1)	46 (16.7)
Freshwater Mussels	54	4	0	0	0	0	1	0	1	1	6	0	14	0	32	3	8 (14.8)	1 (25.0)
Crayfishes	9	4	0	0	0	0	0	0	0	0	0	0	0	0	9	4	0 (0.0)	0 (0.0)
Butterflies and Skippers	294	279	0	0	0	1	2	8	3	9	12	21	32	48	241	137	17 (5.9)	39 (17.4)
Tiger Beetles	31	37	0	0	0	0	0	2	1	0	4	4	4	7	21	24	5 (16.7)	6 (16.2)
Dragonflies and Damselflies	206	7	0	0	0	0	0	0	1	0	5	0	36	0	164	6	6 (2.9)	0 (0.0)
Vascular Plants	3912	1250	1	0	0	1	29	14	48	20	144	63	635	266	2876	818	221 (5.9)	98 (8.3)
Ferns and Relatives	171	43	0	0	0	0	2	1	1	0	20	4	33	11	115	21	23 (13.5)	5 (13.5)
Conifers	36	13	0	0	0	0	0	0	0	0	2	3	3	0	31	10	2 (5.6)	3 (23.1)
Flowering Plants	3705	1194	1	0	0	1	27	13	47	20	122	56	599	255	2730	787	196 (5.6)	90 (8.0)
Total (Percentage)	5457	1751	8 -	5 -	2 (0.0)	3 (0.2)	56 (1.1)	31 (1.9)	59 (1.1)	40 (2.5)	214 (4.1)	110 (6.9)	847 (16.1)	356 (22.2)	4086 (77.6)	1065 (66.4)	333 (6.3)	184 (11.5)

a) Of the species and intraspecies analyzed for this report, some do not have global conservation status ranks assigned due to lack of information to inform ranks, or lack of confidence in assigning ranks. They have thus been excluded from calculations of percentages of species and intraspecies of global conservation concern.

b) Percentage figures in this table (in brackets) have been calculated by dividing the applicable GH/TH to G3/T3 figures into the total applicable GH/TH to G5/T5 figures.

Mammals

Mammals serve various ecological functions (e.g., regulating insect populations, dispersing seeds, pollinating, and acting as indicators of general ecosystem health).⁴⁵ An estimated 5489 mammal species and 412 subspecies occur worldwide. Sixty-three percent of them are thought to be secure, 15% have insufficient data to determine their threat status, and 22% are at risk or extinct (76 mammals have gone extinct since 1500). Habitat loss is the single greatest threat to mammals, affecting over 2000 species.⁴⁶

Canada's mammals that are ranked Presumed Extinct (GX) are the Sea Mink (*Mustela macrodon*) which likely went extinct in the late 1800s, and two subspecies, Dawson Caribou (*Rangifer tarandus dawsoni*, G5TX) and Eastern Cougar (*Puma concolor cougar*, G5TXQ), which both disappeared over the late 1800s to early 1900s (Appendix A). Otherwise Canada provides habitat for 192 living native mammal species and 52 subspecies. For this assessment, all of the species and 45 of the subspecies have reliable global status ranks. Of those, 24 species (12.5%) and 13 subspecies (29.5%) are of global conservation concern (Table 3, Appendix B).

Thirteen of the 37 globally at risk mammals are endemic to Canada. They include the Vancouver Island Wolverine (*Gulo gulo vancouverensis*) which is Possibly Extinct (G4TH), the Vancouver Island Marmot (*Marmota vancouverensis*) which is Critically Imperilled (G1), and the Ungava Seal (*Phoca vitulina mellonae*), one of the world's few freshwater seals and found in a few remote lakes in northern Québec where it is Critically Imperilled (G5T1).

Twelve of the at risk mammals are marine including nine whales, Steller Sea Lion (*Eumetopias jubatus*) which is Vulnerable (G3), Northern Fur Seal (*Callorhinus ursinus*) which is Vulnerable, and the iconic Polar Bear (*Ursus maritimus*) which is also Vulnerable (G3). Also on the list are one Critically Imperilled, one Imperilled, and five Vulnerable bat species.



The endemic Vancouver Island Marmot (*Marmota vancouverensis*) is Canada's rarest mammal and is Critically Imperilled (G1).



Some species at risk can be recovered in part through direct intervention. Here, a field crew on a mountainside on Vancouver Island is preparing a nest box for a captive bred Vancouver Island Marmot to be released into the wild. Numbering less than 30 individuals in the wild as of 2003, there are currently approximately 200 marmots.⁴⁷ The goal of the recovery strategy for this species is to realize 400-600 marmots living in three geographically distinct populations on the island.⁴⁸

Birds

Birds are perhaps the best known group of species and well known for ecological services such as pollinating plants, dispersing seeds, and helping to control insects. An estimated 10,426 bird species occur worldwide.⁴⁹ One in eight of them (13%) are threatened with extinction with “unsustainable agricultural practices” (e.g., cropland expansion, monocultural planting) the single greatest cause, followed by forest loss, fisheries by-catch of seabirds, and invasive alien species (particularly on islands).⁵⁰

Canada has lost three bird species to extinction since the mid-1800s: the Great Auk (*Pinguinus impennis*, GX), last observed in 1844; Labrador Duck (*Camptorhynchus labradorius*, GX), last observed in 1878; and the Passenger Pigeon (*Ectopistes migratorius*, GX), decimated by overhunting and disappearing in 1914 upon the death at the Cincinnati Zoo of the last specimen, a female named Martha (Appendix A).⁵¹

Otherwise, 445 native bird species and 59 subspecies still occur in Canada. For this assessment, all of the species and 53 of the subspecies have reliable global status ranks. Of those, 15 species (3.4%) and 23 subspecies (43.4%) are of global conservation concern (Table 3, Appendix B). They include the Eskimo Curlew (*Numenius borealis*) which has not been seen since 1987 and is Possibly Extinct (GH).

Ten songbirds, nine seabirds, seven raptors, and five shorebirds account for 31 of the 38 birds of global conservation concern in Canada. Seven of these 38 birds are endemic to Canada while the Whooping Crane (*Grus americana*, G1) and Red Crossbill *percna* subspecies (*Loxia curvirostra percna*, G5T1T2Q) have populations which only breed in Canada (i.e., their breeding populations are also endemic).



Northern Saw-whet Owl *brooksi* subspecies (*Aegolius acadicus brooksi*) is a small owl endemic to Haida Gwaii. It is Imperilled to Vulnerable (G5T2T3).



Kirtland's Warbler (*Setophaga kirtlandii*) has a small breeding range primarily in Michigan, secondarily in Wisconsin and Ontario, and is North America's rarest songbird. Conservation efforts have improved the chances of survival for this warbler species. Its global conservation status is now Vulnerable to Apparently Secure (G3G4).

Reptiles and Turtles

Reptiles and turtles serve as both predators and prey and as such are important components of food webs. Some species consume rodents and insects that are harmful to agriculture, while other species can be important seed dispersers or pollinators. A few reptiles (e.g., alligators) are also *keystone* species—critical to the survival of other species within certain ecosystems.⁵²

An estimated 10,272 reptile and turtle species occur worldwide, principally lizards (6145 species) and snakes (3567) followed by turtles (341) and other species (e.g., crocodiles).⁵³ One in five of them (19%) are at risk of extinction, with one in two freshwater turtle species at exceptionally high risk.⁵⁴

None of the 45 native reptile and turtle species and 32 subspecies known for Canada has gone extinct. Four species (8.9%) and two subspecies (6.3%) are of global conservation concern, none of them endemic to Canada (Table 3, Appendix B).

Western Pond Turtle (*Actinemys marmorata*)—Vulnerable to Apparently Secure (G3G4)—occurs in five American states but has not been seen in the wild in Canada (British Columbia, specifically) since 1959.



Amphibians

Amphibians—frogs, toads, newts, and salamanders—are an integral part of ecosystems, serving as important predators of invertebrates, transferring nutrients from aquatic to terrestrial systems, and serving as prey for some vertebrates. In temperate (and tropical) regions, the number of amphibian individuals can significantly exceed those of reptiles, birds, and mammals.⁵⁵

About 7000 species of amphibian occur worldwide.⁵⁶ As of 2012 about 47% of them were at risk of extinction, making amphibians more vulnerable to extinction than species in any other taxonomic group.⁵⁷ Many of them have been hit by chytridiomycosis, a fungal disease described as “the worst infectious disease ever recorded among vertebrates in terms of number of species impacted and [threatened with] extinction.”⁵⁸



Canada provides habitat for 47 native amphibian species and 10 subspecies. Only one species (2.1%) is of global conservation concern—Oregon Spotted Frog (*Rana pretiosa*) which is Imperilled (G2) (Table 3, Appendix B).

Oregon Spotted Frog (*Rana pretiosa*)—Imperilled (G2)—is known from only 22 largely isolated locations across extreme southwestern British Columbia, Washington, and Oregon. The species is extirpated from California.

Freshwater Fishes

Freshwater fishes—those that spend all or some of their lives in freshwater¹—perform a range of ecological functions and “are excellent indicators of biological and ecological integrity due to their continuous exposure to water conditions.”⁵⁹ More than 15,000 freshwater fish species exist worldwide⁶⁰ but, as of 2009, 37% of them were at risk of extinction.⁶¹ Freshwater fishes face many threats, singularly and in combination, including habitat destruction and modification, invasive species, overfishing, pollution, and climate change.⁶²



Atlantic Whitefish (*Coregonus huntsmani*) is known from only three lakes in southwest Nova Scotia and is Critically Imperilled (G1).

Canada has lost three native freshwater fish species (two of which were endemic to Canada) and three subspecies (two endemic to Canada) to extinction (Appendix A), while 215 species and 12 subspecies remain native to the country. Of those, 32 species (14.8%)—including the Shortnose Cisco (*Coregonus reighardi*) which is Possibly Extinct (GH)—and two subspecies (22.2%) are of global conservation concern (Table 3, Appendix B). Sixteen of the 34 globally at risk fishes are endemic to Canada.

Freshwater Mussels

Mussels play several important roles within freshwater and marine environments and are highly sensitive to environmental quality. The absence of native freshwater mussels from freshwater systems to which they belong can be indicative of pollution; conversely, their presence in such systems is indicative of good to excellent water quality.⁶³

Nearly 1000 species of freshwater mussel occur worldwide.⁶⁴ North America, with 281 species and 16 subspecies,⁶⁵ is a centre for diversity for this group. (Forty-one species occur in Ontario alone, 17 of them in the Ottawa River watershed which is more than found in all of Europe.⁶⁶) However, freshwater mussels are one of the hardest hit groups due to habitat destruction, introduction of non-native species, and other causes. About 36 species alone are believed to be extinct in North America.⁶⁷



Fifty-four species and four subspecies of freshwater mussel occur in Canada, and all have reliable global status ranks. Of those, eight species (14.8%) and one subspecies (25.0%) are of global conservation concern (Table 3, Appendix B). None of these mussels at risk are endemic to Canada.

Rayed Bean (*Villosa fabalis*), known from Ontario and from 11 American states (in four of which it is extirpated), is Imperilled (G2).

¹ Some freshwater fishes are anadromous (spawning in freshwater), catadromous (spawning in saltwater), or diadromous (spending part of their lives in freshwater, part in saltwater).

Crayfishes

Crayfishes have important roles in aquatic systems, consuming dead and decaying plant and animal matter, and themselves consumed by a wide range of animals including invertebrates, fishes, amphibians, reptiles, birds, and mammals.⁶⁸ A prominent example of a crayfish predator is that of the Queen Snake (*Natrix septemvittata*): though globally Secure (G5), this snake is considered endangered in Canada where it occurs only in Ontario, and only where crayfish are present and fairly abundant.⁶⁹

An estimated 590 species of crayfishes are known worldwide. At least four of them have gone extinct while 32% of them are at risk of extinction. Crayfishes face numerous threats including habitat loss and degradation, pollution, invasive species, climate change, and more.⁷⁰

The limited time since the last glaciation and the fact that crayfish do not disperse well between watersheds means that only nine native crayfish species have yet colonized Canada, primarily in the south. None of them are endemic to Canada and all are considered globally Secure, as are four subspecies (Table 3).

Butterflies and Skippers

Along with moths, butterflies and skippers (the latter two often termed together as “butterflies”) are part of the large insect order known as Lepidoptera. A total of 18,768 butterfly and skipper species worldwide have been described.⁷¹ Arguably “the most charismatic of the world’s invertebrates,”⁷² butterflies are also sentinels of environmental quality, indicative of invertebrate richness within ecosystems and an important food source for many birds, bats, and other insectivorous animals.⁷³

This report assesses the conservation status of 294 native butterfly species and 279 subspecies. Of them, 290 species and 224 subspecies have reliable global status ranks. Of those, 17 species (5.9%) and 39 subspecies (17.4%)—including the Vancouver Island Blue (*Plebejus saepiolus insulanus*) which is Possibly Extinct (G5TH)—are of global conservation concern (Table 3, Appendix B). Twenty-six of the 56 butterflies and skippers at risk are endemic to Canada.



Maritime Copper (*Lycaena dospassosi*) is endemic to Canada and Vulnerable (G3). It inhabits salt marshes in New Brunswick, Nova Scotia, Prince Edward Island, and Québec.

Tiger Beetles

Tiger beetles, perhaps numbering over 2600 species worldwide,⁷⁴ are part of a large insect group known as the carabid beetles. Fast-moving and “formidable predators in the insect world,” carabid beetles are of significant benefit to agriculture, eating a wide variety of weed seeds, insects and slugs, and consuming up to their body weight daily.⁷⁵ They are found in habitats including sea and lake shorelines, stream banks, sand dunes, and woodlands.⁷⁶

Thirty-one species and 37 subspecies of tiger beetle are native to Canada, none of which are Presumed or Possibly Extinct. All but one of these beetles has a reliable global status rank. Of those, five species (16.7%) and six subspecies (16.2%) are of global conservation concern (Table 3, Appendix B). Three of the subspecies at risk are endemic to Canada.



Gibson's Big Sand Tiger Beetle (*Cicindela formosa gibsoni*), occurs in Saskatchewan and three American states, and is Critically Imperilled (G5T1).

Dragonflies and Damselflies

Dragonflies and damselflies—members of the carnivorous insect group Odonata—are among the oldest types of insects, dating to the Triassic period (some species were as large as hawks). Dragonflies and damselflies have important roles in terrestrial and freshwater habitats, “can be indicators of different biotypes and habitats, and have been used as tools to assess the biological health of [freshwater] habitats and to detect levels of heavy metals such as mercury. They are also considered model organisms to assess the effects of global climate change.”⁷⁷ Adult dragonflies are aerial predators, but dragonflies are considered freshwater insects because their nymphs (generally representing the majority of their life cycle) live in freshwater.

Around 5000 species of dragonfly and damselfly exist worldwide.⁷⁸ Multiple pressures on their habitats put many species at risk. In North America alone at least 20% of all described species are at risk.⁷⁹



Two hundred and six dragonfly and damselfly species and seven subspecies native to Canada were assessed for this report. Six species (2.9%), none of them endemic to Canada, are of global conservation concern (Table 3, Appendix B).

Elusive Clubtail (*Stylurus notatus*)—Vulnerable (G3): This species, known from six provinces and territories, and from 20 American states, is rare and is extirpated from a large part of its range.

Other Invertebrates (Canadian endemics only)

Forty-two invertebrate species and four invertebrate subspecies that are endemic to Canada but that do not belong to any of the five invertebrate groups identified above are also of global conservation concern (Appendix B). Three of these are Possibly Extinct (GH): a mayfly (*Parameletus croesus*), a leaf beetle (*Tricholochmaea sablensis*), and a freshwater bryozoan (*Hyalinella orbisperma*). The other 43 invertebrates include 10 slugs or freshwater snails, eight beetles, seven moths, five caddisflies, three grasshoppers, three amphipods, two stoneflies, a mayfly, a centipede, a millipede, an ant, and a bee.



Banff Springs Snail (*Physella johnsoni*) occurs only in Banff National Park and is Critically Imperilled (G1Q).



False Northwestern Moonwort (*Botrychium pseudopinnatum*) occurs only in Ontario and is Critically Imperilled (G1).

Ferns and Relatives

A group of vascular plants (plants with water-conducting vessels), ferns lack seeds and flowers and reproduce by spores. Like other plants, some ferns are generalists while others are more specialized in their habitat requirements. Some species are also epiphytic—growing on trees or other plants though generally obtaining moisture and nutrients from the air and rain (not from the species they are growing on).⁸⁰ Horsetails, moonworts, quillworts, clubmosses, and some other species are all related to true ferns, and are included with them for this report.

An estimated 10,560 species of ferns and relatives occur worldwide.⁸¹ One hundred and seventy-one of them along with 43 infraspecies are native to Canada. All species and 37 of the infraspecies have reliable global status ranks. Of those, 23 species (13.5%) and five infraspecies (13.5%) are of global conservation concern (Table 3, Appendix B). Two of the ferns are endemic to Canada: Dwarf Coastal Maidenhair Fern (*Adiantum aleuticum* var. *subpumilum*), which is Critically Imperilled to Imperilled (G5?T1T2), and False Northwestern Moonwort (*Botrychium pseudopinnatum*), which is Imperilled.

Conifers

Conifers (cone-bearing trees or shrubs) are notable for example in comprising much of the biomass in ecosystems in which they are found, being major sources of primary production, and storing large quantities of carbon (within the massive trunks of some conifers) for potentially centuries.⁸²

An estimated 615 species of coniferous trees and shrubs occur worldwide.⁸³ As of 2012, 30% of all conifers were considered at risk of extinction.⁸⁴

Canada is home to 36 native conifer species and 13 infraspecies of which two species (5.6%) and three infraspecies (23.1%) are of global conservation concern (Table 3, Appendix B). One of the conifers at risk, Whitebark Pine (*Pinus albicaulis*, G3G4), is “a keystone species of high-elevation western ecosystems whose decline is expected to have cascading effects on ecosystem function and biodiversity.” Across its western North American range (in Canada it occurs in British Columbia and Alberta), Whitebark Pine is being hit hard “by [the interacting effects of] introduced White Pine Blister Rust (*Cronartium ribicola*), outbreaks of Mountain Pine Beetle (*Dendroctonus ponderosae*), succession resulting from [long-term] fire suppression [and] climate change.”⁸⁵



Seaside Juniper (*Juniperus maritima*) occurs in British Columbia and Washington and is Vulnerable to Apparently Secure (G3G4).



