



## American Bumble Bee

Photo: © Victoria MacPhail



### Scientific Name

*Bombus pensylvanicus*

### Taxon

Arthropods

### COSEWIC Status

Special Concern

### Canadian Range

Ontario, Québec

### Reason for designation

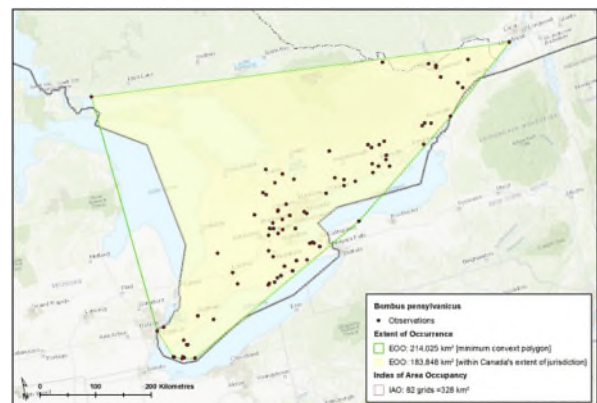
This insect occurs throughout much of North America, and Ontario and Québec represent the northern edge of its distribution. The species experienced significant declines prior to 1980, and overall trends suggest it is still becoming rarer, though it persists within a portion of its historical range in Canada. Causes for declines remain unclear, but pesticide use, habitat conversion, and pathogen spillover from managed colonies are probably contributing factors. Limiting factors such as increasing parasite loads and low genetic diversity negatively influence the persistence of this wildlife species.

### Wildlife Species Description and Significance

The American Bumble Bee (*Bombus pensylvanicus*) is a medium-sized bumble bee with a relatively long head and tongue length compared to many other bumble bee species in Canada. The distinctive dark wings and characteristic yellow and black abdominal banding pattern of females are diagnostic, and consistent throughout its Canadian range. Males have longer antennae than females, with a predominantly yellow abdomen with an orange tip. The American Bumble Bee is an important pollinator of a variety of plant species.

### Distribution

The American Bumble Bee occurs throughout much of southern North America from southern Canada, throughout the United States to Mexico. Ontario and Québec represent the northern edge of its distribution, and approximately 7.1% of its global range for the subspecies *pensylvanicus*; 2.3% for the species).



Canadian range and Extent of occurrence of American Bumble Bee.

Source: COSEWIC. 2018. COSEWIC assessment and status report on the American Bumble Bee *Bombus pensylvanicus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 52 pp.

## Habitat

The American Bumble Bee occurs in a range of open habitats including farmlands, meadows and grasslands. It has been recorded foraging on flowers for pollen and nectar from a variety of plant genera. It predominantly nests above ground in dense mats of long grass, but is also known to opportunistically nest in abandoned rodent burrows and abandoned bird nests well above the ground surface. Like all bumble bees, American Bumble Bee queens overwinter underground and in decomposing organic material such as rotting logs and compost.

## Biology

Like all bumble bees, the American Bumble Bee has an annual life cycle. Mated queens (the colony founders) emerge from wintering sites in the spring, feed, and search for potential nest sites. Once a nest site is chosen, the queen forages for pollen and nectar, returns to the nest site and lays eggs to produce a brood of workers. Workers emerge and take over nest care, defence, and foraging. In late summer, males and new queens are produced. These reproductive individuals leave the colony to mate. Mated queens subsequently enter hibernation while all other castes, including the old queen, perish by autumn.

Photo: © Victoria MacPhail



## Population Sizes and Trends

Historically, the American Bumble Bee is not considered a common species in Canada and represents 3-10% of bumble bee specimens collected in southern Ontario likely because this represents the northern edge of its range. However, it appears to be declining in abundance in recent decades throughout its range, including Ontario where it represented <1% of all bumble bees collected in the last three decades. In some areas where it was once seemingly more common than it is at present it has not been detected, although this may be a reflection of sampling intensity. Overall trends suggest this species is becoming rarer throughout North America, though it continues to persist throughout its historical range in Canada.

## Threats and Limiting Factors

The specific causes of decline for American Bumble Bee are unknown, although it is likely due to a combination of factors. The American Bumble Bees are susceptible to pesticide use, land use activities that reduce floral resources

and/or nesting site availability, and pathogens. American Bumble Bee also appears to have low genetic diversity, which likely contributes to its decline and increases the production of sterile males.

## **Protection, Status and Ranks**

There are no laws in Canada that specifically protect the American Bumble Bee, its nest sites, or habitat. The NatureServe global conservation status rank is G3G4 (Vulnerable to Apparently Secure). The IUCN Red List Category & Criteria rank for American Bumble Bee is Vulnerable.

Source: COSEWIC. 2018. COSEWIC assessment and status report on the American Bumble Bee *Bombus pensylvanicus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 52 pp.

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## Black Ash



Photo © Sean Blaney

### Scientific name

*Fraxinus nigra*

### Taxon

Vascular Plants

### COSEWIC status

Threatened

### Canadian range

Manitoba, Ontario, Québec, New Brunswick,  
Prince Edward Island, Nova Scotia,  
Newfoundland and Labrador

### Reason for designation

Approximately 51% of the global range of this tree is found in Canada. Subpopulations in the central part of the distribution have been devastated by Emerald Ash Borer, an invasive beetle. This invasive species was first detected in Canada (Windsor, Ontario) in 2002 and has since expanded its range as far west as Winnipeg, Manitoba, and east to Bedford, Nova Scotia. Although, it has caused a modest overall decline in known numbers of ash in New Brunswick, Quebec, Ontario, and Manitoba to date, projections indicate that mortality rates will be greater than 90%, and ~73% of the Canadian population is likely to be affected within one

generation (60 years) under current climate conditions. Emerald Ash Borer bio-controls have been initiated in parts of southern Ontario and Quebec, but their effectiveness is uncertain. Consequently, Emerald Ash Borer is expected to expand farther into this species' habitat with climate change.

### Wildlife Species Description and Significance

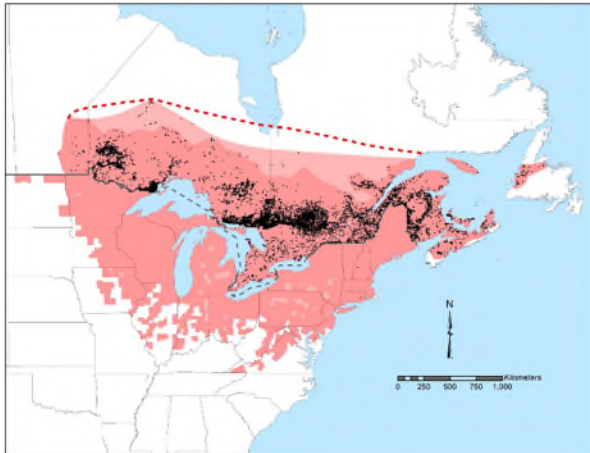
Black Ash is a broad-leaved hardwood tree in the Olive family, growing to 15-20 m in height and 30-50 cm in diameter. The opposite, pinnately-compound leaves are 15-30 cm, with seven to 11 leaflets. The small flowers lack petals and sepals and appear in crowded clusters prior to leaf out. Fruit are elongated, winged samaras. Stalkless leaflets, samaras winged to the base, and a gap between the terminal and nearest lateral buds distinguish Black Ash from other ash species.

Black Ash wood is highly flexible and readily separates into thin strips, making it useful in applications requiring bending. It has been important for barrel hoops, chair seats, snowshoe frames and canoe ribs, and remains significant for use in First Nations basketry. The durable wood is valued commercially for tool handles, furniture, interior finishing and flooring. Numerous First Nations medicinal uses are reported, and it is commercially available in horticulture. Black Ash is a dominant species in many swamp forest and riparian ecosystems, in which it provides food and shelter for many species, including at least ten Canadian ash-specialist arthropods.

### Distribution

Black Ash occurs from western Newfoundland to southeastern Manitoba and North Dakota, ranging southward to Iowa, Illinois, Virginia and Delaware. Black Ash range extends farther north than any other ash and approximately 51% of the species' global range is within Canada.





Global range of Black Ash.

Source : COSEWIC, 2018. COSEWIC assessment and status report on the Black Ash *Fraxinus nigra* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 95 pp.

## Habitat

Black Ash is predominantly a wetland species of swamps, floodplains and fens. It has an intermediate light requirement and a tendency toward greater abundance in more alkaline sites. Most sites in which it is dominant are flood prone, where its high tolerance of seasonal flooding appears to offer a competitive advantage. Black Ash also occurs widely in moist upland forests, but generally at lower densities than in wet areas.

## Biology

Black Ash flowers in mid- to late spring and is windpollinated. Individuals are generally polygamous (unisexual and bisexual flowers borne on the same tree), but occasionally unisexual. Seeds ripen from late August to September and are dispersed by wind and water from October to the following spring. Good seed crops are produced irregularly at one to eight year intervals. Seeds exhibit deep physiological dormancy and germination requires exposure to moisture and both high and low temperatures. This may be significant in determining northern and southern range limits. Black Ash seeds retain viability in the soil from three to eight years. Black Ash can reproduce by seed at about 30 years old

and can live up to 200-300 years. Vegetative reproduction is not known to occur, but extensive sprouting can occur from root crowns or cut stumps. Generation time for this report is estimated at 60 years, which may be an underestimate for this relatively long-lived, slow growing species.



Photo: © Sean Blaney

## Population Sizes and Trends

The Canadian population is incompletely understood, but estimates based on forestry data suggest it is in the range of 162 million mature trees. Emerald Ash Borer (EAB) is causing substantial ash mortality in parts of southern Ontario and Quebec. Mortality of ash species is little studied in Canada, but Black Ash is the most EAB-susceptible of all ashes in the northeast United States. EAB has not yet spread widely

enough within Canada to have greatly reduced the Canadian Black Ash population, but rapid spread of EAB and extensive mortality of Black Ash are expected in less than one generation (60 years). Regional EAB-caused mortality of mature trees in the United States has reached 95-99% with similar rates in the longest affected parts of Canada. Several lines of evidence suggest, however, that effects may not reach that level throughout the Canadian range (see below).

Conversion of forest to other land uses since European settlement has produced significant declines in the Great Lakes Plains within the past three generations, but much of Black Ash's range lies north of heavily settled regions in areas where there is little evidence of substantial recent change. Declines linked to undetermined and potentially introduced disease have been suggested in Nova Scotia, Prince Edward Island and southeastern New Brunswick.

## Threats and Limiting Factors

Black Ash is threatened by the introduced Emerald Ash Borer (EAB), an Asian woodboring beetle that reached southwestern Ontario in 1992 and has since spread to Canadian sites up to 1,100 km northwest and 1,300 km northeast. EAB larvae feed on the inner bark and sapwood, eventually girdling and killing trees. Mortality of mature ash trees (all species) reached 99% within six years in parts of Michigan and Ohio, and Black Ash is the ash species most severely affected by EAB. Similar mortality of ash (all species) has been noted in the first and most heavily affected areas of southern Ontario. Based solely on observed rates of spread, all Canadian Black Ash could be affected within one generation (60 years). Analysis suggests 27% of Black Ash in Canada could be protected from EAB under current climate because of cold minimum temperatures, though most or all of this protection could be lost within about one generation under predicted levels of climate warming. The establishment of introduced biological control agents and the potential for post-EAB recovery (based on evidence from Red

Ash) also suggest ultimate EAB-caused mortality in Canada may be less than 99%. Asian parasitoid wasps introduced for biological control are now well established in various parts of Black Ash's United States range, locally reducing EAB population growth by 50%, but their effects on ash survival are not yet clear. Introduction of biological control agents began in Ontario and Quebec in 2015.

Other potential range-wide threats of lesser immediacy or magnitude are: 1) unknown and potentially introduced pathogen(s) that appear to have caused major declines in Nova Scotia since 1958; 2) the Asian fungal disease, Chalara Dieback, which is causing extreme loss of the closely related European Ash in Europe, is virulent in Black Ash, but is not yet known in North America; and 3) Climate change, which is predicted to significantly reduce the region suitable for Black Ash within one to two generations.

