

Changement climatique Canada

Canada

California Sword Fern



Photo: © Ryan Batten

Scientific name Polystichum californicum

Taxon Vascular Plant

COSEWIC status Endangered

Canadian range

British Columbia

Reason for designation

The limestone and associated mineral deposits have commercial value, making the known sites of this fern desirable for guarry operations. Recreational activities, most notably rock climbing, are another potential threat. With the very small number of individuals and the restricted distribution, this plant is at considerable risk of extirpation from Canada. The Canadian population of this evergreen fern consists of only 48 mature individuals. In Canada, it occurs exclusively on limestone cliffs on Vancouver Island and adjacent Texada Island, in British Columbia.

Wildlife Species Description and Significance

California Sword Fern is a leathery, evergreen, tufted fern with leaves up to 80 cm in length. The primary leaf divisions have saw-like, spiny teeth and there are fine threadlike microscales on the undersurface of the leaves.

In Canada, California Sword Fern is at the northern periphery of its range. Canadian plants are found exclusively on limestone cliffs, whereas in the southern part of its range plants are found in a range of moisture and light conditions.

Distribution

California Sword Fern is at the northern limit of its range in southern British Columbia and it is disjunct from the closest confirmed occurrence in Washington by approximately 300 km. In the United States, California Sword Fern occurs southward into Washington, Oregon, and California in the Coast Ranges and Cascade-Sierra physiographic region. It is known from three sites in British Columbia. Canada, two on Texada Island and a third near Horne Lake on Vancouver Island.



Canadian distribution of California Sword Fern. Map prepared by Alain Filion (COSEWIC Secretariat).

Source: COSEWIC. 2023. COSEWIC assessment and status report on the California Sword Fern Polystichum californicum in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 32 pp.

Habitat

In Canada, California Sword Fern is found exclusively on limestone cliffs. There are few associated plants here because of its xeric microclimate preference.

Biology

California Sword Fern is a tetraploid (2n=164) that is presumed to take 2-5 years to reach maturity and the plants appear to be long-lived. Juvenile California Sword Ferns were observed at Horne Lake but not at either site on Texada Island.

Population Sizes and Trends

The total Canadian population size was determined to consist of 48 mature individuals and one immature juvenile in 2021. There do not appear to be fluctuations in the number of mature individuals. Natural rescue of the Canadian population from the United States is theoretically possible but deemed unlikely.

Threats and Limiting Factors

The limestone and associated mineral deposits have high commercial value making the known sites for California Sword Fern desirable for quarry operations. It is possible that California Sword Fern sites on Texada Island will be impacted by quarrying, but unlikely because of plans for the establishment of a park reserve. The owners of the Horne Lake site are believed unlikely to favour quarry development. It is possible but unlikely that logging and wood harvesting activities will impact California Sword Fern, Recreational activities, most notably rock climbing, are a potential threat at Horne Lake but impact to California Sword Fern plants is expected to be minimal. It is unknown if root rot or other diseases will impact California Sword Fern.

Given the small number of known subpopulations, California Sword Fern numbers may be constrained by a low rate of establishment in the small area of available habitat.

Protection, Status and Ranks

California Sword Fern is not currently protected under the *Species at Risk Act* and there is no other legal protection for the species in Canada. Provincially, California Sword Fern is red-listed and ranked Critically Imperilled (S1) by the BC Conservation Data Centre. Nationally, it is ranked Critically Imperilled (N1) and globally, it is ranked Apparently Secure (G4). It is not listed under the Convention on International Trade in Endangered Species (CITES), the *Endangered Species Act* (United States) and has not been assessed by the International Union for Conservation of Nature (IUCN).

Source: COSEWIC. 2023. COSEWIC assessment and status report on the California Sword Fern *Polystichum californicum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 32 pp.

For more information, please visit <u>https://species-registry.canada.ca/index-en.html</u>



Canada

Coastal Manroot



Photo: © Matt Fairbarns

Scientific name Marah oregana

Taxon Vascular Plants

COSEWIC status Endangered

Canadian range

British Columbia

Reason for designation

This long–lived perennial vine occurs in Canada at only four widely separated subpopulations on southeastern Vancouver Island and adjacent Gulf Islands. Fewer than 50 mature plants remain, with evidence of seedling production at only one site. Losses of habitat, subpopulations, and mature individuals are projected in its Canadian range. Main threats are development of the few known sites, alien species, and random events affecting the handful of remaining individuals. This is a medicinal plant cared for by some west coast First Nations.