Dwarf Western Trillium (*Trillium ovatum* var. *hibbersonii*) occurs only in British Columbia and is Imperilled (G5T2Q).

Flowering Plants

Flowering plants, or angiosperms, are vascular plant species with seeds, flowers, and fruit. The most recently evolved plant group, “[t]hey are also the most diverse and abundant plants throughout the globe and have come to dominate many of the world’s forests.” Unlike other plant species, many flowering plants rely heavily on certain insects, birds, or other animals for their reproductive success, via processes of pollination.⁸⁶ In turn, flowering plants “make up the majority of a lot of different habitats, such as grasslands (all the grasses are flowering plants), most forests except for the boreal forests, and most

terrestrial habitats....They provide food sources and shelters for the organisms that live in these habitats.”⁸⁷

An estimated 369,400 flowering plant species are known to science, comprising the majority of an estimated 390,900 vascular species—21% of which are considered at risk of extinction.⁸⁸ Canada supports an estimated 3705 native species and 1194 infraspecies. Of them, 3525 species and 1132 infraspecies have reliable global status ranks. Of those, 195 species (5.6%) and 90 infraspecies (8.0%)—including Honey-flowered Solomon’s Seal (*Polygonatum biflorum* var. *melleum*) which is Possibly Extinct (G5THQ)—are of global conservation concern (Table 3, Appendix B). Ninety-two of the flowering plants that are globally at risk are endemic to Canada.

Mosses (Canadian endemics only)

Mosses are small, non-woody (herbaceous) plants that lack true roots, that absorb nutrients and water through their leaves, and that reproduce via spores. Typically growing in carpet-like fashion, mosses are often among the first colonizers of disturbed land (e.g., land disturbed by fire). They help to stabilize soil surfaces and thus help reduce erosion. As well, they act like sponges of water, thereby reducing evaporation and conserving water for successive plants. Drawing nutrients from the air, mosses are sensitive to airborne pollutants and thus can serve to warn of atmospheric pollution.⁸⁹



Cain's Screw Moss (*Syntrichia cainii*) occurs only in Ontario and is Critically Imperilled (G1).

More than 10,000 moss species occur worldwide, of which 1002 are known to be native to Canada.⁹⁰ Canada has lost one species to extinction: Macoun's Shining Moss (*Neomacounia nitida*) was endemic to Canada and last observed in 1864 (Appendix A). Three other mosses endemic to Canada are of global conservation concern (Appendix B). They are Cain's Screw Moss (*Syntrichia cainii*), Critically Imperilled (G1) and known only from Ontario, and *Wijkia carlottae* and Carey's Limestone Moss (*Seligeria careyana*), both known only from British Columbia and both Imperilled (G2).

Lichens (Canadian endemics only)

Lichens are organisms fusing a symbiotic partnership of a fungus and an algae.⁹¹ They live in a wide range of terrestrial environments, including those in which harsh climate would otherwise not allow the algae to survive.⁹² Lichens can be an important or even vital food source for some animals, such as the moss-like *Cladonia* species that support the survival of Caribou (*Rangifer tarandus*) in tundra or boreal ecosystems. Like mosses, lichens, too, are sensitive to airborne pollutants (notably sulphur dioxide) and hence can be an indicator of atmospheric pollution.

About 15,000 macrolichens (bush-like or leafy-looking lichens) occur on Earth, of which 860 have been identified as native to Canada.⁹³ Two macrolichens endemic to Canada are of global conservation concern and both are Critically Imperilled (G1). They are Crumpled Tarpaper Lichen (*Collema coniophilum*), known only from British Columbia, and Arctic Orangebush Lichen (*Seiophora aurantiaca*), known only from Northwest Territories and Nunavut (Appendix B).



Crumpled Tarpaper Lichen (*Collema coniophilum*) occurs only in British Columbia and is Critically Imperilled (G1).

SPECIES ENDEMIC TO CANADA AND OF GLOBAL CONSERVATION CONCERN

One hundred and twenty-eight species and 85 infraspecies of animals, plants, and lichens endemic to Canada and assessed for this report are of global conservation concern (Table 4, Appendix B). Five of these endemics are Possibly Extinct: Vancouver Island Wolverine (*Gulo gulo vancouverensis*, G4TH); Vancouver Island Blue butterfly (*Plebejus saepiolus insulanus*, G5TH); and three invertebrates outside of the 13 species groups—a mayfly (*Parameletus croesus*, GH), a leaf beetle (*Tricholochmaea sablensis*, GH), and a freshwater bryozoan (*Hyalinella orbisperma*, GH). Species groups making up the largest portions of globally at risk endemics are flowering plants (56 species, 36 infraspecies), butterflies and skippers (four species, 22 subspecies), freshwater fishes (16 species), and mammals (three species, 10 subspecies).

Table 4: Number of endemic animals and plants, from 13 species groups, plus endemic mosses, lichens, and other invertebrates that are of global conservation concern

	GH	TH	G1	T1	G2	T2	G3	T3	GH–G3	TH–T3
Vertebrates	0	1	16	5	1	5	2	6	19	17
Mammals	0	1	1	4	1	4	1	1	3	10
Birds	0	0	0	1	0	1	0	5	0	7
Reptiles and Turtles	0	0	0	0	0	0	0	0	0	0
Amphibians	0	0	0	0	0	0	0	0	0	0
Freshwater Fishes	0	0	15	0	0	0	1	0	16	0
Invertebrates	3	1	23	5	14	7	6	16	46	29
Freshwater Mussels	0	0	0	0	0	0	0	0	0	0
Crayfishes	0	0	0	0	0	0	0	0	0	0
Butterflies and Skippers	0	1	1	4	2	4	1	13	4	22
Tiger Beetles	0	0	0	1	0	0	0	2	0	3
Dragonflies and Damselflies	0	0	0	0	0	0	0	0	0	0
Other Invertebrates	3	0	22	0	12	3	5	1	42	4
Vascular Plants	0	0	21	12	21	8	15	19	57	39
Ferns and Relatives	0	0	1	1	0	0	0	0	1	1
Conifers	0	0	0	0	0	0	0	2	0	2
Flowering Plants	0	0	20	11	21	8	15	17	56	36
Mosses	0	0	1	0	2	0	0	0	3	0
Mosses	0	0	1	0	2	0	0	0	3	0
Lichens	0	0	2	0	1	0	0	0	3	0
Lichens	0	0	2	0	1	0	0	0	3	0
Total	3	2	63	22	39	20	23	41	128	85

SPECIES OF GLOBAL CONSERVATION CONCERN: COMPARING 2016 TO 2005

NatureServe Canada’s 2005 report *Our Home and Native Land: Canadian Species of Global Conservation Concern* listed 354 species (from 13 species groups) that were globally at risk, ranging from Possibly Extinct to Vulnerable. This amounted to 6.4% of the 5520 species identified in 2005 as having a global status rank ranging from Possibly Extinct to Secure.

In 2016, NatureServe Canada found 333 species to be globally at risk, from those same 13 groups. Against 5266 species identified as having reliable global status ranks, this results in a small decrease in the percentage of globally at risk species, from 6.4% to 6.3% between 2005 and 2016 (Table 5).

Table 5: Summary of species of global conservation concern, from 13 species groups, 2005 and 2016 ^a

Rank	# of Species (2005)	% of Species (2005)	# of Species (2016)	% of Species (2016)
Possibly Extinct (GH)	3	-	2 ^b	-
Critically Imperilled (G1)	48	0.9%	56	1.1%
Imperilled (G2)	69	1.3%	59	1.1%
Vulnerable (G3)	234	4.2%	216	4.1%
TOTAL	354	6.4%	333	6.3%
a) Includes only those GH-G3 species from the 13 species groups that are the principal focus of this report				
b) In 2005 Yukon Draba (<i>Draba yukonensis</i>), a rare plant known only from the Yukon, was considered Possibly Extinct. In subsequent years it has been rediscovered (see page 13).				

While there has been little overall change since 2005 in the percentage of species of global conservation concern, for specific groups several changes stand out (Table 6). Changes in the status of a species may be related to improvements in knowledge of the distribution and abundance of that species, and/or in the nature of the threats to the species, rather than a change in the actual status of the species in the wild. Conversely, a change in status may reflect actual change in a species’ distribution and/or abundance, and/or in the nature of the threats to it.

- **The number and percentage of globally at risk mammal species in Canada rose from 17 and 8.7%, respectively, in 2005, to 24 and 12.5%, respectively, in 2016.** Joining the list of mammals of conservation concern is the Polar Bear (*Ursus maritimus*), now ranked Vulnerable (G3) and a global symbol of the negative consequences of climate change. And, whereas in 2005 two bat species appeared on the list, in 2016 there were seven. This reflects new perils which bat species worldwide now face: all but one of the globally at risk bat species in Canada are impacted by a

Table 6: Species of global conservation concern, from 13 species groups, 2005 and 2016^a

	2005						2016					
	GH	G1	G2	G3	Total GH-G3	% GH-G3	GH	G1	G2	G3	Total GH-G3	% GH-G3
Vertebrates	2	20	4	36	62	6.4%	2	24	5	45	76	8.0%
Mammals	0	3	1	13	17	8.7%	0	5	2	17	24	12.5%
Birds	1	4	1	8	14	3.0%	1	2	1	11	15	3.4%
Reptiles and Turtles	0	0	1	3	4	9.1%	0	0	1	3	4	8.9%
Amphibians	0	0	1	0	1	2.2%	0	0	1	0	1	2.1%
Freshwater Fishes	1	13	0	12	26	12.3%	1	17	0	14	32	14.8%
Invertebrates	0	4	8	35	47	8.3%	0	3	6	27	36	6.1%
Freshwater Mussels	0	2	1	7	10	18.5%	0	1	1	6	8	14.8%
Crayfishes	0	0	0	0	0	0.0%	0	0	0	0	0	0.0%
Butterflies and Skippers	0	2	5	16	23	8.5%	0	2	3	12	17	5.9%
Tiger Beetles	0	0	1	2	3	8.6%	0	0	1	4	5	16.7%
Dragonflies and Damselflies	0	0	1	10	11	5.6%	0	0	1	5	6	2.9%
Vascular Plants	1	24	57	163	245	6.1%	0	29	48	144	221	5.9%
Ferns and Relatives	0	4	6	13	23	13.5%	0	2	1	20	23	13.5%
Conifers	0	0	0	0	0	0.0%	0	0	0	2	2	5.6%
Flowering Plants	1	20	51	150	222	5.8%	0	27	47	122	196	5.6%
Total	3	48	69	234	354	6.4%	2	56	59	216	333	6.3%

a) In order to compare more exactly with figures in this table for 2016, some percentage calculations for 2005 differ slightly from those reported in the 2005 report. Excluded from the adjusted 2005 calculations are species identified in 2005 as Presumed Extinct and species to which a rank was not assigned.

comparatively new threat—wind turbines which, along with White-nose Syndrome,^m are deemed the greatest causes of bat mortality worldwide.⁹⁴

- **The number and percentage of globally at risk freshwater fishes in Canada rose from 26 and 12.3%, respectively, in 2005, to 32 and 14.8%, respectively, in 2016.** Included on the 2016 list are more species with extremely narrow distributions that are thus highly susceptible to extinction (given often localized threats to freshwater systems).
- **The butterflies and skippers group had 23 species (8.5%) in Canada which were considered globally at risk in 2005; by 2016 the number had dropped to 17 (5.9%).**

^m White-nose Syndrome (WNS) is a fungal disease typically lethal to bats. Caused by a fungus, *Pseudogymnoascus destructans* (not native to North America), WNS is transmitted from bat to bat and “invades the skin of hibernating bats and disrupts both their hydration and hibernation cycles....Today, WNS is found in 29 U.S. states and 5 Canadian provinces....and 7 species of bats have been diagnosed with the disease. Five additional species have been found with the fungus, but have not yet developed the disease.” (Source: Bat Conservation International, <http://www.batcon.org/index.php/our-work/regions/usa-canada/address-serious-threats/wns-intro>)

- The dragonflies and damselflies group had 11 species (5.6%) in Canada which were considered globally at risk in 2005; by 2016 the number had dropped to six (2.9%).
- Whereas in 2005 no conifers in Canada were of global conservation concern, in 2016 two (5.6%) such species were: the Vulnerable to Apparently Secure (G3G4) Seaside Juniper (*Juniperus maritima*), and the Vulnerable to Apparently Secure (G3G4) Whitebark Pine (*Pinus albicaulis*).
- The number and percentage of globally at risk tiger beetles rose from three and 8.6%, respectively, in 2005, to five and 16.7%, respectively, in 2016. Part of this increase is because the number of native tiger beetle species occurring in Canada and having a reliable global status rank was reduced by experts from 35 circa 2005 to 31 by 2016.
- The number and percentage of globally at risk flowering plant species in Canada dropped from 222 and 5.8%, respectively, in 2005, to 196 and 5.6%, respectively, in 2016.

Sixty-six species endemic to Canada, from among the 13 species groups, were assessed in the 2005 report as globally at risk. Eighty endemics are now in that category. The increase is largely due to an increase in the number of endemic flowering plants and freshwater fishes considered to be of global conservation concern (Table 7).

Table 7: Endemic species of global conservation concern, from 13 species groups, 2005 and 2016

	2005					2016				
	GH	G1	G2	G3	Total GH–G3	GH	G1	G2	G3	Total GH–G3
Vertebrates	0	13	0	1	14	0	16	1	2	19
Mammals	0	1	0	1	2	0	1	1	1	3
Birds	0	0	0	0	0	0	0	0	0	0
Reptiles and Turtles	0	0	0	0	0	0	0	0	0	0
Amphibians	0	0	0	0	0	0	0	0	0	0
Freshwater Fishes	0	12	0	0	12	0	15	0	1	16
Invertebrates	0	2	1	2	5	0	1	2	1	4
Freshwater Mussels	0	0	0	0	0	0	0	0	0	0
Crayfishes	0	0	0	0	0	0	0	0	0	0
Butterflies and Skippers	0	2	1	2	5	0	1	2	1	4
Tiger Beetles	0	0	0	0	0	0	0	0	0	0
Dragonflies and Damselflies	0	0	0	0	0	0	0	0	0	0
Vascular Plants	1	15	15	16	47	0	21	21	15	57
Ferns and Relatives	0	1	0	0	1	0	1	0	0	1
Conifers	0	0	0	0	0	0	0	0	0	0
Flowering Plants	1	14	15	16	46	0	20	21	15	56
Total	1	30	16	19	66	0	38	24	18	80

SPECIES OF GLOBAL CONSERVATION CONCERN, BY PROVINCE AND TERRITORY

By a wide margin, British Columbia has more globally at risk species (151) and infraspecies (80) than any other province or territory (Table 8ⁿ). That British Columbia should “lead” so overwhelmingly in numbers of species and infraspecies at risk is due in large measure to the province being the most biologically diverse jurisdiction in Canada, which is in turn due to British Columbia’s wide topographic and climatic variability.⁹⁵ Ontario (94), Québec (83), and Alberta (60) are the jurisdictions with the next highest numbers of species at risk. Québec (35), Ontario (29), and Newfoundland and Labrador (26) are the jurisdictions with the next highest numbers of infraspecies at risk.

Table 8: Species and infraspecies of global conservation concern, from 13 species groups, plus endemic mosses, lichens, and other invertebrates of global conservation concern, by province and territory

	GH	TH	G1	T1	G2	T2	G3	T3	Total GH–G3	Total TH–T3
Alberta	1	0	10	5	3	3	46	15	60	23
British Columbia	0	2	31	8	25	20	95	50	151	80
Manitoba	0	0	5	1	3	5	29	7	37	13
New Brunswick	1	0	8	2	5	3	38	15	52	20
Newfoundland and Labrador	1	0	10	7	2	2	22	17	35	26
Northwest Territories	1	0	3	3	7	3	29	8	40	14
Nova Scotia	2	0	9	2	6	2	27	11	44	15
Nunavut	1	0	2	1	7	2	13	6	23	9
Ontario	4	1	11	1	13	8	66	19	94	29
Prince Edward Island	1	0	3	0	2	3	8	5	14	8
Québec	1	0	14	4	12	3	56	28	83	35
Saskatchewan	1	0	5	5	8	5	28	11	42	21
Yukon Territory	0	0	4	1	9	8	43	11	56	20

By a large margin again, British Columbia has more globally at risk Canadian endemic species (46) and infraspecies (35) than any other province or territory (Table 9^o). Of British Columbia’s endemics at risk, 64 are known only from the province and, of those, at least 41 occur only along the west coast. Québec (21), Alberta (16), and Yukon (16) are the jurisdictions with the next highest numbers of endemic species that are globally at risk. Newfoundland and Labrador (17), Québec (16), and Alberta (13) are the jurisdictions with the next highest numbers of endemic infraspecies that are globally at risk.

ⁿ Numbers in Table 8 include all the animals and plants from the 13 species groups plus the mosses, lichens, and other invertebrates endemic to Canada that are identified in this report as globally at risk.

^o Numbers in Table 9 include all the animals and plants from the 13 species groups that are endemic to Canada, plus the mosses, lichens, and other invertebrates endemic to Canada that are identified in this report as globally at risk.

Table 9: Endemic species and infraspecies of global conservation concern, from 13 species groups, plus endemic mosses, lichens, and other invertebrates of global conservation concern, by province and territory

	GH	TH	G1	T1	G2	T2	G3	T3	Total GH–G3	Total TH–T3
Alberta	0	0	7	3	4	2	5	8	16	13
British Columbia	0	2	23	6	15	9	8	18	46	35
Manitoba	0	0	2	1	2	2	1	2	5	5
New Brunswick	0	0	2	0	1	1	5	4	8	5
Newfoundland and Labrador	0	0	8	7	0	1	2	9	10	17
Northwest Territories	0	0	1	2	5	2	4	3	10	7
Nova Scotia	1	0	6	1	0	1	4	4	11	6
Nunavut	0	0	1	0	5	1	2	3	8	4
Ontario	2	0	6	0	3	2	1	2	12	4
Prince Edward Island	0	0	0	0	1	1	2	2	3	3
Québec	0	0	10	5	6	2	5	9	21	16
Saskatchewan	0	0	3	3	6	1	1	5	10	9
Yukon Territory	0	0	3	1	5	3	8	4	16	8



Habitat of Puvirnitúq Mountain Draba (*Draba puvirnitúqii*), a Critically Imperilled (G1) flowering plant known only from Puvirnitúq Mountain in northern Québec

SPECIES OF GLOBAL CONSERVATION CONCERN: RESPONSIBILITY TO PROTECT

Canada has sole responsibility for protecting and conserving the 128 species and 85 infraspecies that are endemic to Canada and identified in this report as globally at risk (Table 10).