## Protection, Status and Ranks

Black Ash was listed under the Nova Scotia Endangered Species Act as Threatened in 2013, but it has no provincial or state level legal status in other jurisdictions. It receives some protection from provincial wetland and riparian policies through most of its Canadian range, and it is present in many protected areas. Black Ash currently has a global status rank of G5 (Secure). This rank and many other NatureServe state ranks pre-date the introduction of EAB and thus overestimate security of Black Ash. It is of conservation concern, independent of EAB, based on the following status ranks: SH (Historic) in the District of Columbia, S1S2 (Imperiled) in Nova Scotia, Delaware, North Dakota and Rhode Island, S2S3 (Imperiled to Vulnerable) in West Virginia and S3 (Vulnerable) in Manitoba, the Island of Newfoundland, Maryland and Virginia. Other Canadian provincial ranks, reviewed in 2016, are: S4 (Apparently Secure) in Ontario; S4S5 (Apparently Secure to Secure) in New Brunswick; and S5? (Questionably Secure) in Quebec.

Source: COSEWIC. 2018. COSEWIC assessment and status report on the Black Ash *Fraxinus nigra* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 95 pp.

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## Carey's Small Limestone Moss

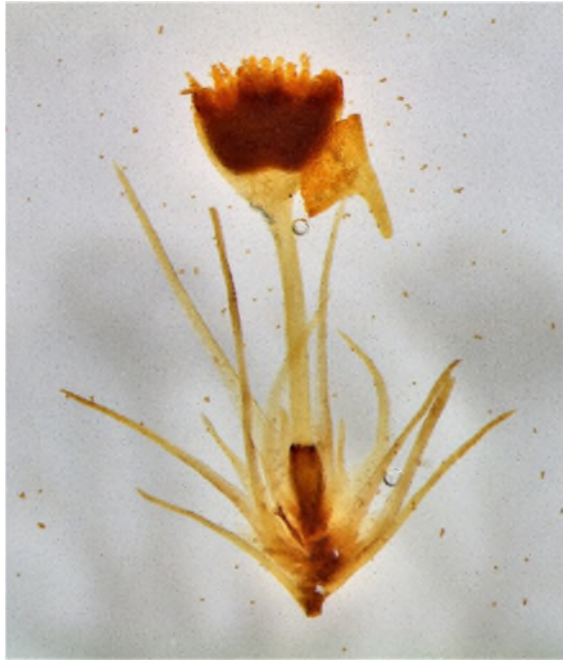


Photo: © Karen Golinski

### Scientific name

*Seligeria careyana*

### Taxon

Mosses

### COSEWIC status

Endangered

### Canadian range

British Columbia

### Reason for designation

This small moss is endemic to Canada, where it is known from three widely separated sites on Haida Gwaii, British Columbia. It is a narrow habitat specialist that occurs exclusively on shaded, pure limestone cliffs in areas of hypermaritime climate. This moss has small, fragile spores that severely limits its dispersal ability to new sites. Two of the subpopulations occur in protected areas but the habitat of the third is susceptible to quarrying. All three subpopulations will be affected by climate change, including drought, and at least one is

vulnerable to tsunamis and can be expected to be flooded by future sea-level rise.

### Wildlife Species Description and Significance

Carey's Small Limestone Moss is a minute, delicate, yellow- to light-green moss that grows in loose colonies on limestone cliffs. The leaves are linear in outline and have a conspicuously long, slender, needle-like point that consists almost entirely of the costa or "midrib" of the leaf. The sporophytes, which are nestled among the tips of the leafy shoots, consist of a short, straight stalk supporting a spore-bearing capsule that is ovate when young but with age becomes cone-shaped and flared at the mouth.

The moss is endemic to Haida Gwaii (formerly known as the Queen Charlotte Islands). It is named for Neil Carey, the captain who transported British Columbia's preeminent bryologist W.B. Schofield throughout the archipelago on collecting trips in the 1960s and 70s. Carey's Small Limestone Moss is recognized as a special element of biodiversity in British Columbia based on its apparent survival in a glacial refugium. Throughout the world, many species of *Seligeria* are rare, including four of the seven species that occur in British Columbia.

### Distribution

Carey's Small Limestone Moss is known from just three sites on Haida Gwaii, all located on northwest Moresby Island. The archipelago is situated approximately 125 km west of the mainland coast of British Columbia.





Canadian range of Carey's small limestone moss

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Carey's small limestone moss (*Seligeria careyana*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 32 pp.

## Habitat

Carey's Small Limestone Moss is a narrow habitat specialist. It is known only from shaded cliffs of Sadler Limestone in the 'Haida Gwaii Variant' of the Very Wet subzone of the Coastal Western Hemlock biogeoclimatic zone. Sadler Limestone is restricted to Haida Gwaii and consists of massive, thick-bedded grey limestones with very high calcium carbonate ( $\text{CaCO}_3$ ) content. It is not widely distributed.

## Biology

Little is known of the biology of Carey's Small Limestone Moss. The species is monoicous, meaning both male and female gametangia occur on the same gametophyte (shoot). Proximity of male and female reproductive organs facilitates self-fertilization in mosses and typically results in an abundance of spore-containing capsules. The spores of *Seligeria* are thin-walled, delicate, and short-lived, and are therefore unlikely to persist for long periods of time. The limited longevity of the spores coupled with the species' occurrence on eroding limestone substrates suggests that colonies of *Seligeria* must reproduce relatively frequently to persist. These factors suggest that the generation time of the species may be in the range of 5–8 years.

The physiology of Carey's Small Limestone Moss has not been studied. Its adaptability is thought to

be limited owing to its minute size and high habitat specificity.

The current distribution of Carey's Small Limestone Moss may reflect its survival in a glacial refugium. Dispersal and potential migration are likely constrained by the physical characteristics of spores which are thought to have a very short period of viability. Furthermore, the species' habitat of sheltered cliffs within a matrix of steep coastal topography is not conducive to long-distance dispersal by wind.

Interspecific interactions involving Carey's small limestone moss have not been observed.

## Population Sizes and Trends

The global population of Carey's Small Limestone Moss consists of three known subpopulations, all located on the northwest coast of Moresby Island. The type specimen was collected from the narrows at the entrance to Kootenay Inlet in 1966 and the species was last observed at the site in 2017. It was not possible to accurately estimate the number of individuals in the subpopulation in 2017 because the steep, slippery cliffs alongside the narrows plunge straight into deep water and access to the cliffs is very limited. Based on field observations of a single colony and the presence of seemingly-appropriate undisturbed habitat elsewhere on the south side of the narrows in 2017, it is estimated that up to five additional colonies may be present.

In 1966 Schofield collected a specimen of Carey's Small Limestone Moss from Kaisun; the size of the subpopulation was not noted, and the species has not been observed at the site since it was first collected. The exact location of the site is unknown, but the subpopulation is expected to be extant because the area is undisturbed. The site was not visited in 2017 or 2018 owing to weather and budget constraints.

The subpopulation at Tasu consisted of at least two colonies based on herbarium specimens. In 1967, Schofield collected a specimen from the

mountainside cliffs directly above the mining townsite. Since then, the lower- to mid-parts of the mountain have been heavily damaged by mining. Searches for the species in 2017 were unsuccessful and it is presumed that the colony has been extirpated. In 1985, Schofield and J. Spence collected a second specimen from limestone cliffs located above the mine and below the mountain summit outcrops. The second site was not surveyed for the moss in 2017, but the area was undisturbed, therefore the colony was expected to be extant. The size of the subpopulation is unknown.

Given the overall rarity of moss at Haida Gwaii, its restriction to a substrate that is infrequent on the islands, the extensive search effort for the species on that substrate, and the few colonies found at known sites for the species, it is unlikely that more than 250 colonies exist in Canada.

Overall, Carey's Small Limestone Moss has not been monitored, therefore trends are unknown. The species is endemic to Canada so there is no possibility of "rescue" from outside populations.

## **Threats and Limiting Factors**

The primary threats to Carey's Small Limestone Moss are climate change, quarrying, and tsunamis. The species is extremely vulnerable to the effects of climate change, particularly increased temperatures and reduced precipitation in summer. Predicted shifts in average values of climatic variables mask great fluctuations associated with two cycles: the El Niño / La Niña Southern Oscillation (ENSO), which alternates between warm and cold phases every 3–5 years, and the Pacific Decadal Oscillation (PDO) which cycles between warm and cold phases every 40–60 years. When coupled, climate change and cyclical variation may exceed climatic tolerances of Carey's Small Limestone Moss, which occupies a narrow thermal and hydrological niche in a shaded, humid cliff-habitat. Given its apparent inability to disperse beyond its immediate surroundings and restriction to globally uncommon Sadler

Limestone deposits, the species is unlikely to survive future climate scenarios.

Another effect of climate change is sea level rise and increases in the intensity and frequency of coastal storms. The subpopulation at Kootenay Inlet narrows is situated near sea level and is vulnerable to stochastic events like tsunamis and storm surges. The subpopulation at Kaisun may be similarly threatened by tsunamis but its position relative to sea level is unknown.

Quarrying is a major threat to Carey's Small Limestone Moss. There are two active mineral claims on the abandoned quarry and surrounding mineral deposits at Tasu. The mine at Tasu is currently (2019) being actively reworked. Elsewhere on Haida Gwaii, almost half of the area of Sadler Limestone has been modified by forestry activities (Griffiths & Ramsey 2009).

Other factors contributing to the extreme vulnerability of Carey's Small Limestone Moss include the small number of subpopulations; the species' highly limited dispersal capability related to the delicacy of its spores; the long distances between subpopulations; and the small size of the shoots, which limits its competitive ability among other species.

## **Protection, Status and Ranks**

Carey's Small Limestone Moss has no legal protection or status under the federal Species at Risk Act, the British Columbia Wildlife Act, or any other legislation Canada. Its global conservation rank is Imperiled, and at the national level in Canada it is ranked Critically Imperiled. At the provincial level in British Columbia it is similarly ranked Critically Imperiled and is included on the province's 'Red List'.

Two of the subpopulations of Carey's Small Limestone Moss are located within the Daawuuxusda Haida Heritage Site and Province of British Columbia Conservancy. The third subpopulation is on Crown land.

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Carey's small limestone moss (*Seligeria careyana*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 32 pp.

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## Columbia Quillwort

Photo: © Ryan Batten



### Scientific name

*Isoetes minima*

### Taxon

Vascular Plants

### COSEWIC status

Endangered

### Canadian range

British Columbia

### Reason for designation

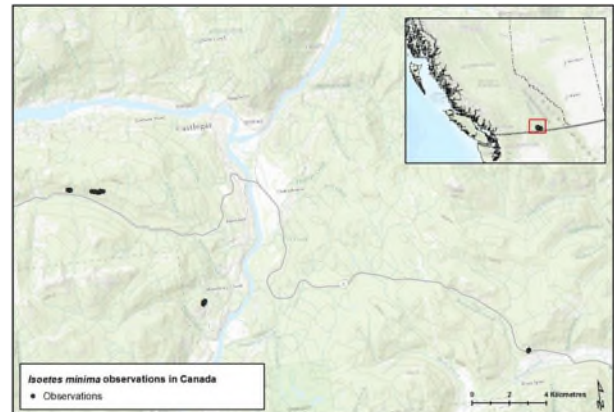
This relative of the ferns grows in thin, acidic substrate over steeply sloping bedrock. It occurs in spring ephemeral seepages in otherwise dry coniferous forest glades. A rare Pacific Northwest endemic, the species is known in Canada from four subpopulations in extreme southern British Columbia (Castlegar area), all of which have been discovered since 1996. As of 2017, there were 1,145 plants (1,019 mature) known in Canada. Reductions in habitat quality and quantity have resulted from recreational activities (specifically mountain biking), and from establishment of non-native plants, such as Spotted Knapweed. All Canadian sites are on Provincial Crown Land and where logging of surrounding areas and/or road building activity could change site hydrology with potential negative impacts on this species. Limited genetic diversity is expected in this population.

## Wildlife Species Description and Significance

Columbia Quillwort (*Isoetes minima*) is a perennial fern ally (pteridophyte) and has small, green, simple, quill-like leaves arising from a globose rootstock. The leaves are swollen at the base where the reproductive microspores and megaspores are contained within sporangia.

## Distribution

Columbia Quillwort is a globally rare endemic in the Pacific Northwest. In Canada, Columbia Quillwort is known from southern British Columbia in the Monashee and Selkirk Mountains within a 25 km radius of Castlegar. Columbia Quillwort is known in the United States from five sites in Washington, Idaho and Oregon.