Wildlife Species Description and Significance

Coast Manroot (Marah oreganus) is a large climbing perennial of the cucumber family (Cucurbitaceae) that grows from an enlarged woody root and produces annual trailing stems with branched tendrils. The alternate stem leaves are about 20 cm long, stalked and irregularly palmately lobed. Plants produce separate whitish male and female flowers on the same plant. Male flowers are stalked, bell–shaped, with generally 5 floral parts and arranged along an elongate central inflorescence stalk arising from the angles between the leaf stalk and stem (leaf axil). Single, stalked female flowers, with a swollen base, are also formed at the leaf axils. Ovaries develop into a prickly fruit that contains several large, smooth, heavy seeds.

British Columbia populations of Coast Manroot have a high conservation value because they represent the entire Canadian population of a very narrowly distributed species. Various parts of Coast Manroot have been used for medicinal purposes by Aboriginal Peoples.

Distribution

Coast Manroot occurs from southern British Columbia to central California, mostly west of the Cascade Mountains. In Canada, it only occurs in a small area extending from southeast Vancouver Island to Pender Island in the Southern Gulf Islands. The species ranges over 77 km² but the few sites where it occurs cover <12 km².



Distribution of Coastal Manroot in Canada (from B.C. Ministry of Environment 2012). Note: the name of the plant is now Coastal Manroot, not "coast manroot".

Source: COSEWIC. 2022. COSEWIC Rapid Review of Classification on the Coastal Manroot Marah oregana in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xil pp.

Habitat

In British Columbia, habitat for Coast Manroot is correlated with the distribution of Garry Oak, which often occurs in the vicinity. The extant and historic populations occur on rocky, south-facing slopes, in roadside thickets or at the margins of wooded areas. They are found at low elevations near the coast of southeastern Vancouver Island and the southern Gulf Islands, often within 30 m of the water's edge.

Biology

This perennial herb develops one or more aerial stems yearly from an enlarged woody root. No asexual reproduction occurs. Seed germination involves a rapid downward elongation of the fused underground seed leaves (cotyledons) and the development of an underground perennial storage tube. This pattern of germination and seedling establishment is distinctive for species of the genus Marah and for a few other dicotyledonous plants. It is considered a complex adaptation that helps ensure fast and successful seedling establishment in seasonally arid areas, described as having a "Mediterranean" climate.

Population Sizes and Trends

In 2006, the Canadian population consisted of 18 mature individuals at three locations. The population at a fourth location is considered extirpated as no plants have been observed since 1964. No data on historic numbers are available from which to derive trends in population size.

Threats and Limiting Factors

The primary threats to Coast Manroot are habitat loss due to development, recreational activities and invasive species. One population has disappeared due to trampling; other populations are very small and are also affected by high levels of trampling.

Protection, Status and Ranks

Coast Manroot is not protected by any species at risk legislation in Canada. Based on NatureServe rankings, it is globally secure (G5) but critically imperiled (S1) in B.C. The species does not occur in any protected areas.

Source: COSEWIC. 2022. COSEWIC Rapid Review of Classification on the Coastal Manroot Marah oregana in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xil pp.

COSEWIC. 2009. COSEWIC assessment and status report on the Coast Manroot Marah oreganus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 28 pp.

For more information, please visit https://species-registry.canada.ca/index-en.html



Eastern Red Bat



Photo: © Brock and Sherri Fenton

Scientific Name

Lasiurus borealis

Taxon Mammals

COSEWIC Status Endangered

Canadian Range

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

Reason for designation

This medium sized reddish-orange bat is found across most of Canada in the summer months and during its fall migration. This bat migrates annually, and this seasonal migration exposes individuals to numerous threats, of which the greatest is from mortality at wind energy facilities. Although there is considerable uncertainty regarding exact rates of decline for these bats across Canada, declines in carcass counts at wind energy facilities suggest declines far in excess of 50% over three generations. The planned increase in wind power capacity will increase this threat but mitigation is possible. Additional threats include habitat loss and degradation, habitat change and pesticide use, and widespread declines in prey insect abundance.

Description Wildlife Species and Significance

Hoary Bats, Eastern Red Bats, and Silver-haired Bats are medium to large in body size relative to other bats species in Canada, with Hoary Bats being the largest species in Canada. All three species have complex and varied colouration that aids in camouflage while roosting or hibernating. These three species of bats are similar in that they mostly roost in trees, migrate long distances between summer breeding grounds and their winter range, are long-lived, give birth to more than one pup per year, and share similar diets and ecomorphology.

There is no evidence of population genetic structure in any of these three species. There is only one designatable unit for each species in Canada.