Table 10: Conservation responsibility for species and infraspecies of global conservation concern (GH/TH–G3/T3) occurring in Canada

	Canada Endemic Species	Canada Endemic Infraspecies	Canada & U.S. Species	Canada & U.S. Infraspecies	Multilateral Species	Multilateral Infraspecies
Vertebrates	19	17	34	17	23	6
Mammals	3	10	7	2	14	1 ^a
Birds	0	7	7	11	8	5
Reptiles and Turtles	0	0	3	2	1	0
Amphibians	0	0	1	0	0	0
Freshwater Fishes	16	0	16	2	0	0
Invertebrates	46	29	32	20	0	1
Freshwater Mussels	0	0	8	1	0	0
Crayfishes	0	0	0	0	0	0
Butterflies and Skippers	4	22	13	16	0	1
Tiger Beetles	0	3	5	3	0	0
Dragonflies and Damsel­flies	0	0	6	0	0	0
Other Invertebrates	42	4	0	0	0	0
Vascular Plants	57	39	160	55	4	4
Ferns and Relatives	1	1	22	4	0	0
Conifers	0	2	2	1	0	0
Flowering Plants	56	36	136	50	4	4
Mosses	3	0	0	0	0	0
Mosses	3	0	n/a	n/a	n/a	n/a
Lichens	3	0	0	0	0	0
Lichens	3	0	n/a	n/a	n/a	n/a
Total	128	85	226	92	27	11
a) The Critically Imperilled (G5T1) Peary Caribou (<i>Rangifer tarandus pearyi</i>), in Northwest Territories and Nunavut and reported from Greenland, requires bilateral conservation cooperation between Canada and Denmark.						

For 226 species and 92 infraspecies which span across Canada and the United States, protection and conservation is a shared responsibility. An example concerns the Imperilled (G5T2) Queen Charlotte Goshawk (*Accipiter gentilis laingi*), found in a small range spanning coastal British Columbia and southeastern Alaska.

Of the animals and plants of global conservation concern for which Canada and the United States have a shared responsibility, about 85 of them have their range primarily within America. An example is the globally Vulnerable (G3) Frosted Elfin (*Callophrys irus*), a butterfly known from 37 states but in Canada known only from Ontario where it is extirpated. The United States, therefore, has major conservation responsibility for this and the other species or infraspecies which are distributed largely in the U.S. Nonetheless, Canada has responsibility too—and this could increase as the ranges of certain species and infraspecies shift northward in response to climate change (see page 37).

The Critically Imperilled (G5T1) Peary Caribou (*Rangifer tarandus pearyi*), in Northwest Territories and Nunavut and reported from Greenland, requires bilateral conservation cooperation between Canada and Denmark. The remaining 27 globally at risk species and 10 infraspecies span three or more nations and require multilateral cooperation for conservation success. They are 14 marine mammals which are typically wide-ranging among the world's oceans; 13 birds including some which utilize much of the Western Hemisphere; the globetrotting Leatherback Sea Turtle (*Dermochelys coriacea*, G2); eight plants which have ranges spanning into Europe or Eurasia; and the iconic Monarch butterfly (*Danaus plexippus plexippus*, G4T3), an international symbol of beauty and fragility shared by Canada, the United States, and Mexico.



Nearly 60% of the globally at risk species and infraspecies identified in this report require cooperation between Canada and the United States for conservation success. A prominent example is the Whooping Crane (*Grus americana*). Once known from the Arctic coast to Central Mexico, the Whooping Crane almost went extinct, having dipped to just 41 birds in 1941. Numbering around 600 birds as of 2015,⁹⁶ the species nonetheless remains Critically Imperilled (G1). Conservation success requires action concerning its wintering grounds in the southeastern United States, its migratory routes through eastern North America and the Great Plains, and its summering grounds in Wisconsin and in and near Wood Buffalo National Park straddling the Alberta-Northwest Territories border (the latter containing the Whooping Crane's natural nesting grounds⁹⁷).

**Tallgrass Prairie in Manitoba:
Conserving Globally Rare Habitats and Species^p**



Species of global conservation concern are often associated with ecosystems which are also rare. Ecosystem rarity occurs either because of natural factors or because once-common ecosystems have been reduced in extent due to human activity.



Tallgrass Prairie, Manitoba

In Manitoba, the Nature Conservancy of Canada (NCC) works with the Manitoba Conservation Data Centre to identify rare ecosystems critical for safeguarding species of global, national, or provincial conservation concern. The tallgrass prairie is one such ecosystem. Once stretching in North America from southern Manitoba and southern Ontario to Texas, most of the land once occupied by tallgrass prairie has long been converted for human use (e.g., agriculture, urbanization) or has been ecologically degraded due to the loss of natural processes (e.g., fire, flooding) required to support healthy prairie.⁹⁸ Conversion of Canada's grasslands, including tallgrass, continues to threaten this ecosystem.⁹⁹

Over 99% of Canada's tallgrass prairie has been lost.¹⁰⁰ The largest intact remnants occur in a region of southeast Manitoba protected as the Tall Grass Prairie Preserve (4650 hectares). These remnants conserve wet and dry tallgrass prairie, marshes and fens, savannahs, and dense woodlands. The NCC and partners are working to help safeguard the Preserve and the over 1000 species associated with tallgrass prairie, including a number of species of global conservation concern.

For example, the Preserve protects more than 50% of the habitat and 70% of the world's population of the globally Vulnerable (G3) Western Prairie White-fringed Orchid (*Platanthera praeclara*).¹⁰¹ As another example, the Preserve provides a lifeline to the Poweshiek Skipperling (*Oarisma poweshiek*). This Critically Imperilled (G1)

butterfly occurs in Canada only in southeast Manitoba: the nearest population is located several hundred kilometres to the south at a handful of sites in Michigan and Wisconsin. The numbers of Poweshiek Skipperling have dropped dramatically in the past few years—fewer than 50 individuals of this butterfly were observed in Canada in 2016.¹⁰² The NCC is working with private landowners in and around the Preserve to help protect this species, and with partners to develop a captive breeding program. The NCC also helps the public discover tallgrass prairie via the organization's Prairie Orchid Interpretive Trail, Agassiz Interpretive Trail, and the Weston Family Tall Grass Prairie Interpretive Centre, located near Stuartburn, Manitoba.



**Poweshiek Skipperling (*Oarisma poweshiek*)
—Critically Imperilled (G1)**

^p This vignette was kindly provided by the Nature Conservancy of Canada.

**Accurate, Current, and Comprehensive Data:
The Foundation for Effective Conservation Decisions^q**



Species of global conservation concern depend on Canada's healthy waters and wild spaces for their survival. But here and around the world, habitat loss, pollution, unsustainable harvesting, and climate change are pushing many species dangerously close to extinction. The international World Wildlife Fund's (WWF) 2016 *Living Planet Report* revealed that global populations of mammals, birds, fish, amphibians, and reptiles declined by 58% between 1970 and 2012. This finding is based on scientific data from monitored populations of 3706 vertebrate species around the world. If that trend concerning the world's vertebrates continues, WWF anticipates that global wildlife populations could decline by more than two-thirds by 2020.¹⁰³



Such a report depends on credible biological data from many scientific bodies, including NatureServe and NatureServe Canada. NatureServe Canada and its network of Canadian CDCs are providing data support for WWF-Canada's forthcoming *Living Planet Report*, to be released in the fall of 2017. That report will focus entirely on the state of biodiversity in Canada, highlighting key ecosystems and species groups and explaining how WWF-Canada's work is addressing key threats to wildlife across Canada.

The success of WWF-Canada's conservation action is grounded in science, including reliance on accurate and current information regarding the status and locations of species, and what threatens them and their habitats. WWF-Canada deploys this science in its programs concerning species, freshwater, oceans, and the Arctic.¹⁰⁴

Above: Polar Bear (*Ursus maritimus*)—Vulnerable (G3): Occurring in 19 relatively discrete populations across the circumpolar region, the Polar Bear's global population is estimated at 22,000-31,000 animals.¹⁰⁵ This global population is projected to decline by 30% or more by around 2050,¹⁰⁶ with decline to be driven primarily by the loss of critical sea ice habitat.¹⁰⁷



Right: Bowhead Whale (*Balaena mysticetus*)—Vulnerable (G3): Bowhead whales were reduced by more than 80% by commercial whaling in the 18th and 19th centuries. The Bowhead presently numbers 10,000-12,000 individuals spread across five discrete populations, the largest being in the western Arctic. Marine pollution and loss of Arctic ice due to climate change constitute the principal threats to this species.¹⁰⁸

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^q This vignette was kindly provided by WWF-Canada.

Deploying Citizen Science for Informing Conservation: BioBlitz Canada 150^r



Comprehensive understanding on the state of biodiversity—where species occur and the impacts of human actions on them—is needed to make well-informed decisions for conservation. To help build this understanding, scientists are engaging volunteers to gather more data and to do so more frequently than scientists could undertake on their own. Given the right tools and instruction, citizen scientists can explore their backyards and natural spaces to record and share what they observe in nature.

With funding from the Government of Canada and as part of Canada’s 150th anniversary celebrations, the Canadian Wildlife Federation and partners in conservation have launched BioBlitz Canada 150—a series of bioblitzes across Canada in 2017. The inaugural year is bringing momentum to BioBlitz Canada which unites citizens and scientists in a participatory survey of life. Locations of events and results are posted on BioBlitzCanada.ca.



Participants in a bioblitz event

A bioblitz blends biodiversity science with community and youth engagement. During an event, scientists and citizen scientists together find, identify, and record as many species as possible in a given time period. Observations are tracked in real time through iNaturalist.ca (the official database platform for BioBlitz Canada 150).

iNaturalist.ca represents a growing online community of people ready to help each other identify what they have observed in nature, meet other nature enthusiasts, and learn about wildlife.¹⁰⁹ Using smartphones, citizen scientists can photograph species, pinpoint their location, and upload information



to the platform. [iNaturalist](http://iNaturalist.ca) is designed so that such information is relevant and accessible to those who can make use of it, including NatureServe Canada and the Canadian Conservation Data Centres in their role of aggregating and providing authoritative information on Canada’s biodiversity.



^r This vignette was kindly provided by the Canadian Wildlife Federation.

THREATS TO CANADA'S BIODIVERSITY

At Confederation in 1867, wild species in Canada were generally not at risk of extinction because threats to them, from within or outside of Canada, were generally neither plentiful nor severe. Over the past 150 years, however, Canada's human population has increased more than 10-fold, reaching 36.4 million by latter 2016.¹¹⁰ In medium- and high-growth scenarios, it is projected to reach 52.3-63.0 million by 2060.¹¹¹

Along with population increase, land and natural resources use, as well as consumption patterns, are intensifying. In consequence, on a per capita basis Canada has an *ecological footprint* larger than most nations.¹¹² As well, declining ecological health has been documented for each of Canada's 25 terrestrial, freshwater, and marine ecozones.¹¹³ And, at least 381 native animal, plant, and lichen species, and a further 188 native infraspecies, are at risk of extinction (as this report documents).

Wild species face numerous threats. The

NatureServe Network has adopted a classification system that identifies 40 threat types within 11 threat categories (Appendix C).¹¹⁴ By themselves, individual threats can render a species extinct, extirpated, or endangered. More commonly, though, a combination of two or more threats is behind species loss or decline. For example, a 2006 study found that 30% of 488 species in Canada which were globally or nationally at risk at the time were in trouble due to a single threat; the rest faced two or more threats.¹¹⁵

Elimination, degradation, or fragmentation of habitat is often the principal cause of species loss or decline. The same 2006 study noted above found habitat loss to be by far the most prevalent threat, affecting 84% of the species studied then.¹¹⁶ Similarly, a 2013 study found "habitat destruction and degradation via direct human disturbance [to be] the dominant threat to imperilled species listed under Canada's *Species at Risk Act*."¹¹⁷

Of the many other threats to wild species, climate change is especially notable. In NatureServe Canada's 2005 report, *Our Home and Native Land: Canadian Species of Global Conservation Concern*, climate change was noted "to inexorably alter habitats and affect species unable to adapt quickly enough. The warming trend is predicted to be particularly great and particularly rapid in Canada's north."¹¹⁸



The Eastern Musk Turtle (*Sternotherus odoratus*) is globally Secure (G5). However, typical of the multiple threats that wild species often face, this turtle is impacted by loss of shoreline habitat, by being accidentally hooked by fishermen, and by being struck by boats. Compounding the threats, the species is slow to sexually mature, has a low reproductive rate, and a small clutch size. Found in 32 American states, in Canada the Eastern Musk Turtle occurs only in Ontario and Québec where, at the provincial level, it is considered Vulnerable (S3) and Critically Imperilled (S1), respectively.

In 2014, the Intergovernmental Panel on Climate Change stated that “[w]arming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased.”¹¹⁹ A year later Canada’s federal government acknowledged that “[t]he scientific evidence is clear: climate change is one of the greatest threats of our time....Warming over the 20th century is indisputable and largely due to human activities.” Moreover, temperature in Canada has been increasing at roughly double the global mean rate. There has been even greater warming in the North which has, in turn, led to a dramatic decrease in Arctic ice coverage.¹²⁰

In response to climate change, many species are rapidly shifting their ranges¹²¹ such as documented in Canada for some plant, butterfly, bird, and mammal species.^{122,123} Range expansions or shifts, however, cannot guarantee that certain species will thrive. For example, climate change has been implicated as a likely important factor in the decline of some bird populations, due to deteriorating wintering ground habitat for migratory birds and “an increasing phenological mismatch—a decoupling of the timing of migration and high food abundance.”¹²⁴

Indeed, current and projected rates of climate change—unprecedented in the last 65 million years¹²⁵—are such that some species will not adapt fast enough to accommodate the new conditions.¹²⁶ Notably at risk are species that have more restrictive life history requirements and/or that live at high altitudes or latitudes.¹²⁷ For Earth as a whole, “the impacts of climate change are projected to result in a net loss of global biodiversity and major shifts in the provision of ecosystem services.”¹²⁸



2015: A permafrost “thaw slump”—caused by a warming climate—will cause this lake near Fort McPherson, Northwest Territories and all the aquatic life it supports to disappear.

The Threat of Climate Change to Species: Applying NatureServe's Climate Change Vulnerability Index

Knowing which species are most at risk to climate change and what might be done to help certain species adapt to profound climate shifts is a challenge requiring technical assistance. To help address this need, in 2010 the NatureServe Network developed an objective method to screen species for their vulnerability to climate change.¹²⁹ The Climate Change Vulnerability Index (CCVI) uses a scoring system that integrates a species' predicted exposure to climate change within an assessment area, with various factors associated with climate change sensitivity (e.g., temperature and precipitation sensitivity, dispersal ability, documented response to climate change.)⁵

Assessing species with the CCVI facilitates grouping unrelated taxa by their relative risk to climate change, as well as identifying patterns of climate stressors that affect multiple species. CCVI assessments provide valuable input for conservation status reports, climate adaptation plans, and other management documents. The CCVI has been widely used in this regard.¹³⁰

The first Canadian version of the CCVI was released in 2010, with a revised version released in 2016. Following are summaries of three applications of the CCVI in Canada to date.

Lake Simcoe watershed

The CCVI was first used in Canada in a 2012 study of 17 priority rare species inhabiting Ontario's Lake Simcoe watershed.¹³¹ Researchers found that six of those species (five of which are of global conservation concern) were vulnerable to climate change: a fish, Redside Dace (*Clinostomus elongates*)—Vulnerable to Apparently Secure (G3G4)—that scored as extremely vulnerable; a plant, Schweinitz's Sedge (*Carex schweinitzii*)—Vulnerable to Apparently Secure (G3G4)—that scored as highly vulnerable; and three other plants and a salamander that scored as moderately vulnerable.

Vulnerabilities associated with these species include specialized life history requirements, limited dispersal capabilities coupled with barriers to movement, restricted distribution, high degree of habitat specialization, and specific physiological requirements related to temperature and moisture. The study's findings can now be used with knowledge about non-climate stressors to better manage for the persistence of these species.



Schweinitz's Sedge (*Carex schweinitzii*) is currently Vulnerable to Apparently Secure (G3G4), but is deemed to be extremely vulnerable to climate change.

⁵ For more information on the CCVI, see: <http://www.natureserve.org/conservation-tools/climate-change-vulnerability-index>

Ontario Great Lakes basin

A study assessing the vulnerability of 280 species in the Ontario Great Lakes basin is being finalized. Priority has been given to assessing globally and provincially rare species, though a small number of more common species have been assessed. Of the 10 major taxonomic groups analyzed, researchers have found that those associated with freshwater habitats (e.g., certain molluscs, amphibians, and fish) are most vulnerable; birds, insects/spiders, and mammals have been found to be generally less vulnerable due in part to their greater relative mobility which enhances their adaptive capacity.

Globally rare species have been found to be more vulnerable than globally secure species. Key risk factors associated with such heightened vulnerability include small isolated ranges and specialized habitats (e.g., alvars, cliffs, sand dunes). Of the globally rare species assessed, Shortjaw Cisco (*Coregonus zenithicus*)—Vulnerable (G3)—and Salamander Mussel (*Simpsonaias ambigua*)—Vulnerable (G3)—have been found to be most sensitive (i.e., extremely vulnerable) to climate change. The Lake Erie basin has been found to have the most vulnerable species, followed by Lake Huron. Meanwhile, the Lake Superior basin contains the highest proportion of species scored as extremely or highly vulnerable to climate change. When complete, the study's report should assist those considering adapting species management practices and conservation strategies to include consideration of climate change.



Limestone Hedge-hyssop (*Gratiola quartermaniae*), found in Canada only in Ontario within the Great Lakes basin, is Vulnerable (G3) and also highly vulnerable to climate change.

Tuktut Nogait, Ukkusiksalik, and Auyuittuq national parks

In 2016, Parks Canada Agency completed a climate change vulnerability assessment for Tuktut Nogait National Park in Northwest Territories, and Ukkusiksalik and Auyuittuq national parks in Nunavut. (Collectively these parks encompass 57,974 km² of protected land and water, equivalent to the size of about 10 Prince Edward Islands.) The assessment was conducted under the auspices of a pilot study entitled *Understanding Climate-Driven Ecological Change in the North*.