Canadian distribution of Columbia Quillwort

Source: COSEWIC, 2019. COSEWIC assessment and status report on the Columbia Quillwort (*Isoetes minima*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi+ 32 pp.

## Habitat

Columbia Quillwort grows in shallow soil in spring seepage in open, east to southsloping glades within forested areas at 700 - 1160 m asl. The



plants grow out of thick moss mats or in bare exposed soil.

## Biology

Columbia Quillwort leaves emerge in the spring and the lifecycle is closely connected to moisture availability. The plants produce thousands of small microspores and hundreds of megaspores between May and early July. Immature individuals have been noted at all Canadian sites.

## Population Sizes and Trends

Four subpopulations are known in Canada, all found between 1996 and 2017. In 2017, 1145 plants (including 1019 mature individuals) were counted at four subpopulations.

## Threats and Limiting Factors

All known subpopulations occur on provincial crown land. Logging is planned for the parcel with the two largest subpopulations. Upslope logging and road building may alter hydrologic patterns, impacting downslope seepage and encouraging the spread of nonnative invasive plants. The most serious non-native competitor is Spotted Knapweed which competes with Columbia Quillwort for water and other resources at all sites. More severe droughts associated with climate change may impact on spore production. Shrub and conifer encroachment associated with succession will degrade habitat over time. Recreational activities including mountain biking and hiking may also have negative impacts on Columbia Quillwort plants and their habitat. Small isolated populations can suffer from limited genetic diversity and inbreeding depression.

Photo: © Ryan Batten



## Protection, Status and Ranks

Columbia Quillwort currently has no legal protection in Canada. In British Columbia, it is red-listed and ranked S1—Critically Imperilled (2015). It is also nationally ranked as Critically Imperilled (N1). All known existing subpopulations occur on provincial crown land.

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Columbia Quillwort (*Isoetes minima*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi+ 32 pp.

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## Cryptic Paw Lichen

Photo: © Stephen Sharnoff



### Scientific name

*Nephroma occultum*

### Taxon

Lichens

### COSEWIC status

Threatened

### Canadian range

British Columbia

### Reason for designation

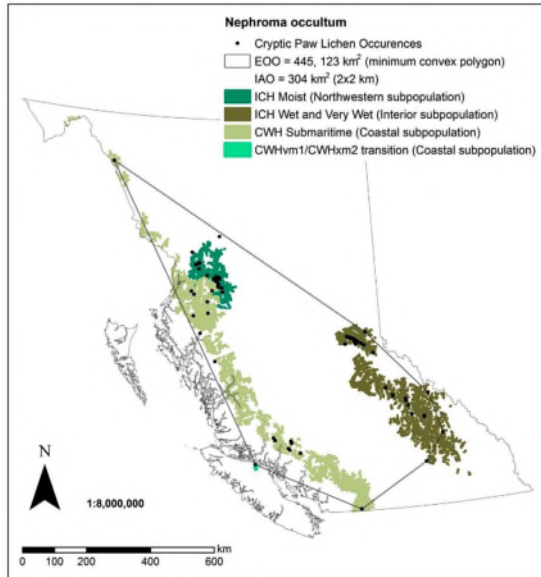
This leafy lichen is endemic to western North America. In Canada the total estimated population is approximately 12,000 individuals. The species has specific habitat requirements, growing in humid old coastal and interior cedar-hemlock forests that have depressions kept moist by input from groundwater. The lichen reproduces only by vegetative propagules with limited capability for dispersal. The species is threatened by habitat loss as a result of forest harvesting, and by climate change leading to altered patterns of winter precipitation and warmer drier summers that can enhance the frequency and severity of fires. The IUCN Threats assessment calculator result for this species was Very High to High.

### Wildlife Species Description and Significance

Cryptic Paw Lichen, *Nephroma occultum*, is a rare lichen endemic to western North America. It is strongly associated with humid old-growth forests and is characterized by a yellowish, greenish, or bluish-grey upper surface with net-shaped ridges, and a hairless tan to sometimes blackish lower surface. Thalli are commonly 2-7 cm broad with rounded lobes 4-12 mm wide. It produces asexual propagules called soredia along the margins and the ridges of the upper surface. It lacks apothecia, the spore-producing sexual stage of reproduction in lichens. Cryptic Paw Lichen is a readily identifiable macrolichen with a common habitat requirement. It is a “flagship” species for a suite of rare and uncommon lichens and bryophytes that are dependent on humid, old-growth forests, many of which exhibit an unusual coastal-inland disjunct distribution.

### Distribution

The global distribution of Cryptic Paw Lichen is within the geographic boundaries of Alaska, British Columbia, Washington and Oregon. The Canadian portion of the range accounts for about 70% of the estimated total world population, and more than 50% of the total spatial distribution.



Canadian range of Cryptic Paw Lichen

Source: COSEWIC, 2019. COSEWIC assessment and status report on the Cryptic Paw Lichen (*Nephroma occultum*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv+ 67 pp.

## Habitat

In Canada, Cryptic Paw Lichen is confined to moist old forests at elevations below 1,000 m. Absence of summer drought is a key requirement for Cryptic Paw Lichen survival. In British Columbia this requirement is met in oceanic old forests and humid continental old forests. The three Canadian subpopulations occur in the Coastal Western Hemlock (CWH) and the Interior Cedar–Hemlock (ICH) biogeoclimatic zones.

## Biology

Cryptic Paw Lichen produces large numbers of asexual soredia which are thought to be dispersed by wind, rain and animals. The soredia of the Cryptic Paw Lichen are larger than those of most lichens, with poor propagule dispersal, a likely limiting factor in the establishment and spread of this lichen. Cryptic Paw Lichen does not have sexual structures (apothecia) and appears to have undergone a past genetic bottleneck event. Furthermore, it is a poor competitor and is easily displaced by mosses or liverworts.

## Population Sizes and Trends

Habitat-based models estimated a total Canadian population for the Cryptic Paw Lichen of 11,202 individuals (thalli), distributed between three subpopulations: the Interior B.C. subpopulation (1,351 thalli), the Northwestern B.C. (Kispiox region) subpopulation (2,294 thalli), and the Coastal B.C. subpopulation (7,557 thalli). Counts of known thalli from past collections and surveys are much lower, with 82, 524, and 600 - 1,800 thalli from each of these three subpopulations, respectively. Another 419 thalli were recorded from the Northwestern subpopulation in the Kispiox region. These were enumerated during preharvest surveys conducted in planned cutblocks. Many of these thalli may no longer exist due to forestry activities. The difference between numbers of known and predicted thalli for each of these three subpopulations reflects the fact that there are areas of remote terrain that have not been visited by lichen specialists. The coastal subpopulation extends southwards into Washington State (WA) and Oregon (OR), where 700 thalli are known from 365 occurrences. A small population with six occurrences has been documented in Alaska.

The three Canadian subpopulations thus represent a majority of the global population. After accounting for threats posed by direct and indirect habitat loss, mainly related to logging of old forests, population estimates predict that declines of over 30% are likely to occur in all subpopulations over the next three generations (60 years).

## Threats and Limiting Factors

Cryptic Paw Lichen is limited by the availability of suitable habitat (humid old-growth forests) and poor dispersal efficiency. The most common host trees are Western Hemlock, Subalpine fir and Hybrid White Spruce in the Interior and Northwestern subpopulations, while in the Coastal subpopulation, Cryptic Paw Lichen

occurs on Sitka Spruce and Pacific silver fir. Humid, old-growth cedar-hemlock forests have diminished in abundance with the progressive expansion of forest harvesting. The looming mid-term timber supply crisis in the B.C. interior, brought about by the Mountain Pine Beetle epidemic in adjacent ecosystems of the central-interior plateau, will accelerate the rate of logging in forests of the Interior and Northwestern subpopulations over the next sixty years. Current planning assumptions for annual allowable cut projections suggest that a majority of old forests in the timber harvesting land base within each of these three subpopulation regions will be converted to second-growth stands within sixty years. Many of the remaining protected areas will consist largely of unsuitable “edge” habitats as logging progresses, reducing the planned conservation value for the Cryptic Paw Lichen. Seventy-six percent of Kispiox Oldgrowth Management areas, for instance, are predicted to become edge habitat due to their irregular and often elongate shapes and the proximity of adjacent clearcuts. Additional losses of thalli are expected from climate change and related increases in the frequency and severity of fires and insect outbreaks, leading to the death of host trees.

## Protection, Status and Ranks

Cryptic Paw Lichen was designated a species of Special Concern by COSEWIC in 1995. This was reconfirmed in 2006. In British Columbia it is a Blue Listed species ranked S2S3 (Imperilled to Special Concern), with a management plan prepared in February 2011. In Washington and Oregon the Cryptic Paw Lichen is listed respectively as S1 (Critically Imperilled) and S3 (Vulnerable). The Cryptic Paw Lichen also occurs in Alaska where it is not ranked.

Twenty of the 78 known Canadian occurrences of the Cryptic Paw Lichen occur within B.C. provincial parks and protected areas. An occurrence is defined as a site where the lichen is growing on one or more trees and this site is more than 1 km from a second group of colonized

trees. Thirteen of the occurrences are within the recently designated Ancient Forest/Chun T'oh Whudujut Provincial Park. In the Northwestern B.C. (Kispiox/Kalum) subpopulation, two of 21 occurrences are within provincial parks. The remainder are in timber supply areas (TSA). Some of the TSA occurrences will become Old-growth Management Areas (OGMA) and/or Wildlife Tree retention patches which provide limited forms of protection.

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Cryptic Paw Lichen (*Nephroma occultum*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv+ 67 pp.

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## Dalton's Moss

Photo: © Matthew Ciccarese



### Scientific name

*Daltonia splachnoides*

### Taxon

Mosses

### COSEWIC status

Endangered

### Canadian range

British Columbia

### Reason for designation

This small moss is known from three sites in North America. It occurs at one remote site in Canada in the hypermaritime temperate rainforests of Haida Gwaii, British Columbia, where it is an epiphyte on native shrubs and trees. It requires very wet conditions to survive. It is threatened by habitat loss and modification linked to climate change and to extreme browsing of understory shrubs by introduced, invasive Sitka Black-tailed Deer.

### Wildlife Species Description and Significance

Dalton's Moss (*Daltonia splachnoides*) is a small, glossy yellow-green to bronzecoloured moss with reddish stems and linear-lanceolate leaves. The leaves are untoothed, have a yellowish border, and a ridged costa ('midrib') that almost reaches the leaf tip. The sporophytes consist of a red stalk and a small, brown, upright, cylindric-ovoid capsule with a short neck and a contracted base. The highly distinctive calyptra (hood-like structure covering the lid of the capsule) is pale and conspicuously fringed.

The species is one of several bryophytes of biogeographic interest that in Canada are confined to the outer west coast of British Columbia.

### Distribution

Dalton's Moss is known from just two sites in British Columbia, both located on Haida Gwaii (formerly known as the Queen Charlotte Islands). Its global distribution has been characterized as "hyperoceanic southern-temperate". Elsewhere in North America, it is known from California (San Francisco County, where it may have been introduced with transplanted host plants from Australia), Mexico, and the West Indies. It has also been recorded from Central America, South America, the Atlantic Islands, Great Britain (Ireland, Scotland), Asia (China), the Pacific Islands (New Zealand), and Australia.

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Canadian range of Dalton's Moss

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Dalton's Moss (*Daltonia splachnoides*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi+ 42 pp.

## Habitat

In British Columbia, Dalton's Moss is an epiphyte on deciduous shrubs and coniferous trees in humid, rich forests near sea level in the 'Haida Gwaii variant' of the Very Wet Hypermaritime subzone of the Coastal Western Hemlock biogeoclimatic zone (CWHvh3). In some places, such as Scotland, it also occurs on rocks and soil near streams and in the spray zones of waterfalls.

## Biology

The reproductive biology of Dalton's Moss is poorly known. The species is monoicous, meaning that both male and female reproductive organs occur on the same shoots—a condition that promotes self-fertilization and the production of sporophytes. Asexual reproductive structures occur infrequently but have not been observed in Canadian specimens.