Distribution

All three species of these bats are widely distributed in North America, found from the northern boreal forest to central Mexico. In Canada, the three species have a range that extends from British Columbia to the Atlantic provinces during the summer, although their extent of occurence in Prince Edward Island, and the territories is uncertain. These species migrate seasonally from northern summer ranges to southern wintering areas outside of Canada; however, some Silver-haired Bats overwinter in British Columbia and around the Great Lakes.



Approximate distribution of Eastern Red Bats

Sources:: Nagorsen and Nash 1984, Knowles 2005, Brown and Hamilton 2006, Lucas and Hebda 2011, Nagorsen and Paterson 2012, Natural Resourse Solutions Inc. 2012, Cebellos 2014, GBIF.org 2020, Government of Alberta 2020, Solick *et al.* 2020, Humber pers. comm. 2023, Canadian Museum of Nature (CMNMA 2822), R Barclay unpub. Data, Klymko pers. comm.

Habitat

Habitat requirements for these species include foraging, drinking, and roosting habitats, with the latter considered the most limiting. All three species roost in trees; however, Hoary Bats and Eastern Red Bats roost by hanging from branches, and Silver-haired Bats roost in tree cavities or under exfoliating bark.

All three species catch aerial insects while in flight. Foraging habitats vary for all three species but include wetlands, open areas, and edge or gap habitats in forested landscapes.

Biology

All three species migrate seasonally. They are relatively fast flyers that hunt most often in open habitats or along habitat edges and within canopy gaps in forested landscapes. They are obligate insectivores that prey on aerial insects.

These species are relatively fecund compared to other bats. They likely first give birth in their second year. Hoary Bats and Silver-haired Bats usually have twins, but Eastern Red Bats may have up to four pups.

Vital rates (survival, longevity, age-structure, etc.) are mostly unknown but it is infered from similar, related species that they are relatively long-lived, with maximum lifespans of at least 12–15 years. Generation time is unknown but estimated at 2-6 years based on IUCN methodology and inferences for similar bats.

Population Sizes and Trends

The primary means used to assess relative abundance of bats include mark-recapture studies, and emergence counts. However, coordinated North American wide monitoring for bats (e.g., NABat) has not occurred for long enough in Canada to generate population trend data. Given the limitations, multiple sources of information were used to assess population trends, including carcass searches at wind energy facilities, changes in capture and acoustic detection rates, rabies submission rates, and population viability modeling that relied on expert estimates.

Current population levels for all three species are unknown; however, experts postulated that the most-likely population size of Hoary Bats across North America is approximately 2.25 million individuals. Given the similarities in life-history and ecology, it was assumed that this estimate can also be broadly applied to Silver-haired Bats and Eastern Red Bats.

In 2007, expert elicitation and projected fatality rates were used to model the effect of wind energy production on Hoary Bat populations in North America. Models were based on variable initial population size, levels of wind energy buildout and fatality rates from the year 2014 and favourable population growth rates without mortality due to wind turbines. That is, the models only considered additive mortality as a result of fatalities at wind turbines, not other threats. Some plausable models suggested that Hoary Bats will decline by 50% to 90% in the next 50 years; a 1.4% to 4.5% annual decline. The "most likely" demographic scenario predicted that fatalities associated with wind energy facilities would result in a 90% population decline over a 50 years with a probability of extinction of 22% over the next 100 years. Follow-up studies that included population models accounting for projected buildout, with and without any mitigation to reduce fatality rates, estimated extinction risk at 0-40% by 2050 based on various build out senarios with a mid-point of 20%. These results suggest that significant population declines may have already occurred if the initial population size of Hoary Bats was below 3 million individuals. Recently, multiple. independently-derived aenetic estimates of effective population size of all three species across North America also suggest their current population sizes are well below 3 million. It is expected that similar probabilities apply to Eastern Red Bats and Silver-haired Bats; however, neither of these species has been explicitly modelled.

In support of the decline suggested by population modelling for Hoary Bats, there are multiple lines of evidence to suggest that population declines are occurring in migratory tree-roosting bats including declining capture rates of lasiurine (bats within the genus *Lasiurus*) bats, and a decrease of annual rabies submissions. Change in fatality rates at wind turbines, change in capture and acoustic detection rates, and change in rabies submission rates all suggest declines for all species.

In Ontario, the number of carcasses found under wind turbines during the late summer and autumn migration declined significantly over seven years and recent occupancy modelling in the US Pacific Northwest provides evidence of decline in the regional occurrence probability of Hoary Bats (2016–2018 relative to 2010). Multi-year acoustic and capture studies also provide evidence for population changes for all three species. In the US, all three species have declined in terms of the proportion of overall bat submissions for rabies testing.