This study explored potential ecological and social vulnerabilities and how knowledge about them can be used to support an adaptive approach to managing for the effects of rapid climate change. Scientific vulnerability assessment themes were identified in consultation with Inuit living in and around park boundaries, and in consultation with Parks Canada staff. Various terrestrial and marine species were identified as important to communities of interest which could be affected by climate change.

The CCVI served to assess vulnerability of 13 terrestrial species. Important prey species such as Nearctic Collared Lemming (*Dicrostonyx groenlandicus*) and Arctic Ground Squirrel (*Urocitellus parryii*), as well as predator species such as Arctic Fox (*Vulpes lagopus*) and Polar Bear (*Ursus maritimus*), were deemed to be either extremely or highly vulnerable to climate change by the middle to the latter part of the 21st century. The CCVI projections suggest that significant reconfiguration of terrestrial Arctic ecosystems is possible in response to the increasing effects of climate change.

KEY FINDINGS

- 1) Ten species (three of which were endemic to Canada) and six subspecies (three endemic to Canada) have vanished from Canada since 1844 and are Presumed Extinct (Appendix A).
- 2) Of all animals and plants from 13 species groups that have reliable global status ranks, 333 species (6.3%) and 184 infraspecies (11.5%) in Canada are of global conservation concern (Table 3, Appendix B). Most of these are flowering plants (196 of 333 species, 90 of 184 infraspecies), followed by butterflies and skippers (17 species, 39 subspecies), birds (15 species, 23 subspecies), mammals (24 species, 13 subspecies), and freshwater fishes (32 species, 2 subspecies).

Another 48 invertebrate, moss, and lichen species endemic to Canada, and another four invertebrate infraspecies endemic to Canada, are also globally at risk (Table 4, Appendix B).

Thus, this report identifies 381 species and 188 infraspecies in Canada— including 128 species and 85 infraspecies that are endemic to Canada—that are globally at risk (Table 4, Appendix B).

- 3) At the species level, in terms of percentage of animals or plants of global conservation concern, tiger beetles are most at risk (16.7%), followed by freshwater mussels (14.8%), freshwater fishes (14.8%), ferns and relatives (13.5%), and mammals (12.5%). At the infraspecies level, birds are most at risk (43.4%), followed by mammals (29.5%), freshwater mussels (25%), conifers (23.1%), and freshwater fishes (22.2%).
- 4) The overall percentage of species of global conservation concern in Canada was stable between 2005 (6.4%) and 2016 (6.3%). However, change was significant for tiger beetles (8.6% to 16.7%), mammals (8.7% to 12.5%), freshwater fishes (12.3% to 14.8%), conifers (0.0% to 5.6%), butterflies and skippers (8.5% to 5.9%), and dragonflies and damselflies (5.6% to 2.9%) (Table 6). Some of these changes relate to improvements in knowledge of the distribution and abundance of species, and/or in the nature of the threats to species, rather than a change in the actual status of species in the wild. Conversely, some changes reflect actual change in species' distribution and/or abundance, and/or in the nature of threats.
- 5) Sixty-six species endemic to Canada from among the 13 species groups reported on in 2005 were globally at risk in 2005. In 2016, 80 of them were (Table 7).
- 6) British Columbia has more species (151) and infraspecies (80) of global conservation concern than any other province or territory, followed by Ontario (94 and 29), Québec (83 and 35), Alberta (60 and 23), and Yukon (56 and 20) (Table 8). More than any other province or territory, British Columbia also has more species (46) and infraspecies (35) of global conservation concern that are



Ram's-head Lady's-slipper
(*Cypripedium arietinum*)—
Vulnerable (G3)

On Guard for Them: Species of Global Conservation Concern in Canada

endemic to Canada, followed by Québec (21 and 16), Alberta (16 and 13), and Newfoundland and Labrador (10 and 17) (Table 9).

- 7) Canada has sole responsibility for protecting and conserving 128 species and 85 infraspecies that are endemic to Canada and that are of global conservation concern (Table 10).
- 8) Canada and the United States have a shared responsibility for protecting and conserving 226 species and 92 infraspecies that occur in both nations. About 85 of these species and infraspecies are found largely within the U.S. (Table 10).
- 9) Twenty-seven of the globally at risk species and 10 infraspecies span three or more nations and thus require multilateral cooperation for conservation success (Table 10). In addition, the Critically Imperilled (G5T1) Peary Caribou (*Rangifer tarandus pearyi*), in Northwest Territories and Nunavut and reported from Greenland, requires bilateral conservation cooperation between Canada and Denmark.



Great Plains Rough Fescue Prairie in Alberta

RECOMMENDATIONS

Based upon the Key Findings of this report and in the spirit of advancing biodiversity science in Canada, NatureServe Canada recommends that Canadians work together to achieve the following:

- 1) Celebrate Canada's biodiversity (terrestrial, freshwater, and marine species and ecosystems), with special emphasis on those species that are endemic to Canada
- 2) Develop a comprehensive and accurate list of Canada's native and naturalized wild species
- 3) Improve knowledge of the taxonomy, distribution, and status of Canada's biodiversity, notably for lesser-known rare and/or threatened species (e.g., lichens, invertebrates from understudied groups, plants of northern Canada)
- 4) Expand biodiversity knowledge through data mining and the digital capture of data currently held in non-electronic format
- 5) Support targeted, expert-driven field surveys that deploy advanced and innovative methods and sampling strategies, including those designed for detecting elusive and/or rare species[†]
- 6) Support effective and engaging citizen-science projects and tools that yield species and ecosystem data that is of value to decision-makers
- 7) Improve provincial, territorial, and federal knowledge regarding the status, trends, and threats to Canada's biodiversity, so that this information can be better interpreted and integrated across all jurisdictional levels and ecological scales
- 8) Complete the Canadian National Vegetation Classification so that provincial, territorial, and state governments can work together across boundaries to identify terrestrial and aquatic ecosystems and the critical habitat these ecosystems provide for rare and threatened species
- 9) Improve access to biodiversity data, through online distribution tools and by promoting data sharing that is in line with Open Data principles, to ensure that conservation decision-making in Canada is based on the best available biodiversity information
- 10) Use species and ecosystems distribution information to identify priority areas for biodiversity conservation, including public and private protected areas



Spotted Owl (*Strix occidentalis*) occurs in British Columbia and 10 American states, and is Vulnerable to Apparently Secure (G3G4).

[†] Most species in Canada and the majority of the Canadian landscape have not been surveyed by biologists and ecologists. Increasing the number and geographic coverage of field surveys often results in determining that a rare species is more common than was previously believed, thereby allowing scarce resources to be redirected to other species of conservation concern (see page 11 for an example).

CONCLUSION

The great ecologist and conservationist Aldo Leopold (1887-1948) said that “to keep every cog and wheel is the first precaution of intelligent tinkering.”¹³² In that spirit, were the recommendations listed above to be fulfilled, Canadians would significantly enhance their base of knowledge from which intelligent decisions may be made regarding protection and utilization of land, water, ecosystems, and species—Canada’s natural capital.

There is reason to be optimistic. First, the identity of Canadians, generally, has long been tied to the wild species that share our land and water.

Second, half of Canadian adults have chosen to live where we do in part to be close to nature, and 70% of us spend time outdoors to experience nature further and are aware of examples of how nature supports us.¹³³ Third, 13% of us volunteer in nature conservation and, for those who do not volunteer, the principal reasons have to do with a lack of time or not being aware of an opportunity to contribute.¹³⁴

To Canadians in 2017, then, as for the Canadians of 1867, nature matters—though in a fundamentally different way. For whereas at Confederation nature may have been seen as something to be exploited or extracted for profit, or removed as an impediment to settlement, today our relationship with nature is arguably deeper and more strongly woven with our identity—indeed with what it means to be Canadian. These ties are symbolized by a maple leaf on our national flag, by the Common Loon (*Gavia immer*) on our dollar, and by countless other means of expression or commemoration.

As long as that identity endures, we can be confident that Canadians will indeed be *on guard for them*—the wild species of Canada that bless our land with beauty and wonder, and that support our health and wealth.



**Sean Blaney, Executive Director and Senior Scientist
of the Atlantic Canada Conservation Data Centre**



Pair of Loons (Roy Henry Vickers)^u

^u Roy Henry Vickers is a renowned First Nations artist British Columbia: <http://www.royhenryvickers.com/>.

Appendix A: Native Animals and Plants Formerly Occurring in Canada and Presumed Extinct

GRANK (2017)	Scientific Name (* = endemic to Canada)	English Common Name	Historic Canada/US Distribution	Last Observed	Principal Reason for "Presumed Extinction"
Mammals					
GX	<i>Neovison macrodon</i>	Sea Mink	Uncertain but believed to include the New England and Bay of Fundy coastlines	1894	Overhunting
G5TX	<i>Rangifer tarandus dawsoni</i> *	Dawson Caribou	BC	1930s	Unclear
G5TXQ	<i>Puma concolor cougar</i>	Eastern Cougar	NB, NS, ON, QC, 22 states	1938	Overhunting
Birds					
GX	<i>Camptorhynchus labradorius</i>	Labrador Duck	NB, NL, NS, PE, QC, 8 states	1878	Unclear
GX	<i>Ectopistes migratorius</i>	Passenger Pigeon	AB, BC, MB, NB, NL, NS, NU, ON, PE, QC, SK, 42 states	1914	Overhunting
GX	<i>Pinguinus impennis</i>	Great Auk	NB, NL, NS, QC, 3 states	1844	Overhunting
Freshwater Fishes					
GX	<i>Coregonus johanna</i> e	Deepwater Cisco	ON, 4 states	1952	Overfishing; predation
GX	<i>Gasterosteus</i> sp. 12*	Hadley Lake Limnetic Threespine Stickleback	BC	1999	Invasive species
GX	<i>Gasterosteus</i> sp. 13*	Hadley Lake Benthic Threespine Stickleback	BC	1999	Invasive species
G3TX	<i>Coregonus kiyi orientalis</i>	Lake Ontario Kiyi	ON, 1 state	1964	Overfishing
G5TX	<i>Sander vitreus glaucus</i>	Blue Pike	ON, 4 states	1965	Overfishing
G5TXQ	<i>Rhinichthys cataractae smithi</i> *	Banff Longnose Dace	AB	1986	Invasive species; pollution; beaver dam
Molluscs					
GXTX	<i>Lottia alveus alveus</i>	Eelgrass Limpet	NB, QC, 4 states	1929	Narrow habitat requirements; narrow genetic variability
Grasshoppers					
GX	<i>Melanoplus spretus</i>	Rocky Mountain Grasshopper	AB, MB, SK, 7 states	1902	Unclear
Flowering Plants					
GX	<i>Draba peasei</i> *	Pease's Draba	QC	1936	Unclear but plant occurred within narrow habitat requirements
Mosses					
GX	<i>Neomacounia nitida</i> *	Macoun's Shining Moss	ON	1864	Habitat loss

Appendix B: Native Animals, Plants, and Lichens of Global Conservation Concern Occurring in Canada

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
"*" denotes species extirpation: e.g., "AB*" means extirpated from Alberta; e.g., "7 states (1*)" means known from seven states but extirpated from one of them							
"●" denotes species occurs in one or more other nations other than Canada or the United States							
a) Data for Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designations and Species at Risk Act (SARA) listings were current as of November 2016. Where two identifiers occur they refer to two separate populations of the taxon that each have COSEWIC designation and/or SARA listing. "XT" = Extirpated; "E" = Endangered; "T" = Threatened; "SC" = Special Concern; "NAR" = Not at Risk; "DD" = Data Deficient							
b) In the "COSEWIC" and "SARA" columns and for some species or infraspecies, two designations may appear (e.g., "E; E"). Where this is shown below, these refer to specific populations of given species for which separate at-risk designations have been assigned by COSEWIC and/or SARA. As well, for a few subspecies (e.g., Monarch, <i>Danaus plexippus plexippus</i>) listed in this appendix, the COSEWIC and/or SARA designation is at the full species level.							
c) "Responsibility" refers to whether Canada alone, Canada and the United States, or Canada and one or more other nations (which could include the US) have responsibility for protecting and conserving the species or infraspecies. "CA" = Canada; "CA-US" = Canada and US together; "ML" = multilateral							
MAMMALS							
G3	<i>Balaena mysticetus</i>	Bowhead Whale	MB, NL, NT, NU, YT, 2 states, ●	-	SC, SC	SC	ML
G3	<i>Balaenoptera borealis</i>	Sei Whale	BC, NB, NL, NS, PE, 15 states, ●	-	E	E	ML
G3G4	<i>Balaenoptera musculus</i>	Blue Whale	BC, NL, NU, PE, QC, 13 states, ●	-	E; E	E; E	ML
G3G4	<i>Balaenoptera physalus</i>	Fin Whale	BC, NB, NL, NS, PE, QC, 18 states, ●	-	T; SC	T; SC	ML
G4T2T3Q	<i>Bos bison athabascaae</i>	Wood Bison	AB, BC, MB, NT, SK*, YT	YES	SC	T	CA
G3	<i>Callorhinus ursinus</i>	Northern Fur Seal	BC, 3 states, ●	-	T	-	ML
G2	<i>Dicrostonyx nunatakensis</i>	Ogilvie Mountains Collared Lemming	YT	YES	-	-	CA
G1	<i>Eubalaena glacialis</i>	North Atlantic Right Whale	NB, NL, NS, PE, QC, 11 states (1*), ●	-	E	E	ML
G1	<i>Eubalaena japonica</i>	North Pacific Right Whale	BC, 5 states, ●	-	E	E	ML
G3	<i>Eumetopias jubatus</i>	Steller Sea Lion	BC, 4 states, ●	-	SC	SC	ML
G4TH	<i>Gulo gulo vancouverensis</i>	Vancouver Island Wolverine	BC	YES	-	-	CA
G3G4	<i>Lasionycteris noctivagans</i>	Silver-haired Bat	AB, BC, MB, NB, NS, NT, ON, QC, SK, 50 states	-	-	-	CA-US

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
G3G4	<i>Lasiurus borealis</i>	Eastern Red Bat	AB, BC, MB, NB, NS, NT, ON, QC, SK, 41 states, ●	-	-	-	ML
G3G4	<i>Lasiurus cinereus</i>	Hoary Bat	AB, BC, MB, NB, NS, NT, ON, QC, SK, 50 states, ●	-	-	-	ML
G1	<i>Marmota vancouverensis</i>	Vancouver Island Marmot	BC	YES	E	E	CA
G5T1	<i>Martes americana atrata</i>	American Marten - Newfoundland Population	NL	YES	T	T	CA
G3Q	<i>Mesoplodon carlhubbsi</i>	Hubb's Beaked Whale	BC, 3 states, ●	-	NAR	-	ML
G3	<i>Mesoplodon stejnegeri</i>	Stejneger's Beaked Whale	BC, 4 states, ●	-	-	-	ML
G5T1	<i>Microtus townsendii cowani</i>	Triangle Island Vole	BC	YES	-	-	CA
G5T3	<i>Mustela erminea anguinae</i>	Vancouver Island Ermine	BC	YES	-	-	CA
G5T2	<i>Mustela erminea haidarum</i>	Queen Charlotte Islands Ermine	BC	YES	T	T	CA
G1	<i>Mustela nigripes</i>	Black-footed Ferret	AB*, SK*, 13 states (3*)	-	XT	XT	CA-US
G3	<i>Myotis keenii</i>	Keen's Myotis	BC, 2 states	-	DD	SC	CA-US
G3	<i>Myotis lucifugus</i>	Little Brown Myotis	AB, BC, MB, NB, NL, NS, NT, NU, ON, PE, QC, SK, YT, 47 states	-	E	E	CA-US
G1G2	<i>Myotis septentrionalis</i>	Northern Myotis	AB, BC, MB, NB, NL, NS, NT, ON, PE, QC, SK, YT, 38 states	-	E	E	CA-US
G5T3	<i>Neotamias minimus oreocetes</i>	Flathead Least Chipmunk	AB, BC, 1 state	-	-	-	CA-US
G2G3	<i>Perimyotis subflavus</i>	Tricolored Bat	NB, NS, ON, QC, 37 states	-	E	E	CA-US
G5T1	<i>Phoca vitulina mellonae</i>	Ungava Seal	QC	YES	E	-	CA
G3G4	<i>Physeter macrocephalus</i>	Sperm Whale	BC, NL, NU, 15 states, ●	-	NAR	-	ML
G5T1	<i>Rangifer tarandus pearyi</i>	Peary Caribou	NT, NU, ●	-	T	-	ML
G3G4	<i>Sorex maritimensis</i>	Maritime Shrew	NB, NS	YES	-	-	CA
G5T2	<i>Sorex palustris brooksi</i>	Vancouver Island Water Shrew	BC	YES	-	-	CA
G5T2T3	<i>Synaptomys borealis artemisiae</i>	Sagebrush Northern Bog Lemming	BC, 1 state	-	-	-	CA-US
G5T1	<i>Tamias minimus selkirki</i>	Selkirk Least Chipmunk	BC	YES	-	-	CA
G5T2Q	<i>Thomomys talpoides segregatus</i>	Creston Northern Pocket Gopher	BC	YES	-	-	CA