The lifespan of an epiphytic moss is limited by that of its host; therefore a species like Dalton's Moss must reproduce and disperse with sufficient frequency for a subpopulation to persist. The estimated lifespan of Dalton's Moss is 9–18 years

(based on the approximate lifespan of the associated shrubs once they have reached maturity and have developed branches and a leafy canopy), with an average generation time of 3–6 years.

The small size of the local population of Dalton's Moss and the globally disjunct pattern of distribution of the species suggests that dispersal is hindered by one or more unknown factors. These may be biological, such as poor viability and/or survivability of the spores; ecological; or geographical, including limits to long-distance dispersal related to the moss's sheltered habitat and topographic barriers between rich, highly humid sites.

The adaptability of Dalton's Moss is unknown. However, it currently persists on Haida Gwaii in a site that has experienced overgrazing by introduced Sitka Black-tailed Deer and where its original host-plant is not currently found, suggesting that the species has adapted to an alternative host.

## Population Sizes and Trends

The Canadian population of Dalton's Moss consists of two subpopulations: one at Bigsby Inlet that is currently composed of an estimated 50 colonies distributed among ~10 branches of a single shrub; and a second at Mercer Lake that is known from a few strands of the moss intermixed with other bryophytes in a herbarium specimen collected in 1969 that is considered to be extirpated based on three targeted searches.

The potential for finding additional subpopulations in British Columbia is low. Bryologists have collected extensively throughout Haida Gwaii over the past 70 years, but additional subpopulations have not been found.

Population trends are unknown and can only be determined through monitoring.

## Threats and Limiting Factors

The three most significant threats to Dalton's Moss are extensive browsing of understory vegetation by introduced Sitka Black-tailed Deer, climate change and associated sea level rise, and stochastic events such as landslides. Both subpopulations are located within protected areas so should not be affected by logging or water level manipulation, including installation of hydroelectric dams. Although the subpopulation at Bigsby Inlet is <1 m above sea level it is located at the head of the inlet and is sheltered from storm surges by offshore islands.

Rescue from outside populations such as the one located in California is extremely unlikely because of the long distances between sites.

## Protection, Status and Ranks

Dalton's Moss is not currently protected under the federal Species at Risk Act, the British Columbia Wildlife Act, or any other legislation in Canada.

Its global status is Critically Imperiled, as are its national status in Canada and its provincial status in British Columbia. The species is included in British Columbia's 'Red List'.

In Great Britain, it is included in the list of nationally rare bryophytes, and in Europe it is a candidate for the 'Red List of European Bryophytes'.

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Dalton's Moss (*Daltonia splachnoides*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi+ 42 pp.

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## Drooping-leaved Beard-moss

Photo: © Wynne Miles



### Scientific name

*Oxystegus recurvifolius*

### Taxon

Mosses

### COSEWIC status

Endangered

### Canadian range

British Columbia

### Reason for designation

This moss has a very restricted distribution in Canada, where it is known from one extirpated subpopulation and four extant subpopulations on Haida Gwaii in British Columbia. The nearest population outside Canada is >2900 km away on Adak Island in the north Pacific Ocean. The species has a narrow physiological niche and grows only in extreme oceanic and highly humid climates. It is rare throughout its disjunct global range. Key threats to the species include climate change (particularly at high elevation), landslides, introduced invasive Sitka Black-tailed Deer, and logging. The species is not expected to adapt to predicted climate change, and migration in response to climate change is inhibited by the lack of effective means of reproduction and dispersal.

### Wildlife Species Description and Significance

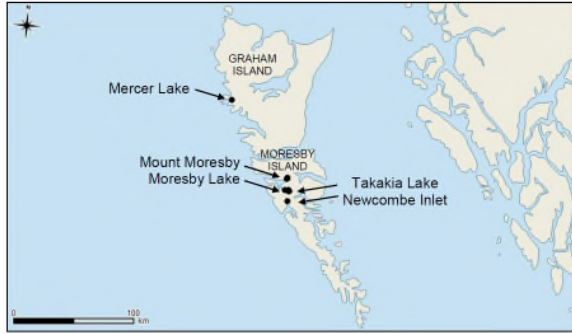
Drooping-leaved Beard-moss (*Oxystegus recurvifolius*) is a pale, yellowish-green moss that typically grows on moist, organic soil. Characteristics distinguishing it from closely-related species include the oblong strap-shaped leaves with light-coloured margins, and leaf apices that bend downward and are sharply and irregularly toothed.

In British Columbia, the species is recognized as a special element of biodiversity based on its rarity and highly restricted distribution. The Canadian population accounts for an estimated one fifth of the global population. The species is also known from Adak Island in the Aleutian Island archipelago of Alaska; coastal Ireland, England, Wales, and Scotland; and the High Himalaya region of Nepal. The globally disjunct “northwestern Europe–Sino-Himalayan–northwestern North American” pattern of distribution is rare in mosses. Phylogenetic relationships among the populations have not been studied but are of great scientific interest.

### Distribution

In Canada, Drooping-leaved Beard-moss is known from just five sites on the west coast of Haida Gwaii (previously known as the Queen Charlotte Islands) in British Columbia: Mercer Lake, on Graham Island, and Mount Moresby, Moresby Lake, Takakia Lake, and Newcombe Inlet on Moresby Island. The Moresby Lake subpopulation was not relocated during recent targeted searches and appears to have been extirpated by hydroelectric development.





Canadian distribution of Drooping-leaved Beard-moss

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Drooping-leaved Beard-moss (*Oxystegus recurvifolius*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii+ 48 pp.

## Habitat

Drooping-leaved Beard-moss occurs on cliff shelves, talus slopes, lake margins, and streambanks influenced by base-rich seepage on western Graham and Moresby islands. The temperate climate is characterized by cool temperatures and high rainfall throughout much of the year. Low cloud and fog are common, and dry spells are rare.

## Biology

The reproductive biology of Drooping-leaved Beard-moss has not been well-studied, but the moss is known to be dioicous, meaning that male and female reproductive organs occur on separate gametophytes (shoots). Throughout its global range, only female plants have been found. Like many species of mosses that are thought to be relictual, sporophytes are unknown.

The life history strategy of Drooping-leaved Beard-moss closely resembles that of a “perennial stayer”, which are characterized by a long lifespan and low sexual reproductive effort. There is a strong association between the inability to produce spores and rarity: species that are dispersal-limited must maintain local populations through long-lived shoots. The lifespan of gametophytic shoots of Drooping-

leaved Beard-moss has not been studied but is estimated to be approximately 20 years based on the “perennial stayer” life history strategy, and the average age of individuals within colonies is estimated to be approximately 7–12 years.

Based on the absence of an efficient means of dispersal and its narrow physiological habitat niche, the adaptability of Drooping-leaved Beard-moss is expected to be low.

## Population Sizes and Trends

The Canadian population of Drooping-leaved Beard-moss is composed of five known subpopulations. Based on a targeted search in 2017, one of the subpopulations appears to have been extirpated as the result of hydroelectric development. Three subpopulations are thought to be extant, and the status of another is unknown. Historical population sizes were not recorded but herbarium specimens collected between 1964 and 1975 indicate there were at least eight colonies among the five subpopulations. Currently there are thought to be 10–12 extant colonies among three or four subpopulations.

## Threats and Limiting Factors

The primary threats to Drooping-leaved Beard-moss in Canada are climate change, landslides, browsing of co-occurring grasses by introduced invasive Sitka black-tailed deer, and logging.

The species is limited by multiple factors including a narrow habitat niche throughout its global range and the absence of viable means of reproduction and dispersal, which exposes it to stochastic disturbances and inhibits migration in response to climate change.

Rescue from the Alaskan population on Adak Island, located >2900 km west of Haida Gwaii in the north Pacific Ocean, is extremely unlikely.

## Protection, Status and Ranks

Drooping-leaved Beard-moss has no legal protection or status in Canada. In British Columbia it is ranked 'Vulnerable' and is included in the province's 'Blue List'. At the national level it is ranked 'Imperiled'. Two of the Canadian subpopulations occur within protected areas: the Mercer Lake subpopulation is located in the VJ Krajina Ecological Reserve, and the Takakia Lake subpopulation is encompassed by the SGaay Taw Siiwaay K'adjuu Heritage Site/Conservancy.

The global conservation rank of Drooping-leaved Beard-moss is 'Vulnerable'. In Europe it has been designated as 'Rare'. Its status in Ireland is 'Not threatened' but the species is included in the Irish Red List (as *Paraleptodontium recurvifolium* (Taylor) D.G. Long) in recognition of the country's "special responsibility". In Great Britain it is 'Scarce'.

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Drooping-leaved Beard-moss (*Oxystegus recurvifolius*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii+ 48 pp.

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## Dwarf hesperochiron

Photo: © Ryan Batten



### Scientific name

*Hesperochiron pumilus*

### Taxon

Vascular Plants

### COSEWIC status

Endangered

### Canadian range

British Columbia

### Reason for designation

This small, perennial plant is restricted to seasonally wet montane forest openings at four sites in a small area of southeastern British Columbia. The total number of mature individuals is very small (under 200). All Canadian sites are on Provincial Crown Land and potentially subject to logging of surrounding areas and/or road building activity with subsequent changes to site hydrology. Negative impact on the thin substrate by mountain-biking activity has been noted close to one occurrence. Competition from non-native plants, most notably Spotted Knapweed, is the most significant threat expected to lead to habitat degradation over time. Drought and atypically intensive natural fire, as per climate change projections, could potentially damage or eliminate

one or more occurrences within three generations.

### Wildlife Species Description and Significance

Dwarf Hesperochiron is a perennial, herbaceous plant that grows up to 10 cm tall from a slender stem connected to smaller offshoots by thin, fragile rhizomes. The generally hairless simple leaves grow in a basal rosette. There are from one to eight solitary, showy flowers per plant. The flowers are 1-3 cm wide, 5-lobed, with white petals and hairy, yellow throats. There are often striking purple markings on the petals. The fruits are oval capsules with many small seeds. Dwarf Hesperochiron is a showy species and a desirable horticultural plant. Although it is widespread in the western United States, it is rare in Canada and is at the northern limit of its range.

### Distribution

In Canada, Dwarf Hesperochiron is restricted to the Selkirk and Monashee mountains in southern British Columbia, where it is known from four subpopulations within a 25 km radius of Castlegar. It is widespread throughout the western United States from Washington, south to California and east to Arizona, Wyoming, and Montana.



Canadian distribution of Dwarf hesperochiron

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Dwarf hesperochiron (*Hesperochiron pumilus*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x+ 32 pp.

## Habitat

Dwarf Hesperochiron grows in small meadows with shallow bedrock outcroppings within a larger forested matrix. Plants grow at the edge of seepages in loamy soils that are over 20 cm deep. The slope position ranges from middle to lower slope with slopes varying from 5-40 degrees. Aspect ranges from east to south and the elevation is from 719-1169 m. Dwarf Hesperochiron grows on soil that is saturated with water in the early spring and is easily compacted or sloughed away by trampling. Dwarf Hesperochiron often grows in bare, exposed soil or with a sparse cover of forbs and bryophytes. Shrubs are usually absent, although they may be present at the edges of the seeps.

## Biology

Dwarf Hesperochiron is associated with spring seepage and it flowers and sets seed when moisture is available. In British Columbia, plants flower in May and the short-lived flowers are pollinated by mining and sweat bees. Seeds appear to require cold stratification for germination. Dwarf Hesperochiron plants produce multiple ramets that are connected by slender rhizomes that can become separated from the parent plant.



Photo © Ryan Batten

## Population Sizes and Trends

In 2017, there were 168 mature flowering plants plus approximately 4360 smaller nonflowering ramets (mostly consisting of one leaf). The non-flowering plants are presumed to be offshoots connected to the main plant but may also be immature seedlings. Dwarf Hesperochiron was found in four distinct subpopulations separated by greater than one kilometre. Population fluctuations and trends for this species are unknown.

## Threats and Limiting Factors

All known subpopulations occur on provincial crown land. Logging is planned for the parcel with the two largest subpopulations. Upslope logging and road building may alter hydrologic patterns, impacting downslope seepage and encouraging the spread of nonnative invasive plants. The most serious non-native competitor is Spotted Knapweed, which competes with Dwarf Hesperochiron for water and other resources. Shrub and conifer encroachment associated with succession will degrade habitat over time. Recreational activities, including mountain biking and hiking, can increase compaction, trample



plants and dislodge soil and associated plants. Well-worn trails can alter hydrology, diverting flows from seepage areas. Small isolated populations can suffer from limited genetic diversity and inbreeding depression.

## **Protection, Status and Ranks**

Dwarf Hesperochiron currently has no legal protection in Canada. In British Columbia, Dwarf Hesperochiron is red-listed and ranked Imperilled—S2 (2017). In Canada, it is nationally ranked N2 (Imperilled) with a global rank of G4 (Apparently Secure). In Canada, all four currently known subpopulations are on provincial crown land. It is SNR (unranked) nationally in the United States.

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Dwarf hesperochiron (*Hesperochiron pumilus*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x+ 32 pp.

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## Goldenseal

Photo: © Adrienne Sinclair



### Scientific name

*Hydrastis canadensis*

### Taxon

Vascular Plant

### COSEWIC status

Special Concern

### Canadian range

Ontario

### Reason for designation

Increased survey effort has resulted in the discovery of new subpopulations of this species since the last assessment. Although the number of mature individuals of this long-lived plant appears to be stable in recent decades, the remaining subpopulations remain subject to threats from deforestation, harvesting, and invasive species.

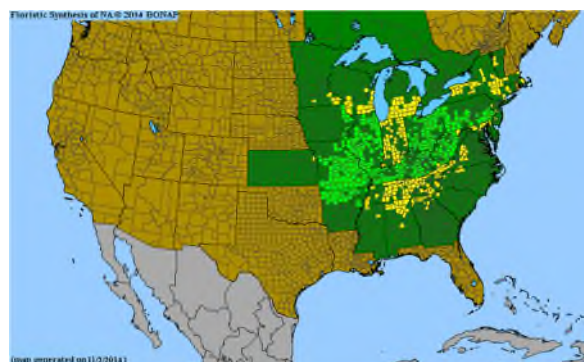
## Wildlife Species Description and Significance

Goldenseal is a herbaceous perennial that grows to 10-50 cm tall. It is characterized by its gnarled yellow rhizome (underground stem), which bears

scars (left from annual stems) that look like the wax seals historically used to close letters (hence the name “Goldenseal”). The plant bears one to three leaves, each with five lobes. Plants were used as a traditional herbal medicine by Indigenous peoples in North America. Goldenseal is still a species of commercial interest and is an ingredient in various herbal products.

### Distribution

Goldenseal occurs from southern Vermont and southern Ontario to southern Wisconsin and south to Arkansas and northern Georgia. It was historically abundant in the central portion of its range. In Canada, the species occurs only in southwestern Ontario, representing 1.6% of its natural range.



Distribution of Goldenseal in North America.

Source: Kartesz, J.T., The Biota of North America Program (BONAP). 2015. North American Plant Atlas. Chapel Hill, N.C. [maps generated from Kartesz, J.T. 2015. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)]. Web site: <http://bonap.net/napa> [accessed May 2016].

### Habitat

Goldenseal occurs in deciduous woodlands that experience periodic flooding (i.e., floodplains). Patches of Goldenseal are generally found on slightly acidic soils under closed to semi-open canopies (i.e., in slightly disturbed sites, such as adjacent to walking paths, sloughs and drainage ways, in woodlot edges, previously flooded areas,

thickets, successional forests, on riverbanks, or at the edges of ditches). The species appears to prefer mesic sites where the topography is level with mounds and depressions, or gradually sloping.

## Biology

Goldenseal reproduces both by seed and vegetative spread, yet seedlings are rare in Canada. A single white flower is produced in May. During maturation (July to August), several young berries fuse into a single, red, globose aggregate fruit containing 10-30 seeds. New shoots develop from the underground stem after the fruit matures. Goldenseal is pollinated by generalist pollinators and dispersed by animals, including birds.

## Population Sizes and Trends

Twenty-five Goldenseal subpopulations are considered extant in Ontario. This number includes 10 subpopulations that existed in 1998 and were reported in the previous status report, and six newly recorded subpopulations. The other nine subpopulations had been on record but not part of the 1998 survey. An additional five subpopulations are considered to be historical. These have not been relocated as a result of imprecise locational information. An additional subpopulation has been deemed extirpated. Goldenseal is a clonal plant that forms dense patches within a site. Stems were counted to estimate population size. An estimated 200,015 stems (42,045 mature flowering) in 207 separate patches were counted at 15 subpopulations in 2015. Given the dense, clonal growth of this species, the stem count is an underestimate, particularly for very large patches of plants that could not be directly counted due to limited survey time.

The Goldenseal population in Ontario is considered currently stable, albeit likely at smaller occurrence levels than at pre-settlement times,

with some patches increasing and others decreasing depending on site conditions.

## Threats and Limiting Factors

This species has declined in past decades due to habitat loss and harvesting. Current threats include clearcut logging, invasive species, recreational activities, and water management (e.g., drainage ditches). The potential threat of harvesting of Goldenseal remains, yet there is no evidence that extant subpopulations are currently subject to harvesting. In terms of limiting factors, Goldenseal does not spread by seed within the majority of subpopulations and is potentially limited by the absence of natural disturbance and dispersal agents.



Photo: © Adrienne Sirdair

## Protection, Status and Ranks

Goldenseal was assessed by COSEWIC as Threatened in May 2000 and is listed as Threatened on Schedule 1 of the federal Species at Risk Act (SARA); in May 2019, COSEWIC reassessed the species as Special Concern. Goldenseal is also listed as threatened under Schedule 4 of the Ontario Endangered Species Act 2007. The species is also included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The Convention regulates international trade in underground parts (i.e., roots, rhizomes) as well as whole plants. CITES export permits are required for whole plants as

well as underground parts in whole, parts, or powdered. Finished products are not regulated (e.g., extracts or capsules). It is listed in the IUCN Red List as Vulnerable.

Source: COSEWIC. 2019. COSEWIC assessment and status report on the Goldenseal (*Hydrastis canadensis*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii+ 35 pp.

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## Greater Short-horned Lizard

Photo: © Erik Enderson



### Scientific Name

*Phrynosoma hernandesi*

### Taxon

Reptiles

### COSEWIC Status

Special Concern

### Canadian Range

Alberta, Saskatchewan

### Reason for designation

In Canada, this species occurs in several scattered localities in grasslands of southern Alberta and Saskatchewan. New localities have been documented since the previous assessment, and the distribution of the species is no longer considered to be severely fragmented. Range-wide threats include habitat modification by invasive plants and increased vulnerability to summer droughts and freeze/thaw events associated with climate change. Approximately 70% of the population occurs in Grasslands National Park, but subpopulations outside the protected area, including all subpopulations in Alberta, are subject to additional threats including agriculture, oil and gas drilling, increased predation because of habitat modification, and other human developments. Current trends in population size and habitat quality in Alberta are unknown. The species is close to meeting criteria

for Threatened because of its small range, inferred and projected reduction in habitat quality, its patchy distribution, and its specific habitat requirements.

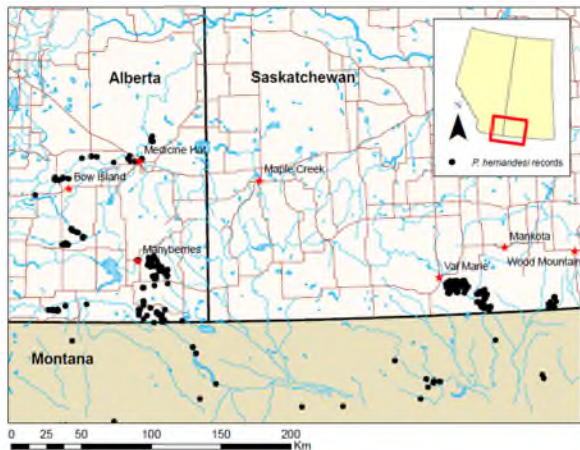
### Wildlife Species Descriptions and Significance

Greater Short-horned Lizard (*Phrynosoma hernandesi*) is the only species of lizard found in Alberta and Saskatchewan. The species occurs farther north than any other iguanid lizard species globally. It is the most widespread and generalist of all horned lizard species. Greater Short-horned Lizard is a small (snout-vent length of approximately 69 mm for adult females), dorso-ventrally flattened lizard with a fringe of protruding scales along the sides, and an array of 'horns' and a deep hornless notch across the back of the head. The blotched dorsal colouration and ability to remain motionless provide the lizards an excellent camouflage, helping protect them from predators and allowing them to ambush prey.

### Distribution

Greater Short-horned Lizard is distributed throughout the North American west, from central Mexico to southern Alberta and Saskatchewan. The lizards occur in distinct habitat areas, four in Alberta and two in Saskatchewan. In Alberta, the species occurs in scattered habitats along the South Saskatchewan River, within the Manyberries Hills, along the Chin Coulee/Forty Mile Coulee complex, and along the Milk River and its associated tributaries. In Saskatchewan, Greater Short-horned Lizard primarily occurs within the East and West Blocks of Grasslands National Park.





Distribution of Greater Short-horned Lizard in Alberta, Saskatchewan, and northern Montana.

Source : COSEPAC. 2019. COSEWIC assessment and status report on the Greater Short-horned Lizard *Phrynosoma hernandesi* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 68 pp.

## Habitat

In Canada, Greater Short-horned Lizard generally occupies sparsely vegetated, south-facing slopes with friable (crumbly) soils and patchy vegetation cover. This pattern provides shade from the sun, as well as overnight shelter. Dense vegetation may inhibit movements. The species occurs throughout the slopes, from the valley and gully bottoms, mid-slope, and into adjacent upland grasslands.

## Biology

Greater Short-horned Lizard is a generalist insectivore, consuming ants as well as crickets, beetles, spiders, and other arthropods. In Canada, females give birth to live young annually in late July or early August. Clutch sizes vary widely but may exceed 10 offspring. Females tend to establish a series of small territories within a larger home range during the summer active period and move relatively short distances. Activity has been recorded between April and November. Greater Short-horned Lizard overwinters approximately 10 cm below the soil surface.

Photo: © Larry Powell



## Population Sizes and Trends

Since the initial agricultural development in the early 20th century, declines in habitat connectivity, quality, and quantity have occurred. There are no clear trends in subpopulations that have been monitored since the 1980s. It is likely that subpopulations in at least some localities have been extirpated during the past two decades (e.g., localities near Medicine Hat). Continuing occupancy has not been recently confirmed at all localities, particularly along the South Saskatchewan River and Milk River. New localities near Manyberries Hills have been recorded, which suggests that not all occupied habitat has been documented. The population size is poorly known but probably exceeds 10,000 adults.

## Threats and Limiting Factors

The long-term viability of the Greater Short-horned Lizard population in Canada is threatened by a variety of anthropogenic activities. Threats include habitat modification by invasive plants, droughts and fluctuations in snow cover associated with climate change, increased predation due to habitat modification, land conversion into agriculture, oil and gas drilling, and recreational activities. The species' distribution in Canada is likely limited by a combination of historical habitat conversion and physiological and behavioural restrictions, acting in conjunction with climatic barriers.

## Protection, Status and Ranks

In Canada, Greater Short-horned Lizard is listed as Endangered on Schedule 1 under the Species at Risk Act. In Alberta, the species is listed as Endangered in Schedule 6 of the provincial Wildlife Act. In Saskatchewan, the provincial Wildlife Act prohibits unauthorized killing, disturbance, collection, harvest, capture, sale, and export of wildlife without a permit. The species is not protected in the United States or internationally. In Alberta and Saskatchewan, Greater Short-horned Lizard has been assigned the subnational rank of S2, indicating that the species is considered imperilled or at high risk of extinction. A global rank of G5 indicates that on a range-wide scale, Greater Short-horned Lizard is considered secure, or common, widespread, and abundant.

Source : COSEWIC. 2018. COSEWIC assessment and status report on the Greater Short-horned Lizard *Phrynosoma hernandesi* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 63 pp.

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## Hairy Paintbrush



Photo © Ryan Batten

### Scientific Name

*Castellija tenuis*

### Taxon

Vascular Plants

### COSEWIC Status

Endangered

### Canadian Range

British Columbia

### Reason for designation

This delicate annual plant is a spring ephemeral of sparsely vegetated seepages over steeply sloping bedrock in otherwise dry coniferous forest glades. It is only known from one site in Canada. Competition from non-native plants, most notably Spotted Knapweed, is the most significant observable threat. Limited genetic diversity is

expected within this isolated population. Potential exists for increased drought and natural fire (as per climate change projections) to damage or eliminate the population within three generations. As a hemiparasite, it is further threatened due to detrimental climate change impacts on its host.