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
G3	<i>Ursus maritimus</i>	Polar Bear	MB, NL, NT, NU, ON, QC, YT (1 state), ●	-	SC	SC	ML
G3	<i>Vulpes velox</i>	Swift Fox	AB, MB*, SK, 11 states (1*)	-	T	T	CA-US
BIRDS							
G5T2	<i>Accipiter gentilis laingi</i>	Queen Charlotte Goshawk	BC, 1 state	-	T	T	CA-US
G5T2T3	<i>Aegolius acadicus brooksi</i>	Northern Saw-whet Owl <i>brooksi</i> subspecies	BC	YES	T	T	CA
G3G4	<i>Anthus spragueii</i>	Sprague's Pipit	AB, MB, SK, 18 states, ●	-	T	T	ML
G2	<i>Brachyramphus brevirostris</i>	Kittlitz's Murrelet	YT, 1 state, ●	-	-	-	ML
G3	<i>Brachyramphus marmoratus</i>	Marbled Murrelet	BC, 4 states	-	T	T	CA-US
G5T3	<i>Branta canadensis occidentalis</i>	Dusky Canada Goose	BC, 2 states	-	-	-	CA-US
G5T3	<i>Branta hutchinsii leucopareia</i>	Aleutian Canada Goose	BC*, 4 states, ●	-	-	-	ML
G4T2	<i>Calidris canutus rufa</i>	Red Knot - <i>rufa</i> subspecies	AB, BC, MB, NB, NL, NS, NT, NU, ON, PE, QC, SK, 34 states, ●	-	E	E	ML
G3G4	<i>Centrocercus urophasianus</i>	Greater Sage-Grouse	AB, BC*, SK, 15 states (3*)	-	-	-	CA-US
G3G4T3Q	<i>Centrocercus urophasianus phaios</i>	Greater Sage-grouse <i>phaios</i> subspecies	BC*, 2 states	-	XT	XT	CA-US
G3	<i>Charadrius melodus</i>	Piping Plover	AB, MB, NB, NL, NS, ON, PE, QC, SK, 38 states (3*)	-	E; E	E; E	CA-US
G3T3	<i>Charadrius melodus circumcinctus</i>	Piping Plover <i>circumcinctus</i> subspecies	AB, MB, ON, SK, 20 states	-	E	E	CA-US
G3T3	<i>Charadrius melodus melodus</i>	Piping Plover <i>melodus</i> subspecies	NB, NL, NS, PE, 15 states	-	E	E	CA-US
G3	<i>Charadrius montanus</i>	Mountain Plover	AB, SK, 14 states (2*)	-	E	E	CA-US
G5T3	<i>Cyanocitta stelleri carlottae</i>	Pacific Steller's Jay	BC	YES	-	-	CA
G5T2	<i>Eremophila alpestris strigata</i>	Streaked Horned Lark	BC*, 2 states	-	E	E	CA-US
G4T3	<i>Falco peregrinus pealei</i>	Peale's Peregrine Falcon	BC, 3 states, ●	-	SC	SC	ML
G4T3	<i>Falco peregrinus tundrius</i>	Arctic Peregrine Falcon	BC, MB, NL, NT, NU, ON, QC, YT, 9 states, ●	-	SC	SC	ML
G4G5T3Q	<i>Glaucidium gnoma swartheta</i>	Northern Pygmy-Owl <i>swartheta</i> subspecies	BC	YES	-	-	CA
G1	<i>Grus americana</i>	Whooping Crane	AB, MB*, NT, NU*, ON, SK*, 19 states (9*)	-	E	E	CA-US

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
G5T3	<i>Lagopus leucura saxatilis</i>	Vancouver Island White-tailed Ptarmigan	BC	YES	-	-	CA
G4T3Q	<i>Lanius ludovicianus migrans</i>	Migrant Loggerhead Shrike	MB, ON, 25 states (4*)	-	-	E	CA-US
G5T1T2Q	<i>Loxia curvirostra percna</i>	Red Crossbill <i>percna</i> subspecies	NL	YES	T	E	CA
GH	<i>Numenius borealis</i>	Eskimo Curlew	AB*, NB*, NL*, NS*, NT*, NU*, ON*, PE*, QC*, SK*, 25 states (25*)	-	E	E	CA-US
G5T1	<i>Passerculus sandwichensis princeps</i>	Ipswich Sparrow	NB, NS, 2 states (1*)	-	SC	SC	CA-US
G1	<i>Phoebastria albatrus</i>	Short-tailed Albatross	BC, 4 states, ●	-	T	T	ML
G3G4	<i>Phoebastria immutabilis</i>	Laysan Albatross	BC, 5 states, ●	-	-	-	ML
G3G4	<i>Phoebastria nigripes</i>	Black-footed Albatross	BC, 3 states, ●	-	SC	SC	ML
G5T3	<i>Picoides villosus picaoideus</i>	Queen Charlotte Hairy Woodpecker	BC	YES	-	-	CA
G5T3	<i>Pinicola enucleator carlottae</i>	Queen Charlotte Pine Grosbeak	BC	YES	-	-	CA
G5T3?	<i>Poocetes gramineus affinis</i>	Oregon Vesper Sparrow	BC, 3 states	-	E	E	CA-US
G3	<i>Puffinus bulleri</i>	Buller's Shearwater	BC, 3 states, ●	-	-	-	ML
G3	<i>Ardenna creatopus</i>	Pink-footed Shearwater	BC, 3 states, ●	-	E	T	ML
G3G4	<i>Setophaga kirtlandii</i>	Kirtland's Warbler	ON, 8 states	-	E	E	CA-US
G4T3	<i>Sterna dougallii dougallii</i>	Roseate Tern	NB, NS, QC 10 states, ●	-	E	E	ML
G3G4	<i>Strix occidentalis</i>	Spotted Owl	BC, 10 states, ●	-	E	E	ML
G3G4T3	<i>Strix occidentalis caurina</i>	Northern Spotted Owl	BC, 3 states	-	E	E	CA-US
G4T3	<i>Tympanuchus phasianellus columbianus</i>	Columbian Sharp-tailed Grouse	BC, 6 states (1*)	-	-	-	CA-US
REPTILES AND TURTLES							
G3G4	<i>Actinemys marmorata</i>	Western Pond Turtle	BC*, 5 states	-	XT	XT	CA-US
G2	<i>Dermochelys coriacea</i>	Leatherback Sea Turtle	BC, NB, NL, NS, PE, QC, 20 states, ●	-	E; E	E	ML
G3	<i>Glyptemys insculpta</i>	Wood Turtle	NB, NS, ON, QC, 18 states	-	T	T	CA-US
G5T2	<i>Nerodia sipedon insularum</i>	Lake Erie Watersnake	ON, 1 state	-	SC	E	CA-US

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
G3	<i>Pantherophis gloydi</i>	Eastern Foxsnake	ON, 2 states	-	E; E	E; E	CA-US
G4T3Q	<i>Sistrurus catenatus catenatus</i>	Eastern Massasauga	ON, 10 states	-	E; T	T	CA-US
AMPHIBIANS							
G2	<i>Rana pretiosa</i>	Oregon Spotted Frog	BC, 3 states	-	E	E	CA-US
FRESHWATER FISHES							
G3	<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	NB, 16 states (1*)	-	SC	SC	CA-US
G3G4	<i>Acipenser fulvescens</i>	Lake Sturgeon	AB, MB, ON, QC, SK, 21 states (4*)	-	E; T	-	CA-US
G3	<i>Acipenser medirostris</i>	Green Sturgeon	BC, 4 states	-	SC	SC	CA-US
G3	<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	NB, NL, NS, QC, 19 states (1*)	-	T	-	CA-US
G3T3	<i>Acipenser oxyrinchus oxyrinchus</i>	Atlantic Sturgeon	NB, NL, NS, PE, QC, 16 states (1*)	-	-	-	CA-US
G3G4	<i>Alosa aestivalis</i>	Blueback Herring	NB, NS, PE, QC, 17 states	-	NAR	-	CA-US
G1	<i>Catostomus</i> sp. 4	Salish Sucker	BC, 1 state	-	T	E	CA-US
G3G4	<i>Clinostomus elongatus</i>	Redside Dace	ON, 11 states (2*)	-	E	SC	CA-US
G1	<i>Coregonus huntsmani</i>	Atlantic Whitefish	NS	YES	E	E	CA
G3G4	<i>Coregonus kiyi</i>	Kiyi	ON, 5 states (1*)	-	SC	SC	CA-US
G1Q	<i>Coregonus nigripinnis</i>	Blackfin Cisco	ON, 4 states (*)	-	DD	T	CA-US
GH	<i>Coregonus reighardi</i>	Shortnose Cisco	ON*, 5 states (4*)	-	E	E	CA-US
G3	<i>Coregonus</i> sp. 2	Squanga Whitefish	YT	YES	SC	SC	CA
G3	<i>Coregonus zenithicus</i>	Shortjaw Cisco	AB, MB, NT, NU, ON, SK (7 states, 4*)	-	T	-	CA-US
G1G2	<i>Cottus</i> sp. 2	Coastrange Sculpin - Cultus population	BC	YES	T	T	CA
G1	<i>Gasterosteus</i> sp. 1	Giant Threespine Stickleback	BC	YES	SC	-	CA
G1	<i>Gasterosteus</i> sp. 2	Enos Lake Limnetic Threespine Stickleback	BC	YES	E	E	CA
G1	<i>Gasterosteus</i> sp. 3	Enos Lake Benthic Threespine Stickleback	BC	YES	E	E	CA

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
G1	<i>Gasterosteus</i> sp. 4	Paxton Lake Limnetic Stickleback	BC	YES	E	E	CA
G1	<i>Gasterosteus</i> sp. 5	Paxton Lake Benthic Stickleback	BC	YES	E	E	CA
G1	<i>Gasterosteus</i> sp. 16	Vananda Creek Limnetic Threespine Stickleback	BC	YES	E	E	CA
G1	<i>Gasterosteus</i> sp. 17	Vananda Creek Benthic Threespine Stickleback	BC	YES	E	E	CA
G1	<i>Gasterosteus</i> sp. 18	Misty Lake Lentic Threespine Stickleback	BC	YES	E	E	CA
G1	<i>Gasterosteus</i> sp. 19	Misty Lake Lotic Threespine Stickleback	BC	YES	E	E	CA
G1G2	<i>Lampetra macrostoma</i>	Vancouver Lamprey	BC	YES	T	T	CA
G3Q	<i>Lethenteron alaskense</i>	Alaskan Brook Lamprey	NT, 1 state	-	DD	-	CA-US
G1	<i>Moxostoma hubbsi</i>	Copper Redhorse	QC	YES	E	E	CA
G3	<i>Notropis anogenus</i>	Pugnose Shiner	ON, 9 states (1*)	-	T	E	CA-US
G3	<i>Notropis bifrenatus</i>	Bridle Shiner	ON, QC, 15 states	-	SC	SC	CA-US
G3	<i>Noturus stigmosus</i>	Northern Madtom	ON, 8 states	-	E	E	CA-US
G1	<i>Prosopium</i> sp. 2	McCleese/Mclure Lake Pygmy Whitefish	BC	YES	-	-	CA
G3	<i>Rhinichthys</i> sp. 4	Nooksack Dace	BC, 1 state	-	E	E	CA-US
G5T3T4Q	<i>Salvelinus alpinus oquassa</i>	Landlocked Arctic Char	QC, 4 states	-	-	-	CA-US
G1G2Q	<i>Spirinchus</i> sp. 1	Longfin Smelt - Pygmy populations	BC	YES	DD	-	CA
FRESHWATER MUSSELS							
G1G2	<i>Alasmidonta heterodon</i>	Dwarf Wedgemussel	NB, 12 states	-	XT	XT	CA-US
G3	<i>Alasmidonta varicosa</i>	Brook Floater	NB, NS, 17 states (1*)	-	SC	SC	CA-US
G2T2	<i>Epioblasma torulosa rangiana</i>	Northern Riffleshell	ON, 7 states (1*)	-	E	E	CA-US
G2G3	<i>Epioblasma triquetra</i>	Snuffbox	ON, 19 (2*)	-	E	E	CA-US
G3	<i>Gonidea angulata</i>	Rocky Mountain Ridged Mussel	BC, 6 states	-	E	SC	CA-US
G3G4	<i>Lampsilis cariosa</i>	Yellow Lampmussel	NB, NS, 15 states (1*)	-	SC	SC	CA-US

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
G3G4	<i>Leptodea ochracea</i>	Tidewater Mucket	NB, NS, 14 states	-	-	-	CA-US
G3	<i>Simpsonaias ambigua</i>	Salamander Mussel	ON, 14 states (1*)	-	E	E	CA-US
G2	<i>Villosa fabalis</i>	Rayed Bean	ON, 11 states (4*)	-	E	E	CA-US
NON-MARINE SNAILS AND SLUGS (CANADIAN ENDEMIC ONLY)							
G1G2	<i>Oreohelix stantoni</i>	Cypress Hills Mountainsnail	AB, BC	YES	-	-	CA
G5T2	<i>Physa gyrina athearni</i>	Blunt Albino Physa	AB	YES	-	-	CA
G5T2	<i>Physa gyrina latchfordi</i>	Gatineau Tadpole Snail	ON*, QC	YES	-	-	CA
G1Q	<i>Physa winnipegensis</i>	Lake Winnipeg Physa Snail	MB	YES	DD	-	CA
G1Q	<i>Physella johnsoni</i>	Banff Springs Snail	AB	YES	E	E	CA
G1Q	<i>Physella wrighti</i>	Hotwater Physa	BC	YES	E	E	CA
G5T2	<i>Planorbella campanulatum collinsi</i>	Low-spired Ramshorn	MB, ON	YES	-	-	CA
G3	<i>Staala gwaii</i>	Haida Gwaii Slug	BC	YES	SC	-	CA
G5T3	<i>Stagnicola catascopium preblei</i>	Subarctic Lake Stagnicola	SK	YES	-	-	CA
G1	<i>Vallonia terraenovae</i>	Newfoundland Vallonia Snail	NL	YES	-	-	CA
AMPHIPODS (CANADIAN ENDEMIC ONLY)							
G1	<i>Ramellogammarus vancouverensis</i>	an amphipod	BC	YES	-	-	CA
G1	<i>Stygobromus canadensis</i>	Castleguard Cave Stygobromid	AB	YES	-	-	CA
G1	<i>Stygobromus secundus</i>	Cordilleran Stygobromid	AB	YES	-	-	CA
MILLIPEDES AND CENTIPEDES (CANADIAN ENDEMIC ONLY)							
G1	<i>Arctogeophilus insularis</i>	a centipede	BC	YES	-	-	CA
G1	<i>Nearctodesmus insularis</i>	a millipede	BC	YES	-	-	CA
MAYFLIES (CANADIAN ENDEMIC ONLY)							
G1G2Q	<i>Caenis candida</i>	a mayfly	ON, QC	YES	-	-	CA

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
GH	<i>Parameletus croesus</i>	a mayfly	ON*	YES	-	-	CA
DRAGONFLIES AND DAMSELFLIES							
G3G4	<i>Gomphus quadricolor</i>	Rapids Clubtail	ON, 25 states (1*)	-	E	E	CA-US
G3	<i>Gomphus ventricosus</i>	Skillet Clubtail	NB, NS, ON, QC, 19 states (1*)	-	E	-	CA-US
G3G4	<i>Gomphus viridifrons</i>	Green-faced Clubtail	ON, 15 states	-	-	-	CA-US
G3	<i>Ophiogomphus howei</i>	Pygmy Snaketail	NB, ON, 11 states (1*)	-	SC	SC	CA-US
G2G3	<i>Somatochlora hineana</i>	Hine's Emerald	ON, 7 states (2*)	-	E	-	CA-US
G3	<i>Stylurus notatus</i>	Elusive Clubtail	AB, MB, NT, ON, QC, SK, 20 states (2*)	-	-	-	CA-US
STONEFLIES (CANADIAN ENDEMIC ONLY)							
G2	<i>Bolshecapnia gregsoni</i>	Alpine Snowfly	BC	YES	-	-	CA
G1Q	<i>Bolshecapnia rogozera</i>	Moosehorn Snowfly	BC	YES	-	-	CA
GRASSHOPPERS (CANADIAN ENDEMIC ONLY)							
G3G4	<i>Bruneria yukonensis</i>	Yukon Grasshopper	YT	YES	-	-	CA
G2	<i>Melanoplus gaspesiensis</i>	Gaspésie Grasshopper	QC	YES	-	-	CA
G2	<i>Melanoplus madeleineae</i>	Magdalen Islands Grasshopper	QC	YES	SC	-	CA
BUTTERFLIES AND SKIPPERS							
G3	<i>Boloria Alberta</i>	Alberta Fritillary	AB, BC, 1 state	-	-	-	CA-US
G5T3	<i>Boloria epithore sigridae</i>	Western Meadow Fritillary	BC, YT	YES	-	-	CA
G5T3	<i>Boloria eunomia nichollae</i>	Nicholl's Bog Fritillary	AB, BC	YES	-	-	CA
G3	<i>Boloria natazhati</i>	Beringian Fritillary	BC, NT, NU, YT, 1 state	-	-	-	CA-US
G3T1T2	<i>Boloria natazhati bankslandia</i>	Natazhati Fritillary	NT	YES	-	-	CA
G3T3	<i>Boloria natazhati nabokovi</i>	Natazhati Fritillary	BC, YT	YES	-	-	CA
G3T2T3	<i>Boloria natazhati natazhati</i>	Natazhati Fritillary	BC, YT, 1 state	-	-	-	CA-US
G5T3T4	<i>Callophrys augustinus helenae</i>	Brown Elfin	NL	YES	-	-	CA
G3	<i>Callophrys irus</i>	Frosted Elfin	ON*, 31 states (1*)	-	XT	XT	CA-US
G3G4	<i>Callophrys johnsoni</i>	Johnson's Hairstreak	BC, 3 states	-	-	-	CA-US
G3G4	<i>Callophrys lanoraieensis</i>	Bog Elfin	NB, NS, ON, QC, 4 states	-	-	-	CA-US
G5T2	<i>Chlosyne harrisii hanhami</i>	Harris's Checkerspot	MB, SK	YES	-	-	CA

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G1	<i>Coenonympha nipisiquit</i>	Maritime Ringlet	NB, QC	YES	E	E	CA
G5T3T4	<i>Coenonympha tullia insulana</i>	Vancouver Ringlet	BC, 1 state	-	-	-	CA-US
G5T3	<i>Colias christina kluanensis</i>	Kluane Sulphur	YT, 1 state	-	-	-	CA-US
G2	<i>Colias johanseni</i>	Johansen's Sulphur	NU	YES	-	-	CA
G1G3	<i>Colias rankinensis</i>	Rankin Inlet Sulphur	NU	YES	-	-	CA
G5T3	<i>Colias tyche boothii</i>	Booth's Sulphur	NT, NU, YT	YES	-	-	CA
G4T3	<i>Danaus plexippus plexippus</i>	Monarch	AB, BC, MB, NB, NL, NS, ON, PE, QC, SK, 48 states, ●	-	E	E	ML
G5T1	<i>Erebia pawloskii canadensis</i>	a yellow dotted alpine	MB	YES	-	-	CA
G5T2T3	<i>Erebia youngi herscheli</i>	Four-dotted Alpine, <i>herscheli</i> subspecies	YT	YES	-	-	CA
G3	<i>Erynnis martialis</i>	Mottled Duskywing	MB, ON, QC, 37 states (4*)	-	-	-	CA-US
G5T1T3	<i>Erynnis persius persius</i>	Persius Duskywing	ON*, 14 states (1*)	-	E	E	CA-US
G5T1	<i>Euchloe ausonides insulanus</i>	Island Large Marble	BC*, 1 state	-	XT	XT	CA-US
G5T1	<i>Euphydryas editha taylori</i>	Taylor's Checkerspot	BC, 2 states	-	E	E	CA-US
G3	<i>Euphydryas gillettii</i>	Gillette's Checkerspot	AB, BC, 5 states	-	-	-	CA-US
G3	<i>Euphyes dukesi</i>	Dukes' Skipper	ON, 17 states	-	-	-	CA-US
G3T3	<i>Euphyes dukesi dukesi</i>	Dukes' Skipper	ON, 16 states	-	-	-	CA-US
G5T2	<i>Hesperia colorado oregonia</i>	Oregon Branded Skipper	BC, 1 state	-	E	-	CA-US
G5T3T4	<i>Hesperia comma borealis</i>	Common Branded Skipper <i>borealis</i> subspecies	NL	YES	-	-	CA
G2	<i>Hesperia dacotae</i>	Dakota Skipper	MB, SK, 5 states (1*)	-	E	T	CA-US
G3G4	<i>Hesperia ottoe</i>	Ottoe Skipper	MB, 16 states	-	E	E	CA-US
G5T1	<i>Lycaena dorcas claytoni</i>	Clayton's Copper Butterfly	NB, 1 state	-	-	-	CA-US
G3	<i>Lycaena dospassosi</i>	Maritime Copper	NB, NS, PE, QC	YES	-	-	CA
G1	<i>Oarisma poweshiek</i>	Poweshiek Skipperling	MB, 7 states	-	E	T	CA-US