### Wildlife Species Description and Significance

Hairy Paintbrush is a delicate annual plant, 4.5-30 (rarely up to 52) cm tall, arising from a slender taproot or branched root system. Stems are covered with a mixture of short hairs and soft spreading long hairs. Lower leaves are linear to lanceolate; upper leaves are 0-3 (rarely 5) lobed; both leaf surfaces are coarsely hairy. Flowers are arranged in a terminal spike, with green lanceolate to ovate floral bracts with pointed tips. The white to yellow corolla (fused petals) is tubular, 12-20 mm long, and 2-lipped. The upper lip ends in a straight beak-like tip, while the lower lip is inflated, 3-lobed, and pouch-like.

### Distribution

The Canadian distribution of Hairy Paintbrush is a single site between Salmo and Castlegar, in southern British Columbia. In the United States, it occurs from California through Oregon to Washington and east as far as Nevada and Idaho.



Canadian distribution of Hairy Paintbrush

Source : COSEWIC. 2019. COSEWIC assessment and status report on the Hairy Paintbrush *Castilleja tenuis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 29 pp.

## Habitat

In Canada, Hairy Paintbrush occurs in a small glade with spring seepage surrounded by forest. It grows in shallow soils (average 10 cm deep) with scattered surface rock. The habitat is full sun with a southern aspect and an elevation of 870 metres. The slope is 10 degrees and slope position is upper to mid-slope. Microsites are well-drained and receive additional nutrients from flowing seepage water. Hairy Paintbrush microsites have sparse vegetation cover of herbs and many of the plants grow directly out of thick moss mats. Shrubs and trees grow at the edge of the meadow.

## Biology

Germination occurs in the spring and the seeds likely require a period of cold stratification to germinate. Hairy Paintbrush flowers from mid-June to mid-July and the flowers are adapted for bee pollination. Hairy Paintbrush are either diploid or tetraploid. The plants are probably hemiparasitic, forming root grafts with other species via haustoria that penetrate the root cortex of host plants. Specific hosts for Hairy Paintbrush have not been identified, but a range of host plants can be used by each species of other hemiparasitic *Castilleja*.

Photo © Ryan Batten



## Population Sizes and Trends

In 2000, Frank Lomer collected the first voucher specimen from a Canadian site, and it remains the only known location in Canada. In 2017, 57 plants were counted.

## Threats and Limiting Factors

Invasive non-native plants, in particular Spotted Knapweed (*Centaurea stoebe* ssp. *micranthos*), compete for water and other resources. Shrub and conifer encroachment associated with successional processes will degrade habitat over time. Hemiparasites are especially sensitive to climate change because changes to temperature and CO<sub>2</sub> will impact both the hemiparasite and their host plants. Small isolated populations can suffer from limited genetic diversity and inbreeding depression.

## Protection, Status and Ranks

Hairy Paintbrush currently has no legal protection in Canada. In British Columbia, it is red-listed and is ranked S1—critically imperilled (2017). Nationally it is ranked N1 (critically imperilled). It is not ranked at the national level in the United States and is considered globally secure (G5). The only known site in Canada occurs on provincial crown land.

Source : COSEWIC. 2019. COSEWIC assessment and status report on the Hairy Paintbrush *Castilleja tenuis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 29 pp.

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## Hairy Valerian



Photo: © Holly Bickerton

### Scientific name

*Valeriana edulis ssp. ciliata*

### Taxon

Vascular Plants

### COSEWIC status

Endangered

### Canadian range

Ontario

### Reason for designation

This long-lived perennial plant is found in wet prairies and fens in southwestern Ontario, which are very rare habitats. Declines have been observed in its distribution, number of locations, and quality of habitat, and declines are inferred in the number of mature individuals. The three remaining locations have few mature individuals, which are threatened by commercial

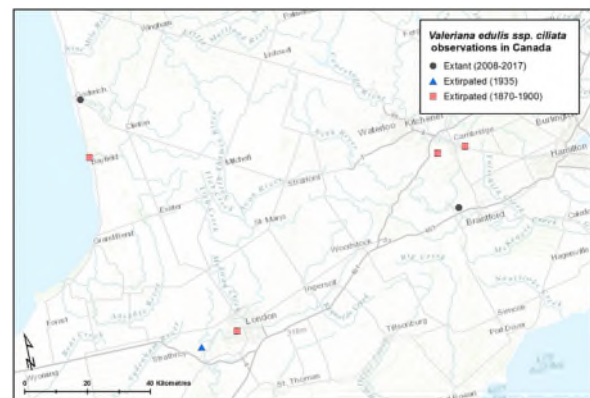
development, invasive species, and natural succession.

### Wildlife Species Description and Significance

Hairy Valerian (*Valeriana edulis ssp. ciliata*) is a tall flowering plant, often growing one metre in height or more. In southern Ontario, it flowers in May and June, with tall stalks bearing an inflorescence of small white flowers arising from basal rosettes. This species has large taproots that were a source of food and medicine for Indigenous peoples.

### Distribution

Hairy Valerian is endemic to the Great Lakes region and occurs in a narrow band from Wisconsin and Iowa in the west, through Michigan and Indiana into Ohio. The Canadian subpopulations in southwestern Ontario represent the northeastern edge of the range of the subspecies. These are entirely separate and disjunct from western *ssp. edulis*, which, in Canada, occurs only in southern BC.



Distribution of Hairy Valerian in Ontario

Source : COSEWIC. 2018. COSEWIC assessment and status report on the Hairy Valerian *Valeriana edulis ssp. ciliata* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 35 pp.

## Habitat

Hairy Valerian is typically found on wet and mesic prairies and fens, but it can also occur on drier sites such as hillsides and bluffs with groundwater flow. It occurs in full sun or light shade, and is sometimes associated with calcium-rich sites. The three extant Canadian subpopulations occur in dry, formerly open sites that are undergoing succession to shrub thickets.

## Biology

Hairy Valerian is dioecious, with male and female flowers on separate plants. It is a long-lived perennial, and not all mature plants flower every year. Flowers are visited and likely pollinated by a variety of insects, and most pollen is deposited within 10 m of the source plant. Seeds are small and are probably dispersed by gravity, wind and water. Hairy Valerian does not reproduce vegetatively.



Photo: © Holly Bickerton

## Population Sizes and Trends

Three southern Ontario subpopulations total 609 plants (336 flowering plants and 273 non-flowering plants). One of these subpopulations contained a single flowering plant and may no longer be viable. As there are no previous estimates of abundance at any Ontario sites, trends are unknown. However, the total number of plants in Canada can be inferred to have declined. The abundance of Hairy Valerian has declined along the Maitland River due to the

recent establishment of the non-native cultivar of Reed Canary Grass. Five of the eight documented subpopulations in Canada are considered extirpated.

## Threats and Limiting Factors

Habitat loss and degradation from urban and agricultural development have been the primary cause of the loss of at least half of the known Canadian subpopulations. An aggressive non-native cultivar of Reed Canary Grass appears to have recently substantially reduced suitable habitat for Hairy Valerian at the largest Canadian subpopulation. In general, invasive species are the primary threat to this taxon. Other possible threats include industrial development, succession, herbicide use, and recreational trails.

## Protection, Status and Ranks

Hairy Valerian has a NatureServe conservation rank of G5T3, meaning that although the species (*V. edulis*) is considered globally secure (G5), the endemic central North American subspecies (*ssp. ciliata*) is considered Vulnerable (T3). It is ranked N3 (Vulnerable) in the United States, N1 (Critically Imperilled) in Canada, and S1 in Ontario. Hairy Valerian is legally protected in six of the seven American states where it occurs. In Ontario and Canada, it currently has no designation or legal protection. None of the documented Canadian subpopulations is currently in a protected conservation area or park.

Source: COSEWIC. 2018. COSEWIC assessment and status report on the Hairy Valerian *Valeriana edulis* *ssp. ciliata* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 35 pp.

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## Hudsonian Godwit



Photo: © Holly Bickerton

### Scientific name

*Limosa haemastica*

### Taxon

Birds

### COSEWIC status

Threatened

### Canadian range

Yukon, Northwest Territories, Nunavut, British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, New Brunswick, Prince Edward Island, Nova Scotia, Newfoundland and Labrador

### Reason for designation

This large Arctic-nesting shorebird is poorly monitored on its known breeding grounds in the Hudson Bay Lowlands, Mackenzie Delta, and Alaska. However, both migration monitoring and winter surveys indicate substantial population declines over the past two to three generations. Key threats include reduced suitability of nesting habitat and changes in prey availability arising from climate change, and overgrazing by abundant geese in the Hudson Bay Lowlands, as well as loss of habitat and disturbance on the wintering grounds in South America.

### Wildlife Species Description and Significance

Hudsonian Godwit is a large, long-legged shorebird with a long, slightly upturned bill. The species exhibits sexual dimorphism in both size and plumage, with females larger and heavier than males and paler overall in breeding plumage. Males have distinctive red chest colouring during the breeding season, while females are a lighter rufous colour. Both males and females are greyish-brown in non-breeding plumage.

Spatial segregation and genetic differentiation provide evidence for potential subdivision of Hudsonian Godwit into three designatable units (DUs), corresponding to breeding subpopulations in the Hudson Bay Lowlands, Mackenzie Delta, and Alaska, respectively. Although there are also three primary wintering areas in South America that are believed to generally correspond to the separate breeding subpopulations, the linkages between breeding and wintering grounds remain only partially understood and there is evidence of individuals moving among the wintering regions. Considering also the limited sample size of genetic studies to date, the potential extent of exchange of individuals among breeding subpopulations is uncertain. Therefore, currently available evidence is considered to be insufficient to delineate evolutionarily distinct populations of Hudsonian Godwit in Canada, and the species is assessed as a single DU.

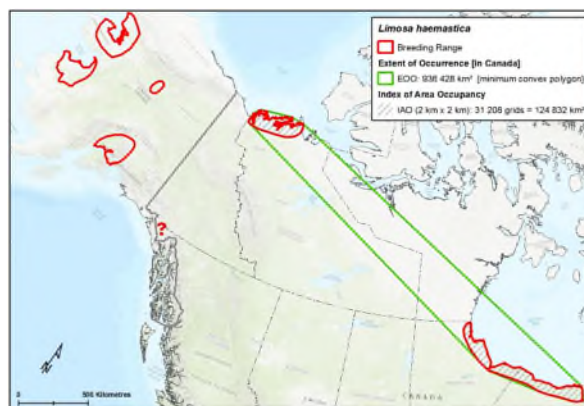
Hudsonian Godwit was for many decades considered one of North America's rarest birds because it was seldom seen. It has one of the longest migration routes among Western Hemisphere shorebirds, and covers much of the distance through non-stop flights spanning multiple days.



## Distribution

Hudsonian Godwit breeds in sub-Arctic and Boreal regions of Canada and Alaska and overwinters in the southernmost regions of South America. Some local breeding sites may remain undiscovered. The main known breeding areas in Canada are along the Hudson Bay Lowlands in Manitoba and Ontario, and in the Mackenzie Delta, Northwest Territories. In Alaska, breeding is known from four areas in the central, western, and southern parts of the state.

Within Canada, the primary staging areas on southbound migration are the coast of James Bay for birds from the Hudson Bay Lowlands and Mackenzie Delta, and prairie lakes in Saskatchewan for birds from Alaska. Migrants then fly long distances east and southward over the Atlantic Ocean, often stopping at staging areas in northern or central South America for up to several weeks before continuing to wintering grounds farther south. Breeding subpopulations are believed to largely be associated with separate wintering grounds, with birds from the Hudson Bay Lowlands wintering primarily in Tierra del Fuego and southern Patagonia, those from the Mackenzie Delta wintering mostly around Samborombon Bay in northern Argentina, and those from Alaska generally wintering on Chiloe Island and the adjacent mainland of Chile. On northbound migration, most birds fly non-stop from their wintering grounds to the United States Gulf Coast and follow a common route north through the U.S. Great Plains, then diverge from the eastern Canadian prairies to their breeding grounds. Hudsonian Godwit occurs regularly during breeding or migration in all three territories and in provinces from British Columbia to Québec, as well as occasionally in fall in all of the Atlantic provinces.



Canadian distribution of Hudsonian Godwit

Source : COSEWIC. 2019. COSEWIC assessment and status report on the Hudsonian Godwit *Limosa haemastica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 50 pp.

## Habitat

Hudsonian Godwit breeds in wetland habitats (sedge meadows and muskeg) in sub-Arctic and Boreal regions. It uses a wide variety of habitats on migration, including freshwater marshes, saline lakes, flooded fields, shallow ponds, coastal wetlands and mudflats. On the wintering grounds, Hudsonian Godwit mainly forages in large shallow bays, lagoons, or estuaries with extensive intertidal mudflats, and roosts in a range of habitats, such as upper tidal flats, sand spits, rocky shorelines, salt marshes, and grasslands. The species faces habitat loss and degradation at all stages of its annual cycle, primarily through climate change and development.

## Biology

Hudsonian Godwit reaches sexual maturity at three years of age, and individuals appear to remain on their wintering grounds until ready to breed. Females lay a single clutch of four eggs but may lay a second clutch if the nest is lost to predation. Generation time is estimated to be 7.7 years. The species primarily feeds on invertebrates, although plant tubers are also known to be part of the diet.



## Population Sizes and Trends

Systematic long-term monitoring data are lacking for this species, and estimates of population size and trends are considered imprecise. The most recent population estimate for Hudsonian Godwit is approximately 41,000 mature individuals (24,300 individuals in the Hudson Bay Lowlands, 800 in Mackenzie Delta, and 15,750 in Alaska). Migration monitoring trend data from 1995 to 2016 (just under 3 generations) indicate a 6% annual decline (71% cumulative decline) in total population size, although the reliability of the estimate is low because of limited data coverage (only from stopover sites in eastern North America). Surveys on the wintering grounds indicate an annual decline of 4.08% in Tierra del Fuego from 2002 to 2018, equivalent to a three-generation decline of 62%, but stable numbers at Chiloe Island since the late 1980s. Considering the relative size of the wintering populations, the overall annual rate of decline over the past 16 years is approximately 2.5%, corresponding to 44% over three generations (23 years).

## Threats and Limiting Factors

Hudsonian Godwit faces numerous threats throughout its annual cycle. Climate change, and severe weather, as well as natural system modifications, are likely the most serious risks.

Climate change is predicted to affect Hudsonian Godwit in numerous ways. Rising sea levels are expected to reduce coastal foraging habitat throughout its annual cycle. Warmer and drier conditions will cause tundra and prairie wetlands to shrink. Northward advancement of the treeline may reduce the availability of suitable nesting habitat, particularly in the Mackenzie Delta. Altered climate regimes along the northbound migration route and on the breeding grounds appear to be causing an ecological mismatch between timing of breeding and peak prey abundance for birds in

the Hudson Bay Lowlands and the Mackenzie Delta. Droughts could affect most Hudsonian Godwits, primarily on the Great Plains during spring migration. Warming temperatures along the migration route are predicted to increase the frequency and severity of extreme weather, which could cause direct mortality of birds, as well as delays in migration.

Much of the South American wintering grounds are threatened by habitat loss and degradation. Urban sprawl affects foraging habitat in Patagonia, whereas expanding aquaculture and algal harvesting activities threaten it on Chiloe Island, where beachfront housing development is also reducing the availability of upland roosting habitat. At their wintering grounds as well as stopover sites, Hudsonian Godwits face additional disturbance from boat traffic, humans, and dogs.

Most Hudsonian Godwits are exposed to pollution in agricultural systems, either on migration, on the wintering grounds, or both, which may reduce prey quality and abundance. Petrochemical pollution from ships and industrial discharge is a concern, especially along the coast of South America. Portions of the Hudson Bay Lowlands are exposed to overgrazing of their tundra habitat by geese, although the impacts on Hudsonian Godwit remain unclear.

## Protection, Status and Ranks

Hudsonian Godwit is protected in Canada under the Migratory Birds Convention Act, 1994 and in the United States under the Migratory Bird Treaty Act. The International Union for Conservation of Nature (IUCN) ranks the species as Least Concern globally. The Canada and U.S. Shorebird Conservation Plans recognize it as a species of high concern and it is on the North American Bird Conservation Initiative's watch list. NatureServe designates both the global and Canadian breeding populations as apparently secure. The

Canadian Endangered Species Conservation Council (CESCC) considers Hudsonian Godwit to be vulnerable.

Source : COSEWIC. 2019. COSEWIC assessment and status report on the Hudsonian Godwit *Limosa haemastica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 50 pp.

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## Ute Ladies'-tresses

Photo: © Walter Fertig



### Scientific name

*Spiranthes diluvialis*

### Taxon

Vascular Plants

### COSEWIC status

Endangered

### Canadian range

British Columbia

### Reason for designation

This short, globally rare orchid occurs in Canada at only two locations in British Columbia, one of which contains a single individual. Its habitat is seasonally moist, slightly to moderately saline lakeshores that are free from overly tall/competitive species. It is primarily threatened by invasive species.

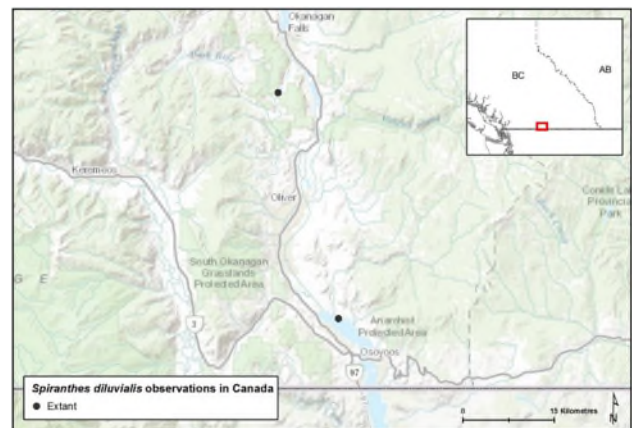
### Wildlife Species Description and Significance

The orchid Ute Ladies'-tresses (*Spiranthes diluvialis*) occurs in wetlands in western North America. It is showy, white-flowered, and blooms

late in the season. It is one of only two species of the genus *Spiranthes* known to occur in British Columbia. It is rare globally, and especially rare in Canada, where only a small fraction of the global population occurs.

### Distribution

Ute Ladies'-tresses is endemic to western North America. It is known from few subpopulations in several clusters, mostly in the United States. In Canada, Ute Ladies'-tresses occurs in two subpopulations in the Okanagan Valley in extreme southern British Columbia: Mahoney Lake and Osoyoos Lake.



Distribution of Ute Ladies'-tresses in British Columbia.

Source : COSEWIC. 2018. COSEWIC assessment and status report on the Ute Ladies'-tresses *Spiranthes diluvialis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 31 pp.

### Habitat

Ute Ladies'-tresses occurs in diverse wetland habitats in its core US range, including riparian sedge-fringe, stream margins, gravel bars, springs, subirrigated meadows, and saline lakeshore marshes. Associated species vary among these habitats.

Commonalities among the Canadian and US populations suggest a requirement for a specific set of soil chemistry conditions. The Osoyoos Lake

subpopulation experiences an altered hydrology due to the presence of a flood-control dam to the south in the US. The Mahoney Lake subpopulation is not evidently under any artificial hydrologic regime, but lake levels fluctuate with periods of wetter and drier weather.

## Biology

Ute Ladies'-tresses is a perennial herb, regenerating annually from slender tubers. Longevity of the plants is unknown. Plants reproduce sexually, producing minute seeds that are dispersed by wind. There are suggestions that the plants may reproduce vegetatively through root fragmentation or apomictically through maturation of unfertilized ovules to the seed stage. Bees are the primary, or perhaps sole, effective pollinators of Ute Ladies'-tresses. Flowering of the Canadian population occurs in late summer. The seeds of this species, like all orchids, have effectively no food stores to sustain the embryo over time, so to germinate and establish, the seeds must rapidly connect to nourishing mycorrhizal fungi. Young seedlings first develop underground, facilitated by their host fungi, for some years before producing above-ground, photosynthetic plants. Mature plants may also undergo prolonged below-ground dormancy.



Photo: © Janel Janhson

## Population Sizes and Trends

Two subpopulations of Ute Ladies'-tresses occur in Canada, with a total of 6-58 mature individuals observed, depending upon the year. The Mahoney Lake subpopulation included 57 mature individuals in 2017, but only 5 were observed in 2018. Surveys at Osoyoos Lake found one mature individual in 2006 and 2016.

## Threats and Limiting Factors

Threats to Ute Ladies'-tresses in Canada include invasive plant species, altered hydrology, recreation/trampling, livestock grazing, possibility of chemical or oil spills, and herbicide drift. The habitat requirements of Ute Ladies'-tresses limit its range and reduce its ability to expand its range. Its long-term survival requires recruitment of new cohorts from viable seed. That requirement can be limited if pollinator populations decline.

## Protection, Status and Ranks

Ute Ladies'-tresses is currently ranked by NatureServe as G2G3 (imperilled to vulnerable) globally and N1 (critically imperilled) in Canada. It is ranked S1 (critically imperilled, Red listed) by the British Columbia Conservation Data Centre but does not have legal status at either the provincial or federal levels. It is listed Threatened under the Endangered Species Act in the United States. It, like all orchids, is legally barred from international trade under the CITES Convention. The IUCN Red List ranks the species as Least Concern.

Source: COSEWIC. 2018. COSEWIC assessment and status report on the Ute Ladies'-tresses *Spiranthes diluvialis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 31 pp.

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## White-rimmed Shingle Lichen

Photo: © Sean Haughian



### Scientific name

*Fuscopannaria leucosticta*

### Taxon

Lichens

### COSEWIC status

Threatened

### Canadian range

Ontario, Québec, New Brunswick, Nova Scotia

### Reason for designation

This large Arctic-nesting shorebird is poorly monitored on its known breeding grounds in the Hudson Bay Lowlands, Mackenzie Delta, and Alaska. However, both migration monitoring and winter surveys indicate substantial population declines over the past two to three generations. Key threats include reduced suitability of nesting habitat and changes in prey availability arising from climate change, and overgrazing by abundant geese in the Hudson Bay Lowlands, as well as loss of habitat and disturbance on the wintering grounds in South America.

## Wildlife Species Description and Significance

White-rimmed Shingle Lichen, *Fuscopannaria leucosticta*, is a rare lichen that grows on trees in wet forests of eastern Canada. The lichen consists of many small, overlapping lobes (like shingles). These lobes typically have a dark olive-grey colour on their upper surface, and a noticeable white rim on the edges. Mature colonies produce many brownish coloured discs (fruiting bodies) on their upper surface.

### Distribution

White-rimmed Shingle Lichen has a disjunct global distribution. It occurs primarily in eastern Canada, the southeastern United States, and also in Europe and the Asia-Pacific region. In Canada, it is found in New Brunswick, Nova Scotia, and a small area in western Ontario. In the U.S.A., it has not been detected in any New England states for at least 30 years.



Canadian distribution of White-rimmed Shingle Lichen

Source: COSEWIC, 2019. COSEWIC assessment and status report on the White-rimmed Shingle Lichen *Fuscopannaria leucosticta* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, xi + 85 pp.

## Habitat

The White-rimmed Shingle Lichen lives almost exclusively on the bark of trees in wet forests. It is most commonly found on Red Maple in Nova Scotia, and on Eastern White Cedar in New Brunswick and Ontario. It usually occurs on the uppermost surface of tree trunks that lean away from the vertical position, and it avoids the southwestern sides of trunks. The preferred habitat of this species ranges from open swamps, with persistent standing water throughout the year, to dense riparian (stream or lakeside) corridors or transitional habitats near peatlands.

## Biology

Lichens are symbiotic organisms, formed by the association of a fungus and a photosynthetic green alga or cyanobacterium. In the White-rimmed Shingle Lichen, the photosynthetic partner is a cyanobacterium belonging to the genus *Nostoc*. The fungus is an ascomycete in the family Pannariaceae. This lichen is thought to disperse over long distances by spores but may colonize nearby patches of tree bark if fragments break off the main body (thallus). Because the spores contain only fungal DNA, a compatible cyanobacterium must already be present if new habitats are to be colonized. The generation time of this species is unknown, but related lichen species require between 5 and 22 years to reach maturity. Available data suggest the generation time is at least 12 years.