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G5T1T2	<i>Oeneis bore gaspeensis</i>	Gaspé Arctic	QC	YES	-	-	CA
G5T3T4	<i>Oeneis bore taygete</i>	White-veined Arctic	NL, QC	YES	-	-	CA
G5T1T2	<i>Oeneis jutta terraenovae</i>	Jutta Arctic	NL	YES	-	-	CA
G5T2T3	<i>Oeneis melissa melissa</i>	Melissa Arctic	NL	YES	-	-	CA
G5T3	<i>Oeneis polixenes brucei</i>	Polixenes Arctic <i>brucei</i> subspecies	AB, BC	YES	-	-	CA
G5T3T4	<i>Oeneis polixenes polixenes</i>	Polixenes Arctic <i>polixenes</i> subspecies	NL, QC	YES	-	-	CA
G5T2	<i>Oeneis polixenes subhyalina</i>	Polixenes Arctic <i>subhyalina</i> subspecies	NT, NU	YES	-	-	CA
G4G5T3	<i>Papilio brevicauda bretonensis</i>	Short-tailed Swallowtail	NB, NS	YES	-	-	CA
G4G5T2T3	<i>Papilio brevicauda gaspeensis</i>	Short-tailed Swallowtail	NB, 1 state	-	-	-	CA-US
G5T3	<i>Papilio machaon pikei</i>	Pike's Old World Swallowtail	AB, BC	YES	-	-	CA
G5T3Q	<i>Pieris marginalis guppyi</i>	Margined White <i>guppyi</i> subspecies	BC, 1 state	-	-	-	CA-US
G3?	<i>Pieris virginensis</i>	West Virginia White	ON, QC, 20 states	-	-	-	CA-US
G5T3	<i>Plebejus icarioides blackmorei</i>	Blackmore's Blue	BC, 1 state	-	-	-	CA-US
G5T3T4	<i>Plebejus idas aster</i>	Crowberry Blue	NL	YES	-	-	CA
G5T1	<i>Plebejus lupini spangelatus</i>	Lupine Blue	SK, 1 state	-	-	-	CA-US
G5T2	<i>Plebejus melissa samuelis</i>	Karner Blue	ON*, 12 states (3*)	-	XT	XT	CA-US
G5TH	<i>Plebejus saepiolus insulanus</i>	Vancouver Island Blue	BC	YES	E	E	CA
G5T3T4	<i>Polygonia oreas threatfuli</i>	Oreas Anglewing	AB, BC, 3 states	-	-	-	CA-US
G5T3T4	<i>Pontia sisymbrii beringiensis</i>	California White	AB, BC, YT	YES	-	-	CA
G3	<i>Speyeria idalia</i>	Regal Fritillary	MB, 32 states (8*)	-	-	-	CA-US
G5T3T4	<i>Speyeria zerene bremnerii</i>	Bremner's Silverspot	BC, 2 states	-	-	-	CA-US
MOTHS (CANADIAN ENDEMIC ONLY)							
G1	<i>Agrotis arenarius</i>	a moth	NS	YES	-	-	CA

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G1G3	<i>Animomyia hardwicki</i>	a moth	SK	YES	-	-	CA
G1G3	<i>Arctia brachyptera</i>	Kluane Tiger Moth	NT, YT	YES	-	-	CA
G3	<i>Dodia tarandus</i>	Woodland Tiger Moth	AB, MB, SK, YT	YES	-	-	CA
G1	<i>Eucosma sableana</i>	a moth	NS	YES	-	-	CA
G1	<i>Papaipema sp. 6</i>	Sable Island Papaipema	NS	YES	-	-	CA
G1G3	<i>Xanthorhoe clarkeata</i>	a moth	BC	YES	-	-	CA
CADDISFLIES (CANADIAN ENDEMIC ONLY)							
G2G3	<i>Apatania Alberta</i>	a caddisfly	AB, BC	YES	-	-	CA
G3G4	<i>Limnephilus ademus</i>	a caddisfly	NB, NL	YES	-	-	CA
G2G3	<i>Sphagnophylax meiops</i>	Eastern Beringian Small-eyed Caddisfly	NT, YT	YES	-	-	CA
G1G3	<i>Tinodes parvus</i>	a caddisfly	ON	YES	-	-	CA
G1G3	<i>Triaenodes schmidi</i>	a caddisfly	YT	YES	-	-	CA
TIGER BEETLES							
G3	<i>Cicindela ancocisconensis</i>	Appalachian Tiger Beetle	QC, 16 states (1*)	-	-	-	CA-US
G3G4	<i>Cicindela denikei</i>	Laurentian Tiger Beetle	MB, ON, 1 state	-	-	-	CA-US
G5T1	<i>Cicindela formosa gibsoni</i>	Gibson's Big Sand Tiger Beetle	SK, 3 states	-	T	-	CA-US
G5T3T4	<i>Cicindela hirticollis athabascensis</i>	Athabasca Tiger Beetle	AB, SK	YES	-	-	CA
G3G4	<i>Cicindela lepida</i>	Ghost Tiger Beetle	AB, MB, ON, QC, SK, 36 states (1*)	-	-	-	CA-US
G4T1Q	<i>Cicindela limbata labradorensis</i>	Sandy Tiger Beetle	NL	YES	-	-	CA
G2	<i>Cicindela marginipennis</i>	Cobblestone Tiger Beetle	NB, 14 states (1*)	-	E	E	CA-US
G4T2T4	<i>Cicindela parowana wallisi</i>	Dark Saltflat Tiger Beetle	BC, 2 states	-	E	E	CA-US
G3	<i>Cicindela patruela</i>	Northern Barrens Tiger Beetle	ON, QC, 24 states	-	E	E	CA-US
G3T3	<i>Cicindela patruela patruela</i>	Northern Barrens Tiger Beetle	ON, 22 states	-	-	-	CA-US

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G5T2T4	<i>Cicindela repanda novascotiae</i>	Nova Scotia Shore Tiger Beetle	NB, NS, PE, QC	YES	-	-	CA
OTHER BEETLES (CANADIAN ENDEMIC ONLY)							
G1G2	<i>Hydrotus autumnalis</i>	a small scavenger beetle	ON	YES	-	-	CA
G1G3	<i>Lypoglossa manitobae</i>	a rove beetle	MB	YES	-	-	CA
G1	<i>Macrohydrotus tibiocalcaris</i>	a small scavenger beetle	ON	YES	-	-	CA
G1	<i>Mitosynum vockerothi</i>	a rove beetle	NB	YES	-	-	CA
G1G3	<i>Nebria charlottae</i>	a ground beetle	BC	YES	-	-	CA
G1G3	<i>Nebria louseae</i>	a ground beetle	BC	YES	-	-	CA
G1G2	<i>Ophraella nuda</i>	a leaf beetle	AB	YES	-	-	CA
G1	<i>Sanfilippodytes bertae</i>	Bert's Predaceous Diving Beetle	AB	YES	E	E	CA
GH	<i>Tricholochmaea sablensis</i>	a leaf beetle	NS*	YES	-	-	CA
ANTS (CANADIAN ENDEMIC ONLY)							
G3G4	<i>Leptothorax pocahontas</i>	an ant	AB	YES	-	-	CA
BEES (CANADIAN ENDEMIC ONLY)							
G1	<i>Lasioglossum sablense</i>	Sable Island Sweat Bee	NS	YES	T	-	CA
FRESHWATER BRYOZOA (CANADIAN ENDEMIC ONLY)							
GH	<i>Hyalinella orbisperma</i>	a freshwater bryozoan	ON*	YES	-	-	CA
FERNS AND RELATIVES							
G5?T1T2	<i>Adiantum aleuticum</i> var. <i>subpumilum</i>	Dwarf Coastal Maidenhair Fern	BC	YES	-	-	CA
G3	<i>Adiantum viridimontanum</i>	Green Mountain Maidenhair Fern	QC, 1 state	-	-	-	CA-US
G4T3	<i>Asplenium scolopendrium</i> var. <i>americanum</i>	American Hart's-tongue Fern	ON, 5 states	-	SC	SC	CA-US
G1	<i>Botrychium acuminatum</i>	Pointed Moonwort	ON, 2 states	-	-	-	CA-US
G3	<i>Botrychium ascendens</i>	Upswept Moonwort	AB, BC, NL, ON, QC, SK, YT, 11 states	-	-	-	CA-US

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G3G4	<i>Botrychium campestre</i>	Prairie Dunewort	AB, MB, NB, NL, ON, SK, 16 states	-	-	-	CA-US
G3	<i>Botrychium crenulatum</i>	Dainty Moonwort	AB, BC, ON, 10 states	-	-	-	CA-US
G3	<i>Botrychium lineare</i>	Narrow-leaved Moonwort	AB, BC, NB, QC, YT, 12 states	-	-	-	CA-US
G3	<i>Botrychium michiganense</i>	Michigan Moonwort	BC, NB, ON, QC, SK, 7 states	-	-	-	CA-US
G3	<i>Botrychium montanum</i>	Mountain Moonwort	BC, 6 states	-	-	-	CA-US
G3	<i>Botrychium mormo</i>	Little Goblin Moonwort	QC, 3 states	-	-	-	CA-US
G3	<i>Botrychium pallidum</i>	Pale Moonwort	AB, BC, MB, ON, QC, SK, 7 states	-	-	-	CA-US
G3G4	<i>Botrychium paradoxum</i>	Paradox Moonwort	AB, BC, SK, 8 states	-	-	-	CA-US
G3G4	<i>Botrychium pedunculosum</i>	Stalked Moonwort	AB, BC, QC, SK, 6 states	-	-	-	CA-US
G1	<i>Botrychium pseudopinnatum</i>	False Northwestern Moonwort	ON	YES	-	-	CA
G3	<i>Botrychium rugulosum</i>	Rugulose Grapefern	NB, ON, QC, 6 states	-	-	-	CA-US
G5T3T4	<i>Botrychium simplex</i> var. <i>compositum</i>	Western Least Moonwort	BC, 2 states	-	-	-	CA-US
G5T3T4	<i>Botrychium simplex</i> var. <i>simplex</i>	Least Moonwort	NB, NL, NT, ON, QC, SK, 20 states	-	-	-	CA-US
G3	<i>Botrychium spathulatum</i>	Spatulate Moonwort	AB, BC, MB, NT, ON, QC, YT, 6 states	-	-	-	CA-US
G3G4	<i>Botrychium tunux</i>	Tunux Moosewort	BC, YT, 8 states	-	-	-	CA-US
G3G4	<i>Botrychium yaaxudakeit</i>	Yaa Xu da Keit Moonwort	BC, YT, 5 states	-	-	-	CA-US
G3	<i>Cystopteris laurentiana</i>	Laurentian Bladder Fern	NB, NL, NS, ON, QC, 6 states	-	-	-	CA-US
G3	<i>Isoetes acadensis</i>	Acadian Quillwort	NB, NL, NS, 4 states	-	-	-	CA-US
G2	<i>Isoetes prototypes</i>	Prototype Quillwort	NB, NS, 1 state	-	SC	SC	CA-US
G3	<i>Pellaea gastonyi</i>	Gastony's Cliffbrake	AB, BC, MB, SK, 3 states	-	-	-	CA-US
G4T3T4	<i>Polystichum imbricans</i> ssp. <i>imbricans</i>	Narrow-leaved Sword Fern	BC, 3 states	-	-	-	CA-US
G3	<i>Polystichum setigerum</i>	Alaska Holly Fern	BC, 1 state	-	-	-	CA-US
G3G4	<i>Schizaea pusilla</i>	Little Curly-grass Fern	NB, NL, NS, QC, 3 states	-	-	-	CA-US

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CONIFERS							
G5T3T4	<i>Juniperus communis</i> var. <i>charlottensis</i>	Queen Charlotte Islands Juniper	BC, 1 state	-	-	-	CA-US
G5T3	<i>Juniperus communis</i> var. <i>megistocarpa</i>	Magdalen Islands Juniper	NB, NL, NS, QC	YES	-	-	CA
G3G4	<i>Juniperus maritima</i>	Seaside Juniper	BC, 1 state	-	-	-	CA-US
G3G4	<i>Pinus albicaulis</i>	Whitebark Pine	AB, BC, 7 states	-	E	E	CA-US
G5T3T4	<i>Pinus contorta</i> var. <i>yukonensis</i>	Yukon Lodgepole Pine	YT	YES	-	-	CA
FLOWERING PLANTS							
G4G5T2	<i>Abronia umbellata</i> ssp. <i>breviflora</i>	Pink Sand-verbena	BC, 3 states	-	E	E	CA-US
G5T1	<i>Achillea millefolium</i> var. <i>megacephala</i>	Large-headed Woolly Yarrow	AB, NT, SK	YES	SC	SC	CA
G3	<i>Agalinis neoscotica</i>	Nova Scotia False Foxglove	NB, NS, 1 state	-	-	-	CA-US
G3G4	<i>Agalinis skinneriana</i>	Skinner's Agalinis	ON, 16 states	-	E	E	CA-US
G4T3?	<i>Alchemilla filicaulis</i> ssp. <i>filicaulis</i>	Thin-stemmed Lady's Mantle	NL, QC, ●	-	-	-	ML
G4T2T4	<i>Alchemilla filicaulis</i> ssp. <i>vestita</i>	Lesser Lady's Mantle	QC	YES	-	-	CA
G3?	<i>Amelanchier fernaldii</i>	Fernald's Serviceberry	NB, NL, NS, PE, QC	YES	-	-	CA
G3Q	<i>Amelanchier nantucketensis</i>	Nantucket Serviceberry	NS, 5 states	-	-	-	CA-US
G3G4	<i>Anemone multiceps</i>	Porcupine River Anemone	YT, 1 state	-	-	-	CA-US
G3G4	<i>Antennaria densifolia</i>	Dense-leaved Pussytoes	BC, NT, YT, 2 states	-	-	-	CA-US
G5T3	<i>Antennaria pulcherrima</i> ssp. <i>eucosma</i>	Newfoundland Pussytoes	NL, QC	YES	-	-	CA
G3	<i>Aquilegia jonesii</i>	Jones' Columbine	AB, 2 states	-	-	-	CA-US
G3G4	<i>Arenaria longipedunculata</i>	Long-stemmed Sandwort	AB, BC, YT, 1 state	-	-	-	CA-US
G5T1T2	<i>Armeria maritima</i> ssp. <i>interior</i>	Athabasca Thrift	SK	YES	SC	SC	CA
G5T1T2	<i>Arnica griscomii</i> ssp. <i>griscomii</i>	Griscom's Arnica	NL, QC	YES	T	-	CA
G5T3T4	<i>Arnica lanceolata</i> ssp. <i>lanceolata</i>	Lance-leaved Arnica	NB, QC, 4 states	-	-	-	CA-US

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G3	<i>Arnica louiseana</i>	Lake Louise Arnica	AB, BC	YES	-	-	CA
G3?	<i>Artemisia woodii</i>	Rock Wormwood	YT	YES	NAR	-	CA
G5T3	<i>Astragalus alpinus</i> var. <i>brunetianus</i>	Brunet's Milkvetch	NB, NL, QC, 3 states (2*)	-	-	-	CA-US
G5T3T4	<i>Astragalus laxmannii</i> var. <i>tananaicus</i>	Tanana River Milkvetch	BC, YT, 1 state	-	-	-	CA-US
G5T1T2	<i>Astragalus robbinsii</i> var. <i>fernaldii</i>	Fernald's Milkvetch	NL	YES	SC	SC	CA
G3G4	<i>Astragalus spaldingii</i>	Spalding's Milkvetch	BC, 3 states	-	-	-	CA-US
G5T3T4	<i>Atriplex glabriuscula</i> var. <i>franktonii</i>	Frankton's Saltbush	NB, NS, PE	YES	-	-	CA
G1	<i>Atriplex nudicaulis</i>	Baltic Saltbush	NL	YES	-	-	CA
G1Q	<i>Betula murrayana</i>	Murray's Birch	ON, 1 state	-	-	-	CA-US
G3	<i>Bidens amplissima</i>	Vancouver Island Beggarticks	BC, 1 state	-	SC	SC	CA-US
G3	<i>Bidens eatonii</i>	Eaton's Beggarticks	NB, QC, 4 states	-	-	-	CA-US
G2G3Q	<i>Bidens heterodoxa</i>	Connecticut Beggarticks	NB, PE, QC, 1 state	-	-	-	CA-US
G1G2	<i>Boechera cascadiensis</i>	Small-leaf Rockcress	BC, 2 states	-	-	-	CA-US
G2G4	<i>Boechera paupercula</i>	Tiny Sunscress	BC, 4 states	-	-	-	CA-US
G1	<i>Boechera quebecensis</i>	Quebec Rockcress	QC	YES	-	-	CA
G1	<i>Braya fernaldii</i>	Fernald's Braya	NL	YES	E	T	CA
G5T1T2Q	<i>Braya humilis</i> ssp. <i>maccallae</i>	McCalla's Braya	AB, BC	YES	-	-	CA
G5T3T4	<i>Braya humilis</i> ssp. <i>porsildii</i>	Porsild's Braya	AB, BC, NT	YES	-	-	CA
G2?	<i>Braya linearis</i>	Narrow-fruit Braya	QC, ●	-	-	-	ML
G1	<i>Braya longii</i>	Long's Braya	NL	YES	E	E	CA
G2	<i>Braya pilosa</i>	Hairy Braya	NT	YES	E	-	CA
G3G4	<i>Calochortus lyallii</i>	Lyall's Mariposa Lily	BC, 1 state	-	SC	T	CA-US
G3G4	<i>Cardamine microphylla</i>	Small-leaved Bittercress	NT, YT, 1 state	-	-	-	CA-US
G3G4	<i>Carex cordillerana</i>	Cordilleran Sedge	AB, BC, 5 states	-	-	-	CA-US
G5T1	<i>Carex deweyana</i> var. <i>collectanea</i>	Round-fruited Sedge	QC	YES	-	-	CA
G3	<i>Carex juniperorum</i>	Juniper Sedge	ON, 3 states	-	E	E	CA-US
G4T3T4	<i>Carex petricosa</i> var. <i>misandroides</i>	Man-hater Sedge	NL, QC	YES	-	-	CA

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
G3G4	<i>Carex schweinitzii</i>	Schweinitz's Sedge	ON, 10 states	-	-	-	CA-US
G5T3	<i>Carex scirpoidea</i> ssp. <i>convoluta</i>	Lake Huron Single-spike Sedge	ON, 1 state	-	-	-	CA-US
G5T3?	<i>Carex scopulorum</i> var. <i>prionophylla</i>	Saw-leaved Sedge	BC, 4 states	-	-	-	CA-US
G5T3	<i>Carex viridula</i> ssp. <i>brachyrrhyncha</i>	Long-stalked Yellow Sedge	NB, NL, NS, QC	YES	-	-	CA
G5T3	<i>Carex viridula</i> var. <i>elatior</i>	Long-stalked Yellow Sedge	NB, NL, NS, QC, 1 state	-	-	-	CA-US
G5T1T2	<i>Carex viridula</i> var. <i>saxilittoralis</i>	Rocky Shore Sedge	NL, NS	YES	-	-	CA
G2G4	<i>Carex waponahkikensis</i>	Dawn-land Sedge	NB, 1 state	-	-	-	CA-US
G1	<i>Castilleja levisecta</i>	Golden Paintbrush	BC, 2 states	-	E	E	CA-US
G5T3T4	<i>Castilleja miniata</i> ssp. <i>dixonii</i>	Dixon's Paintbrush	BC, 3 states	-	-	-	CA-US
G5T3T4	<i>Castilleja parviflora</i> var. <i>albida</i>	Small-flower Indian-paintbrush	BC, 1 state	-	-	-	CA-US
G3G4	<i>Castilleja rupicola</i>	Cliff Paintbrush	BC, 2 states	-	T	T	CA-US
G1	<i>Castilleja victoriae</i>	Victoria's Paintbrush	BC, 1 state	-	E	E	CA-US
G1	<i>Cerastium terrae-novae</i>	Newfoundland Chickweed	NL	YES	-	-	CA
G5T3T4Q	<i>Chaerophyllum procumbens</i> var. <i>shortii</i>	Short's Spreading Chervil	ON, 11 states	-	-	-	CA-US
G2G3	<i>Chenopodium foggii</i>	Fogg's Goosefoot	ON, QC, 9 states	-	-	-	CA-US
G3G4	<i>Chenopodium subglabrum</i>	Smooth Goosefoot	AB, BC, MB, SK, 9 states	-	T	T	CA-US
G5T3	<i>Cicuta maculata</i> var. <i>victorinii</i>	Victorin's Water-hemlock	QC	YES	SC	SC	CA
G2G3	<i>Cirsium pitcheri</i>	Pitcher's Thistle	ON, 4 states	-	SC	1	CA-US
GNRT3	<i>Cirsium pumilum</i> var. <i>hillii</i>	Hill's Thistle	ON, 6 states	-	T	T	CA-US
G5T3T4	<i>Claytonia multiscapa</i> ssp. <i>pacifica</i>	Pacific Spring Beauty	BC, 1 state	-	-	-	CA-US
G3	<i>Claytonia ogilviensis</i>	Ogilvie Mountains Spring Beauty	YT	YES	-	-	CA
G5T1T3	<i>Corallorhiza maculata</i> var. <i>ozettensis</i>	Ozette Coralroot	BC	YES	-	-	CA
G5T2T4	<i>Corallorhiza odontorhiza</i> var. <i>pringlei</i>	Pringle's Coralroot	ON, 14 states	-	-	-	CA-US

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G3	<i>Coreopsis rosea</i>	Pink Coreopsis	NS, 9 states (1*)	-	E	E	CA-US
G4G5T2T3	<i>Corispermum hookeri</i> var. <i>pseudodeclinatum</i>	British Columbia Bugseed	BC	YES	-	-	CA
G3G4	<i>Corispermum ochotense</i>	Okhotian Bugseed	NT, SK, YT, 1 state	-	-	-	CA-US
G3G4T2?	<i>Corispermum ochotense</i> var. <i>alaskanum</i>	Alaska Bugseed	YT, 1 state	-	-	-	CA-US
G3G4T3T4	<i>Corispermum ochotense</i> var. <i>ochotense</i>	Okhotian Bugseed	NT, SK, 1 state, ●	-	-	-	ML
G1G3	<i>Crassula viridis</i>	Prickly-seed Pygmyweed	BC, 2 states	-	-	-	CA-US
G2G3	<i>Crataegus atrovirens</i>	Dark Green Hawthorn	BC	YES	-	-	CA
G2G4	<i>Crataegus beata</i>	Dunbar's Hawthorn	ON, 5 states	-	-	-	CA-US
G5T2T3	<i>Crataegus chrysocarpa</i> var. <i>vernonensis</i>	Vernon Hawthorn	BC	YES	-	-	CA
G2G3	<i>Crataegus enderbyensis</i>	Enderby Hawthorn	BC	YES	-	-	CA
G3G4Q	<i>Crataegus fluviatilis</i>	Fort Sheridan Hawthorn	ON, QC, 11 states	-	-	-	CA-US
G2G3	<i>Crataegus formosa</i>	Beautiful Hawthorn	ON, 3 states	-	-	-	CA-US
G3G4	<i>Crataegus lumaria</i>	Round-leaved Hawthorn	ON, QC, 5 states	-	-	-	CA-US
G1G3Q	<i>Crataegus nitidula</i>	Ontario Hawthorn	ON, 3 states	-	-	-	CA-US
G2G4	<i>Crataegus okennonii</i>	O'Kennon's Hawthorn	BC, 3 states	-	-	-	CA-US
G2G3	<i>Crataegus orbicularis</i>	Oval Hawthorn	BC	YES	-	-	CA
G3	<i>Crataegus pennsylvanica</i>	Pennsylvania Hawthorn	ON, 7 states	-	-	-	CA-US
G1?	<i>Crataegus perjucunda</i>	Middlesex Frosted Hawthorn	ON, 1 state	-	-	-	CA-US
G2G3	<i>Crataegus phippisii</i>	Phipps' Hawthorn	BC, 2 states	-	-	-	CA-US
G2	<i>Crataegus rivuloadamensis</i>	Adams Creek Hawthorn	AB, SK	YES	-	-	CA
G1	<i>Crataegus rivulopugnensis</i>	Battle Creek Hawthorn	AB, SK	YES	-	-	CA
G2	<i>Crataegus rubibracteolata</i>	Red Bracteole Hawthorn	AB, SK	YES	-	-	CA
GNRT2?	<i>Crataegus sheila-phippisae</i> var. <i>sheila-phippisae</i>	Sheila Phipps' Hawthorn	BC	YES	-	-	CA

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G2G3	<i>Crataegus shuswapensis</i>	Shuswap Hawthorn	BC	YES	-	-	CA
G3?	<i>Crataegus suborbiculata</i>	Caughuawaga Hawthorn	ON, QC, 4 states	-	-	-	CA-US
G4G5T3T4	<i>Crepis modocensis</i> ssp. <i>rostrata</i>	Siskiyou Hawk's-beard	BC, 1 state	-	-	-	CA-US
G3	<i>Cypripedium arietinum</i>	Ram's-head Lady's-slipper	MB, NS, ON, QC, SK, 9 states	-	-	-	CA-US
G2	<i>Deschampsia mackenzieana</i>	Mackenzie Hairgrass	NT, SK	YES	SC	SC	CA
G3	<i>Douglasia laevigata</i>	Smooth Dwarf Primrose	BC, 2 states	-	-	-	CA-US
G2?	<i>Draba aleutica</i>	Aleutian Draba	YT, 1 state	-	-	-	CA-US
G1	<i>Draba bruce-bennettii</i>	Klaza Draba	YT	YES	-	-	CA
G1	<i>Draba caswellii</i>	Caswell's Draba	YT	YES	-	-	CA
G2	<i>Draba cayouettei</i>	Cayouette's Draba	NU, QC	YES	-	-	CA
G3Q	<i>Draba chamissonis</i>	Cape Thompson Draba	BC, 1 state, ●	-	-	-	ML
G1G3	<i>Draba franktonii</i>	Frankton's Draba	BC	YES	-	-	CA
G1	<i>Draba kluanei</i>	Kluane Draba	YT	YES	-	-	CA
G2	<i>Draba murrayi</i>	Murray's Draba	YT, 1 state	-	-	-	CA-US
G3G4	<i>Draba ogilviensis</i>	Ogilvie Range Draba	NT, YT, 1 state	-	-	-	CA
G3G4	<i>Draba porsildii</i>	Porsild's Draba	AB, BC, NT, YT, 3 states	-	-	-	CA-US
G1	<i>Draba puvirnituqii</i>	Puvirnituq Mountain Draba	QC	YES	-	-	CA
G1G2	<i>Draba pycnosperma</i>	Dense Draba	NL, NS, QC	YES	-	-	CA
G3G4	<i>Draba scotteri</i>	Scotter's Draba	BC, YT	YES	-	-	CA
G3	<i>Draba simmonsii</i>	Simmons' Draba	NU	YES	-	-	CA
G3G4	<i>Draba stenopetala</i>	Star-flowered Draba	BC, YT, 1 state	-	-	-	CA-US
G1G2	<i>Draba taylori</i>	Taylor's Draba	BC	YES	-	-	CA
G3G4Q	<i>Draba thompsonii</i>	Thompson's Draba	BC, YT, 2 states	-	-	-	CA-US

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G3	<i>Draba ventosa</i>	Wind River Draba	AB, BC, YT, 4 states	-	-	-	CA-US
G2G3	<i>Draba yukonensis</i>	Yukon Draba	YT	YES	E	-	CA
G1G2	<i>Elatine ojbwayensis</i>	Ojibway Waterwort	QC	YES	-	-	CA
G3	<i>Eleocharis aestuum</i>	Tidal Spikerush	QC, 8 states	-	-	-	CA-US
G2	<i>Eleocharis diandra</i>	Wright's Spikerush	ON, QC, 5 states	-	-	-	CA-US
G3G4Q	<i>Elymus diversiglumis</i>	Variable-glumed Wildrye	MB, ON, SK, 11 states	-	-	-	CA-US
G5T3Q	<i>Epilobium ciliatum</i> var. <i>ecomosum</i>	Estuarine Willowherb	QC	YES	-	-	CA
G3?	<i>Erigeron leibergii</i>	Leiberg's Fleabane	BC, 1 state	-	DD	-	CA-US
G2G3	<i>Erigeron muirii</i>	Muir's Fleabane	YT, 1 state	-	-	-	CA-US
G1	<i>Erigeron pacalis</i>	Peace River Fleabane	BC	YES	-	-	CA
G5T1	<i>Erigeron philadelphicus</i> var. <i>glaber</i>	Vancouver Island Fleabane	BC	YES	-	-	CA
G5T3Q	<i>Erigeron philadelphicus</i> var. <i>provancheri</i>	Provancher's Fleabane	QC, 2 states	-	SC	SC	CA-US
G3G4	<i>Erigeron radicans</i>	Taproot Fleabane	AB, SK, 4 states	-	NAR	-	CA-US
G3	<i>Erigeron salishii</i>	Salish Fleabane	BC, 1 state	-	-	-	CA-US
G3?	<i>Erigeron trifidus</i>	Three-lobed Fleabane	AB, BC	YES	-	-	CA
G3	<i>Eriocaulon parkeri</i>	Parker's Pipewort	NB, QC, 11 states (2*)	-	NAR	-	CA-US
G5T2	<i>Eriogonum flavum</i> var. <i>aquilinum</i>	Yukon Wild Buckwheat	YT, 1 state	-	-	-	CA-US
G3G4	<i>Eritrichium splendens</i>	Showy Alpine Forget-me-not	NT, YT, 1 state	-	-	-	CA-US
G3?	<i>Erythranthe patula</i>	Stalk-leaved Monkeyflower	AB, BC, 5 states	-	-	-	CA-US
G3?	<i>Eucephalus paucicapitatus</i>	Olympic Mountain Aster	BC, 1 state	-	-	-	CA-US
G1G3	<i>Euphrasia vinacea</i>	Burgundy Eyebright	MB, ON	YES	-	-	CA
G3G4Q	<i>Festuca frederikseniae</i>	Frederiksen's Fescue	NL, QC, ●	-	-	-	ML
G2G3	<i>Festuca pseudovivipara</i>	Queen Charlotte Islands Fescue	BC	YES	-	-	CA

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G2G3	<i>Festuca washingtonica</i>	Washington Fescue	BC, 1 state	-	-	-	CA-US
G3G4	<i>Gentiana fremontii</i>	Lowly Gentian	AB, NT, SK, 7 states	-	-	-	CA-US
G3G5T3	<i>Gentianopsis detonsa</i> ssp. <i>yukonensis</i>	Yukon Fringed Gentian	YT, 1 state	-	-	-	CA-US
G5T2Q	<i>Gentianopsis virgata</i> ssp. <i>victorinii</i>	Victorin's Fringed Gentian	QC	YES	T	T	CA
G2	<i>Geum peckii</i>	Eastern Mountain Avens	NS, 1 state	-	E	E	CA-US
G2	<i>Geum schofieldii</i>	Queen Charlotte Avens	BC	YES	-	-	CA
G3	<i>Glyceria leptostachya</i>	Slender-spike Mannagrass	BC, 4 states	-	-	-	CA-US
G3	<i>Gratiola quartermantiae</i>	Limestone Hedge-hyssop	ON, 5 states	-	-	-	CA-US
G3G4	<i>Hackelia ciliata</i>	Okanogan Stickseed	BC, 1 state	-	NAR	-	CA-US
G4T3	<i>Hackelia diffusa</i> var. <i>diffusa</i>	Spreading Stickseed	BC, 4 states	-	-	-	CA-US
G3	<i>Hieracium robinsonii</i>	Robinson's Hawkweed	NB, NL, NS, QC, 2 states	-	-	-	CA
G3G4	<i>Hydrastis canadensis</i>	Goldenseal	ON, 26 states	-	T	T	CA-US
G3G4	<i>Impatiens ecornuta</i>	Spurless Jewelweed	BC, 4 states	-	-	-	CA-US
G3	<i>Iris lacustris</i>	Dwarf Lake Iris	ON, 2 states	-	SC	T	CA-US
G2?	<i>Isotria medeoloides</i>	Small Whorled Pogonia	ON, 22 states (2*)	-	E	E	CA-US
G3G4	<i>Juncus breweri</i>	Brewer's Rush	BC, 3 states	-	-	-	CA-US
G2G3	<i>Juncus caesariensis</i>	New Jersey rush	NS, 4 states	-	SC	SC	CA-US
G3G4	<i>Lathyrus littoralis</i>	Silky Beach Pea	BC, 3 states	-	T	-	CA-US
G5T1T2	<i>Lechea intermedia</i> var. <i>depauperata</i>	Impoverished Pinweed	AB, SK	YES	DD	-	CA
G5T2	<i>Lechea maritima</i> var. <i>subcylindrica</i>	Beach Pinweed	NB, PE	YES	SC	SC	CA
G3	<i>Lewisiopsis tweedyi</i>	Tweedy's Lewisia	BC, 1 state	-	E	-	CA-US
G2	<i>Limnanthes macounii</i>	Macoun's Meadowfoam	BC	YES	T	T	CA
G5T3	<i>Linum lewisii</i> var. <i>lepagei</i>	Lepage's Flax	MB, NU, ON	YES	-	-	CA

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G5T3T4	<i>Linum medium</i> var. <i>medium</i>	Stiff Yellow Flax	ON, 1 state	-	-	-	CA-US
G5T3	<i>Lloydia serotina</i> var. <i>flava</i>	Golden Alpine Lily	BC	YES	-	-	CA
G3?	<i>Lomatium brandegeei</i>	Brandegee's Desert-parsley	BC, 1 state	-	-	-	CA-US
G5T1T3	<i>Lupinus arbustus</i> ssp. <i>neolaxiflorus</i>	Grassland Lupine	BC, 3 states	-	-	-	CA-US
G5T2T3	<i>Lupinus arbustus</i> ssp. <i>pseudoparviflorus</i>	Montana Lupine	BC, 5 states	-	-	-	CA-US
G3G4	<i>Lupinus minimus</i>	Least lupine	AB, BC, 5 states	-	-	-	CA-US
G4T2	<i>Lupinus oreganus</i> var. <i>kincaidii</i>	Kincaid's Lupine	BC*, 2 states	-	XT	XT	CA-US
G2G4	<i>Lupinus rivularis</i>	Streambank Lupine	BC, 3 states	-	E	E	CA-US
G3Q	<i>Lycopus laurentianus</i>	St. Lawrence Water-horehound	QC	YES	-	-	CA
G5T3Q?	<i>Malaxis monophyllos</i> var. <i>monophyllos</i>	Eurasian White Adder's-mouth	BC, 1 state	-	-	-	CA-US
G3G4	<i>Malaxis paludosa</i>	Bog Adder's-mouth	AB, BC, MB, NT, ON, SK, YT, 2 states	-	-	-	CA-US
G2G3	<i>Meconella oregana</i>	White Meconella	BC, 3 states	-	E	E	CA-US
G2G3	<i>Mertensia drummondii</i>	Drummond's Bluebells	NT, NU, 1 state	-	-	-	CA-US
G5T3T4	<i>Mertensia paniculata</i> var. <i>borealis</i>	Northern Bluebells	BC, 4 states	-	-	-	CA-US
G2	<i>Micranthes gaspensis</i>	Gaspé Saxifrage	QC	YES	-	-	CA
G5T3	<i>Micranthes nelsoniana</i> var. <i>carlottae</i>	Queen Charlotte Islands Saxifrage	BC	YES	-	-	CA
G3G4	<i>Micranthes stellaris</i>	Starry Saxifrage	NL, NU, QC, ●	-	-	-	ML
G1G2	<i>Micranthes tischii</i>	Olympic Saxifrage	BC, 1 state	-	-	-	CA-US
G5T2Q	<i>Mimulus ringens</i> var. <i>colpophilus</i>	Estuary Monkeyflower	QC, 2 states	-	-	-	CA-US
G3	<i>Minuartia marcescens</i>	Serpentine Stitchwort	NL, QC, 1 state	-	SC	-	CA-US
G3	<i>Montia bostockii</i>	Bostock's Montia	BC, YT, 1 state	-	-	-	CA-US
G3G4	<i>Montia howellii</i>	Howell's Montia	BC, 3 states	-	-	-	CA-US
G3G4	<i>Neottia auriculata</i>	Auricled Twayblade	MB, NB, NL, ON, QC, 7 states	-	-	-	CA-US