Photo: © Sean Haughian

## Population Sizes and Trends

Based on surveys, 1,663 thalli of the White-rimmed Shingle Lichen have been enumerated and found on 502 trees in 88 occurrences, in Canada. Of the known thalli, about 45% are in New Brunswick, about the same percentage are in Nova Scotia, and less than 10% are in Ontario. Based on the information provided by distribution models and developed for this report, the population in Canada is estimated to be approximately 9,265 thalli in total.

## Threats and Limiting Factors

The main threat to White-rimmed Shingle Lichen in Canada is logging of Eastern White Cedar and Red Maple. This species is also sensitive to atmospheric pollution in the form of acid rain. Climate change is also a threat particularly in the form of warmer dryer summers to which this lichen is sensitive as its photosynthetic partner is a cyanobacterium. Hence, it requires liquid water to initiate photosynthesis, unlike lichens associated with green algae that become metabolically active with humid air. Climatic changes not only stress the lichen but may also result in an increase in the incidence of forest fires. Furthermore, the predicted increase in the frequency of extreme weather events is likely to cause blowdown of host trees. Grazing by invasive slugs is another threat but currently it seems to be limited to Nova Scotia. Overall, it is predicted that 45% of the population of White-rimmed Shingle Lichen could be lost over the next three generations (36 years) as a result of threats.

## Protection, Status, and Ranks

White-rimmed Shingle Lichen has a national rank of N2N3 – Imperilled to Vulnerable and a General Status rank of N3 (vulnerable). The Natural Heritage Information Centre (Ontario) ranks the species as S1S2 (Critically Imperilled to Imperilled), and the Atlantic Conservation Data

Centre ranks it as S2S3 (Imperilled to Vulnerable)  
in New Brunswick and Nova Scotia.

Source: COSEWIC. 2019. COSEWIC assessment and status report on the White-rimmed Shingle Lichen *Fuscopannaria leucosticta* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 85 pp.

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## Yellow Scarab Hunter Wasp

Photo: © Jennifer Heron



### Scientific name

*Dielis pilipes*

### Taxon

Arthropods

### COSEWIC status

Special Concern

### Canadian range

British Columbia

### Reason for designation

This large distinctive wasp is restricted to the low-elevation Antelope-brush and sagebrush ecological communities of the south Okanagan and Similkameen valleys of British Columbia. The larvae feed on the underground grubs of Ten-lined June Beetle that occur in sandy soils west of the Rocky Mountains. The loss, degradation, and fragmentation of open, sandy habitats, and pesticide application on adjacent agricultural lands during the adult flight period are the primary threats to the species. Further threats include increasing numbers of non-native plants into the open sand habitats, which limit detectability of host beetle larvae by adult female wasps. The species may become Threatened if factors

suspected of negatively influencing the persistence of the species are not managed.

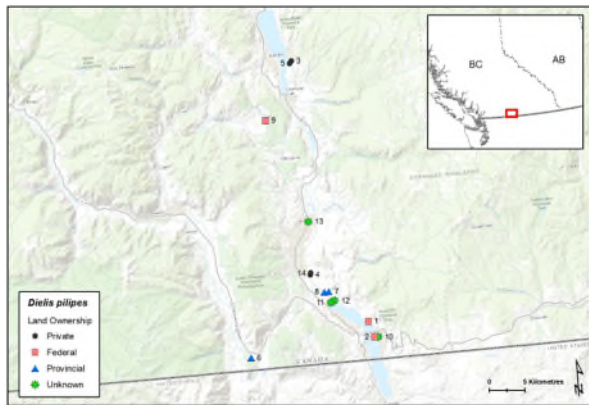
### Wildlife species description and significance

Yellow Scarab Hunter Wasp (*Dielis pilipes*) is a large (20–25 mm length), uncommon black and yellow wasp; one of four scoliid wasp species reported from Canada. The wasp is a solitary ectoparasitoid of one or both of the two species of Ten-lined June beetles (*Polyphylla crinita* and *P. decemlineata*) that range in southern British Columbia. June beetle larvae are considered pests on a wide range of native shrubs, fruit trees, ornamental and garden plants, and the wasp is considered a natural biological control for the beetle larvae.

### Distribution

The global range of Yellow Scarab Hunter Wasp extends from extreme south-central British Columbia into the United States through central Washington east to North Dakota and Oklahoma, and south to the Mexican border through New Mexico, Arizona and California. In Canada, Yellow Scarab Hunter Wasp has a range restricted to the Antelope-brush and sagebrush ecological communities in the valley bottoms of the southern Okanagan and lower Similkameen valleys, British Columbia. Specifically, the species is recorded from the east side of Skaha Lake south to Osoyoos; west to White Lake and one site south of Cawston and adjacent to the international border at Nighthawk Road in the Similkameen Valley.





Distribution of Yellow Scarab Hunter Wasp in British Columbia.

Source : COSEWIC. 2018. COSEWIC assessment and status report on the Black Ash *Fraxinus nigra* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 50 pp.

## Habitat

All known Canadian records for Yellow Scarab Hunter Wasp are within the low elevation (< 600 m) Antelope-brush or sagebrush ecological communities. Soils where both the adult wasps and the host beetles are found together have open bare ground and soft, sandy friable substrates that are deep and relatively free of rocks, cobble, other larger substrates and surface weedy vegetation. Once a female wasp has found and oviposited on the host beetle larva, this burrow site will become the feeding site of the developing wasp larva, and site of diapause/overwintering of the pupa. Because of their long flight period, adult wasps likely nectar on a wide range of flowering plants.

## Biology

The Yellow Scarab Hunter Wasp has four life stages (egg, larva, pupa and adult) and develops through complete metamorphosis. Most scoliid wasps have an annual life cycle and it is likely the Yellow Scarab Hunter Wasp also has one generation per year. Host beetles have one generation every two to four years, and overwinter as first and third instar larvae.

Adult Yellow Scarab Hunter Wasps have been recorded from April 20–August 2, during which mating and oviposition occur. The female detects the host beetle larva by the kairomones the beetle emits. Once she finds a patch of habitat containing the host, she will dig into the ground in search of it, and ultimately paralyze the beetle larva. The female wasp will attach her egg to the scarab larva and prepare a crude cell around both, leaving the paralyzed larva in situ. The egg hatches and the wasp larva begins feeding upon the paralyzed host for 1–2 weeks, consuming the entire beetle larva, spinning a cocoon and remaining in diapause until the following spring. Although unconfirmed, the wasp likely parasitizes the host beetle between its second and third instar.



Photo: © Jennifer Heron

## Population Sizes and Trends

Yellow Scarab Hunter Wasp surveys to date have been primarily by wandering transects through suitable habitat and focused on recording new sites, natural history and habitat information. No information on the Canadian population size or trends is available.

## Threats and Limiting Factors

The highest impact threat to Yellow Scarab Hunter Wasp is the application of pesticides to control grape and orchard pests throughout the



region, which can directly and indirectly impact the Yellow Scarab Hunter Wasp. Additional threats include the cumulative loss, degradation, and fragmentation of habitat (open and sandy Antelope-brush and sagebrush ecological communities). Biologically limiting factors include small population size, vulnerability to changing weather patterns, and availability of deep, sandy soil that is required to complete life stages.

## **Protection, Status and Ranks**

Yellow Scarab Hunter Wasp, and its scarab beetle hosts, is not specifically protected under provincial or federal legislation. The wasp is known from at least three private properties; the Osoyoos/Inkameep Indian Reserve (Osoyoos First Nation); the federal property at White Lake; and three provincial protected areas. The species is not yet ranked by the British Columbia Conservation Data Centre, NatureServe or the General Status of Wildlife in Canada.

Source: COSEWIC. 2018. COSEWIC assessment and status report on the Yellow Scarab Hunter Wasp *Dielis pilipes* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 50 pp.

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## Yukon Draba



Photo: © Bruce Bennett

### Scientific name

*Draba yukonensis*

### Taxon

Vascular Plants

### COSEWIC status

Special Concern

### Canadian range

Yukon territory

### Reason for designation

This small, short-lived perennial mustard species is endemic to the southern Yukon. It has a very restricted distribution limited to well-drained meadows and south-facing slopes. Surveys undertaken since 2011 increased the area of distribution and number of known sites from 3 to 19, and indicate that the population may not undergo extreme fluctuations as previously thought. Present threats include forest encroachment, wildfire, invasive species, and trampling by humans and bison. These threats have the potential to reduce the area of

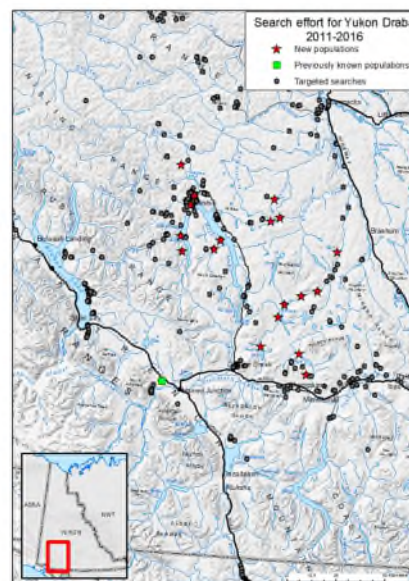
suitable habitat and numbers of potentially unviable subpopulations enough to qualify the species for Threatened status.

### Wildlife species description and significance

Yukon Draba is a small herb in the mustard family with untoothed leaves covered with distinctive stiff, unforked hairs. Individual plants have a small taproot, one or more rosettes of leaves that lie on the soil, and one or more flower-bearing stems. The flowers are small, white, and have four petals.

### Distribution

Yukon Draba is endemic to the southwestern Yukon, and is known from 19 sites at present.



Distribution of Yukon Draba in Yukon territory.

Source: COSEWIC. 2018. COSEWIC assessment and status report on the Yukon Draba *Draba yukonensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 35 pp

## Habitat

Yukon Draba grows on dry, well-drained meadows. The meadows are often on ancient beaches and spits formed at the edge of proglacial lakes. Where it is found on steep, south-facing slopes, it is often restricted to the top and/or the bottom of the slope, where the conditions are less dry than the mid-slope.

## Biology

Little is known about the biology of Yukon Draba, but recent monitoring data indicate that it is a short-lived perennial. It appears to be tolerant of dry conditions and direct sun. The ability of Yukon Draba to disperse via seeds is likely quite limited. Seed damage from small mammal and insect herbivory has been observed.



Photo: © Bruce Bennett

## Population Sizes and Trends

The population is estimated to be about 160,200 to 333,000 individuals. Great variation in the number of flowering individuals can occur between years, but recent monitoring efforts (2012-2017) suggest that the population itself does not undergo extreme fluctuations. There is no information on long-term trends.

Although the great majority of mature individuals occur in two large subpopulations, the majority of known sites have small, isolated subpopulations with unknown viability.

## Threats and Limiting Factors

Multiple factors (including fire suppression, reduction of herbivore populations, and impacts of climate change) are apparently leading to habitat loss via the shrubification and afforestation of some Yukon grasslands. Conversely, climate change may also result in an increase in forest fires, and these fires would help maintain open grasslands.

Bison were reintroduced to the region in the 1980s, and increasing bison numbers will result in more trampling, heavier grazing and burial of plants in droppings. Although trampling and grazing may kill individual plants, this also helps to keep grasslands open.

Traffic is increasing on the small dirt road that has long traversed the largest Yukon Draba subpopulation at the Alsek Meadow, and habitat disturbance related to this traffic may increase as well. In 2011, an exploration company established mining claims on the meadow to upgrade this road to facilitate mining operations and provide access to mining properties. The mining company has subsequently (2013) entered into a security agreement with the Yukon Government, which essentially prohibits mining on these claims.

## Protection, Status and Ranks

COSEWIC assessed Yukon Draba as Special Concern in 2018; it was previously assessed as Endangered in 2011. It currently has no legal protection or status in Canada or the US. It is not listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

NatureServe considers Yukon Draba to be globally imperilled to vulnerable (G2G3); the same rank applies at the national (N2N3) and territorial (S2S3) scales.

Source: COSEWIC. 2018. COSEWIC assessment and status report on the Yukon Draba *Draba yukonensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 41 pp.

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