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G3	<i>Nestotus macleanii</i>	Yukon Goldenweed	YT	YES	-	-	CA
G1G2	<i>Nymphaea loriana</i>	a water-lily	MB, SK	YES	-	-	CA
G4G5T3T4	<i>Olsynium douglasii</i> var. <i>inflatum</i>	Inflated Grass-widow	BC, 6 states	-	-	-	CA-US
G4T3?	<i>Orobanche corymbosa</i> ssp. <i>mutabilis</i>	Flat-topped Broomrape	BC, 1 state	-	-	-	CA-US
G2G3	<i>Orthocarpus barbatus</i>	Grand Coulee Owl's-clover	BC, 1 state	-	-	E	CA-US
G3?	<i>Orthocarpus bracteosus</i>	Rosy Owl's-clover	BC, 4 states	-	-	E	CA-US
G4?T1T2	<i>Oxytropis arctica</i> var. <i>murrayi</i>	Murray's Arctic Locoweed	YT	YES	-	-	CA
G5T3	<i>Oxytropis campestris</i> var. <i>davisii</i>	Davis' Locoweed	AB, BC, NT	YES	-	-	CA
G5T1T3	<i>Oxytropis campestris</i> var. <i>dispar</i>	Late Blue Locoweed	MB, SK, 2 states	-	-	-	CA-US
G4G5T3T4	<i>Oxytropis lagopus</i> var. <i>conjugans</i>	Hare's-foot Locoweed	AB, 1 state	-	T	SC	CA-US
G3G4	<i>Packera contermina</i>	Northwestern Groundsel	AB, BC, 1 state	-	-	-	CA-US
G5T3T4	<i>Packera subnuda</i> var. <i>moresbiensis</i>	Moresby Island Groundsel	BC, 1 state	-	-	-	CA-US
G3G4	<i>Panax quinquefolius</i>	American Ginseng	ON, QC, 35 states	-	E	E	CA-US
G3G4	<i>Papaver alboroseum</i>	Pale Poppy	BC, YT, 1 state	-	-	-	CA-US
G3	<i>Papaver gorodkovii</i>	Russian Poppy	YT, 1 state	-	-	-	CA-US
G3	<i>Papaver pygmaeum</i>	Dwarf Alpine Poppy	AB, BC, 1 state	-	-	-	CA-US
G1G2	<i>Pedicularis furbishiae</i>	Furbish's Lousewort	NB, 1 state	-	E	E	CA-US
G3G4	<i>Phacelia lyallii</i>	Lyall's Phacelia	AB, BC, 2 states	-	-	-	CA-US
G3G4	<i>Phacelia mollis</i>	Soft Phacelia	YT, 1 state	-	-	-	CA-US
G4G5T3Q	<i>Phlox richardsonii</i> ssp. <i>richardsonii</i>	Richardson's Phlox	NT, NU, YT, 1 state	-	-	-	CA-US
G3	<i>Physaria calderi</i>	Calder's Bladderpod	NT, YT, 1 state	-	-	-	CA-US
G2G3	<i>Plagiobothrys humistratus</i>	Low Popcornflower	BC, 1 state	-	-	-	CA-US
G3?	<i>Platanthera candida</i>	White-lip Rein Orchid	BC, 4 states	-	-	-	CA-US

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G2G3	<i>Platanthera leucophaea</i>	Eastern Prairie White-fringed Orchid	ON, 12 states (1*)	-	E	E	CA-US
G3	<i>Platanthera praeclara</i>	Western Prairie White-fringed Orchid	MB, 8 states	-	E	E	CA-US
G3	<i>Poa ammophila</i>	Sand Bluegrass	NT	YES	-	-	CA
G3G4	<i>Poa hartzii</i>	Hartz's Bluegrass	NT, NU, QC, YT, 1 state	-	-	-	CA-US
G3G4T3T4	<i>Poa hartzii</i> ssp. <i>hartzii</i>	Hartz's Bluegrass	NT, NU, QC, ●	-	-	-	ML
G5?T1	<i>Poa laxa</i> ssp. <i>banffiana</i>	Banff Bluegrass	AB, BC, 1 state	-	-	-	CA-US
G5?T3	<i>Poa laxa</i> ssp. <i>fernaldiana</i>	Fernald's Bluegrass	NL, QC, 5 states	-	-	-	CA-US
G3G4	<i>Poa laxiflora</i>	Lax-flowered Bluegrass	BC, 3 states	-	-	-	CA-US
G5T3T4Q	<i>Poa saltuensis</i> ssp. <i>languida</i>	Weak Bluegrass	ON, QC, 15 states	-	-	-	CA-US
G3G4	<i>Podistera yukonensis</i>	Yukon Podistera	YT, 1 state	-	SC	-	CA-US
G3G4	<i>Polemonium vanbruntiae</i>	Van Brunt's Jacob's-ladder	NB, QC, 7 states (1*)	-	T	T	CA-US
G5THQ	<i>Polygonatum biflorum</i> var. <i>melleum</i>	Honey-flowered Solomon's Seal	ON, 1 state (1*)	-	-	-	CA
G5T3T4	<i>Polygonum aviculare</i> ssp. <i>boreale</i>	Northern Knotweed	MB, 1 state	-	-	-	CA-US
G5T3	<i>Polygonum fowleri</i> ssp. <i>hudsonianum</i>	Hudson Bay Knotweed	MB, NL, NU, ON, QC	YES	-	-	CA
G4G5T3T4	<i>Polygonum polygaloides</i> ssp. <i>confertiflorum</i>	White-margined Knotweed	AB, BC, SK, 11 states	-	-	-	CA-US
G3	<i>Potamogeton hillii</i>	Hill's Pondweed	ON, 9 states	-	SC	SC	CA-US
G5T3	<i>Potamogeton pusillus</i> ssp. <i>gemmaiparus</i>	Budding Pondweed	QC, 5 states	-	-	-	CA-US
G3G4	<i>Potamogeton subsibiricus</i>	Yenisei River Pondweed	NT, NU, ON, QC, YT, 1 state	-	-	-	CA
G3	<i>Potentilla lasiodonta</i>	Sandhills Cinquefoil	AB, 1 state	-	-	-	CA-US
G3?	<i>Potentilla macounii</i>	Macoun's Cinquefoil	AB, 1 state	-	-	-	CA-US
G3?	<i>Pseudorchis straminea</i>	Vanilla-scented Bog Orchid	NL, NU, QC, ●	-	-	-	ML
G2G3	<i>Puccinellia banksiensis</i>	Banks Island Alkaligrass	NT, NU, 1 state	-	-	-	CA-US
G5T3T4	<i>Ranunculus occidentalis</i> var. <i>hexasepalus</i>	Queen Charlotte Island Buttercup	BC	YES	-	-	CA

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
G3	<i>Ranunculus turneri</i>	Turner's Buttercup	NT, YT, 1 state	-	-	-	CA-US
G3	<i>Rorippa calycina</i>	Persistent-sepal Yellowcress	BC, NT, 5 states	-	-	-	CA-US
G2	<i>Rorippa crystallina</i>	Mackenzie River Yellowcress	NT	YES	-	-	CA
G3	<i>Rumex beringensis</i>	Bering Sea Dock	YT, 1 state	-	-	-	CA-US
G3	<i>Rumex subarcticus</i>	Subarctic Dock	NU, ON, QC	YES	-	-	CA
G3	<i>Sabatia kennedyana</i>	Plymouth Gentian	NS, 4 states	-	E	T	CA-US
G1G2Q	<i>Sabulina litorea</i>	Seashore Stitchwort	ON, QC	YES	-	-	CA
G5T3	<i>Salix brachycarpa</i> var. <i>psammophila</i>	Sand-dune Short-capsuled Willow	SK	YES	SC	SC	CA
G4G5T1T2	<i>Salix calcicola</i> var. <i>glandulosior</i>	Glandular Limestone Willow	AB, 1 state	-	-	-	CA-US
G1	<i>Salix chlorolepis</i>	Green-scaled Willow	QC	YES	T	T	CA
G1G2	<i>Salix jejuna</i>	Barrens Willow	NL	YES	E	E	CA
G5T3T4	<i>Salix ovalifolia</i> var. <i>arctolitoralis</i>	Arctic Seashore Willow	NT, YT, 1 state	-	-	-	CA-US
G3	<i>Salix raupii</i>	Raup's Willow	AB, BC, NT, YT	YES	-	-	CA
G2G3	<i>Salix silicicola</i>	Blanket-leaved Willow	NU, SK	YES	SC	SC	CA
G2	<i>Salix turnorii</i>	Turnor's Willow	SK	YES	SC	SC	CA
G2	<i>Salix tyrrellii</i>	Tyrrell's Willow	NU, SK	YES	NAR	-	CA
G3?	<i>Sandbergia whitedii</i>	Whited's Fissurewort	BC, 1 state	-	-	-	CA-US
G3G4	<i>Sanguisorba menziesii</i>	Menzies' Burnet	BC, 2 states	-	-	-	CA-US
G5T2T3	<i>Saxifraga rivularis</i> ssp. <i>arctolitoralis</i>	Arctic Seashore Saxifrage	YT, 1 state	-	-	-	CA-US
G3G4	<i>Saxifraga taylorii</i>	Taylor's Saxifrage	BC	YES	-	-	CA
G3	<i>Scirpus ancistrochaetus</i>	Northeastern Bulrush	QC, 8 states	-	-	-	CA-US
G2G3	<i>Scirpus longii</i>	Long's Bulrush	NS, 7 states (1*)	-	SC	SC	CA-US
G5T2T3	<i>Senecio integerrimus</i> var. <i>scribneri</i>	Scribner's Ragwort	SK, 2 states	-	-	-	CA-US

GRANK (2016)	Scientific Name	English Common Name	Canada/U.S. Distribution (*) (●)	Endemic to Canada	COSEWIC (a) (b)	SARA (a) (b)	Responsibility (c)
G3	<i>Senecio sheldonensis</i>	Mount Sheldon Ragwort	BC, NT, YT	YES	-	-	CA
G3	<i>Sericocarpus rigidus</i>	White-top Aster	BC, 2 states	-	SC	SC	CA-US
G3	<i>Sida hermaphrodita</i>	Virginia Mallow	ON, 13 states (1*)	-	E	E	CA-US
G3	<i>Sidalcea hendersonii</i>	Henderson's Checker-mallow	BC, 3 states	-	-	-	CA-US
G2	<i>Silene spaldingii</i>	Spalding's Campion	BC, 4 states	-	E	E	CA-US
G4G5T2	<i>Silene uralensis</i> ssp. <i>ogilviensis</i>	Ogilvie Mountain Catchfly	ON, YT, 1 state	-	-	-	CA-US
G3G4	<i>Sinosenecio newcombei</i>	Newcombe's Butterweed	BC	YES	-	-	CA
G3	<i>Smelowskia media</i>	Fern-leaved Smelowskia	NT, YT, 1 state	-	-	-	CA-US
G2	<i>Solidago chlorolepis</i>	Mt. Albert Goldenrod	QC	YES	-	-	CA
G3?	<i>Solidago gillmani</i>	Gillman's Goldenrod	ON, 4 states	-	-	-	CA-US
G3	<i>Solidago houghtonii</i>	Houghton's Goldenrod	ON, 2 states	-	SC	SC	CA-US
G3	<i>Solidago ontarioensis</i>	Ontario Goldenrod	ON, 1 state	-	-	-	CA-US
G5T3?	<i>Solidago simplex</i> var. <i>racemosa</i>	Racemose Goldenrod	NB, QC, 6 states	-	-	-	CA-US
G4T2	<i>Spiranthes casei</i> var. <i>novaescotiae</i>	Nova Scotia Ladies'-tresses	NS	YES	-	-	CA
G2G3	<i>Spiranthes diluvialis</i>	Ute Ladies'-tresses	BC, 8 states	-	-	-	CA-US
G3G4	<i>Spiranthes magnicamporum</i>	Great Plains Ladies'-tresses	MB, ON, 25 states (1*)	-	-	-	CA-US
G3G4	<i>Stellaria americana</i>	American Starwort	AB, 1 state	-	-	-	CA-US
G5T3	<i>Stellaria longipes</i> ssp. <i>arenicola</i>	Lake Athabasca Starwort	AB, SK	YES	-	-	CA
G1G2	<i>Suaeda rolandii</i>	Roland's Sea-blite	NB, NS, QC, 2 states	-	-	-	CA-US
G3	<i>Symphyotrichum anticostense</i>	Anticosti Aster	NB, QC, 1 state	-	T	T	CA-US
G1G2	<i>Symphyotrichum laurentianum</i>	Gulf of St. Lawrence Aster	NB, PE, QC	YES	T	T	CA
G3	<i>Symphyotrichum nahanniense</i>	Nahanni Aster	NT	YES	SC	-	CA
G5T3?	<i>Symphyotrichum novi-belgii</i> var. <i>crenifolium</i>	Gaspé Aster	NB, NS, QC, 4 states	-	-	-	CA-US

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G3	<i>Symphotrichum yukonense</i>	Yukon Aster	NT, YT, 1 state	-	NAR	-	CA-US
G5T3	<i>Tanacetum huronense</i> var. <i>floccosum</i>	Floccose Tansy	SK	YES	SC	SC	CA
G3	<i>Taraxacum carneocoloratum</i>	Pink Dandelion	YT, 1 state	-	-	-	CA-US
G2	<i>Taraxacum latilobum</i>	Large-lobed Dandelion	NL, QC, 1 state	-	-	-	CA-US
G1G2	<i>Taraxacum laurentianum</i>	Gulf of St. Lawrence Dandelion	NL, QC	YES	-	-	CA
G3	<i>Tetraneuris herbacea</i>	Lakeside Daisy	ON, 3 states	-	T	-	CA
G4T3	<i>Transberingia bursifolia</i> ssp. <i>virgata</i>	Slender Mouse-ear-cress	AB, SK, 7 states	-	T	T	CA-US
G3G4	<i>Trifolium reflexum</i>	Buffalo Clover	ON*, 24 states (3*)	-	-	-	CA-US
G5T2Q	<i>Trillium ovatum</i> var. <i>hibbersonii</i>	Dwarf Western Trillium	BC	YES	-	-	CA
G3G4	<i>Triphora trianthophoros</i>	Nodding Pogonia	ON, 34 states	-	E	E	CA-US
G5T3	<i>Valeriana edulis</i> ssp. <i>ciliata</i>	Hairy Valerian	ON, 7 states	-	-	-	CA-US
G5T3	<i>Viola biflora</i> var. <i>carlottae</i>	Queen Charlotte Islands Violet	BC	YES	-	-	CA
G5T3	<i>Zizania aquatica</i> var. <i>brevis</i>	Estuarine Wildrice	NB, QC, 1 state	-	-	-	CA-US
MOSESSES (CANADIAN ENDEMIC ONLY)							
G2	<i>Seligeria careyana</i>	Carey's Limestone Moss	BC	YES	-	-	CA
G1	<i>Syntrichia cainii</i>	Cain's Screw Moss	ON	YES	-	-	CA
G2G3	<i>Wijkia carlottae</i>	a moss	BC	YES	-	-	CA
LICHENS (CANADIAN ENDEMIC ONLY)							
G1	<i>Collema coniophilum</i>	Crumpled Tarpaper Lichen	BC	YES	T	-	CA
G1G3	<i>Lecanora carlottiana</i>	a lichen	ON	YES	-	-	CA
G1G2	<i>Seiophora aurantiaca</i>	Arctic Orangebush Lichen	NT, NU	YES	-	-	CA

Appendix C: Threats Classification Adopted by NatureServe

Threat No.	Threat Description
1	Residential & Commercial Development
1.1	Housing & Urban Areas
1.2	Commercial & Industrial Areas
1.3	Tourism & Recreation Areas
2	Agriculture & Aquaculture
2.1	Annual & Perennial Non-Timber Crops
2.2	Wood & Pulp Plantations
2.3	Livestock Farming & Ranching
2.4	Marine & Freshwater Aquaculture
3	Energy Production & Mining
3.1	Oil & Gas Drilling
3.2	Mining & Quarrying
3.3	Renewal Energy
4	Transportation & Service Corridors
4.1	Roads & Railroads
4.2	Utility & Service Lines
4.3	Shipping Lanes
4.4	Flight Paths
5	Biological Resource Use
5.1	Hunting & Collecting Terrestrial Animals
5.2	Gathering Terrestrial Plants
5.3	Logging & Wood Harvesting
5.4	Fishing & Harvesting Aquatic Resources
6	Human Intrusions & Disturbance
6.1	Recreational Activities
6.2	War, Civil Unrest & Military Exercises
6.3	Work & Other Activities
7	Natural System Modifications
7.1	Fire & Fire Suppression
7.2	Dams & Water Management/Use
7.3	Other Ecosystem Modifications
8	Invasive & Other Problematic Species & Genes
8.1	Invasive Non-Native/Alien Species
8.2	Problematic Native Species
8.3	Introduced Genetic Material
9	Pollution
9.1	Household Sewage & Urban Waste Water
9.2	Industrial & Military Effluents
9.3	Agricultural & Forestry Effluents
9.4	Garbage & Solid Waste

9.5 Air-Borne Pollutants

9.6 Excess Energy

10 Geological Events

10.1 Volcanoes

10.2 Earthquakes/Tsunamis

10.3 Avalanches/Landslides

11 Climate Change & Severe Weather

11.1 Habitat Shifting & Alteration

11.2 Droughts

11.3 Extreme Temperatures

11.4 Storms & Flooding

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