Threats and Limiting Factors

These three bat species face several threats, some of which are common to all bats found in Canada, while others are more specific to these migratory species. Several threats contribute cumulatively to suspected declines for all three species. Based on the IUCN threats calculator, the threats assessment is High to Very High for Hoary Bats, Eastern Red Bats, and Silver-haired Bats.

Wind energy development is the most immediate and concerning threat. Hoary Bats, followed by Silver-haired Bats, and then Eastern Red Bats, account for most fatalities at wind turbines in Canada. The number and extent of wind energy facilities (hereafter "buildout") will continue to increase substantially across the range of these species.

As obligate insectivores, the global decline of insects is of particular concern for these bats, similar to that for migratory birds that are also aerial insectivores. The causes of insect declines are likely multifactorial, cumulative, and difficult to reverse. While long-term abundance data do not exist for migratory bats, they are likely just as affected by widespread declines in prey as birds with similar diets.

Other threats include chemical and noise pollution, as well as deforestation that results in the loss of roosting habitat. However, these threats are considered to have a low impact over the next three generations for all three species.

Protection, Status and Ranks

None of these bats receive special protection in Canada, except in Québec where they are integrated on the Liste des espèces susceptibles d'être désignées menacées ou vulnérables (list of wildlife species likely to be designated threatened or vulnerable). Québec is also the only province to have established a recovery strategy for Eastern Red Bats. In most jurisdictions, in conjunction with other wildlife, they are provided general protection by provincial and territorial wildlife acts. In 2018, Hoary Bats and Eastern Red Bats were added to Appendix II of the Convention on Migratory Species (CMS), based on their "unfavourable conservation status" related to the rapid expansion of wind energy and a need for international cooperation for their conservation.

All three species are ranked as Least Concern in the IUCN Red List, but key threats identified in this assessment were not considered. In contrast, NatureServe's global status (G ranks) for all three species is G3G4 rounded to G3 (Vulnerable). The national status (N ranks) for all of these bats in Canada by NatureServe is N5B, NUM; that is the breeding population is assessed as Secure, while the status of the migratory population is Undetermined. Status of each of these three bat species assessed in each province, territory, or state (S ranks) is variable, likely reflecting more about the state of knowledge in each jurisdiction rather than their actual conservation status.

Source: COSEWIC. 2023. COSEWIC assessment and status report on the Hoary Bat Lasiurus cinereus, Eastern Red Bat Lasiurus borealis and Silver-haired Bat, *Lasionycteris noctivagans*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxi + 100 pp.

> For more information, please visit https://species-registry.canada.ca/index-en.html

Eastern Whip-poor-will

Environment and



Photo: © Christian Artuso

Scientific name

Antrostomus vociferus

Taxon Birds

COSEWIC status

Special Concern

Canadian range

Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island.

Reason for designation

Similar to many other aerial insectivores, this well-known nocturnal bird has experienced a long-term population decline in Canada. However, reanalysis of trend data suggests that the decline may not have been quite as severe as thought at the time of the previous assessment, and new data suggest that abundance may now be stable or increasing. Concern remains regarding the reduction in the bird's insect prey base, attributed to ongoing pesticide use, in addition to other threats such as habitat loss and degradation and increasingly frequent and severe hurricanes along its migration routes. Although numbers remain relatively large, this species is at risk of becoming Threatened if threats are not adequately mitigated.

Wildlife Species Description and Significance

Eastern Whip-poor-will is a nightjar with a large flattened head and cryptic grey-brown plumage. It has a small bill, but its gape is large and ringed with sensory bristles for capturing flying insects. The species is commonly evoked as a symbol of rural life. It has attained significant status in popular culture, being mentioned in countless songs, poems, books, and movies.

Distribution

The breeding range of Eastern Whip-poor-will extends from east-central Saskatchewan to Nova Scotia, south into the United States from Oklahoma to South Carolina. The breeding range is approximately 2,833,000 km2, of which approximately 553,000 km2 occurs in Canada. During winter, the species ranges from coastal South Carolina (rarely) through Florida and along the Gulf Coast of the United States into Mexico and Central America, as far south as Costa Rica and western Panama.



Breeding, migration, and non-breeding (wintering) range of Eastern Whip-poor-will (adapted from Birds of the World 2020 and eBird 2020). Breeding range is based on breeding bird atlases (Cadman et al. 2007; Stewart et al. 2015; Artuso et al. 2018; Robert et al. 2019; Birds Canada 2020) and eBird (2020). Changes in distribution from the previous iteration of the Eastern Whippoor-will COSEWIC Status Report on this map do not represent extensions in the range of Eastern Whip-poor-will but reflect increased search effort and data availability.

Source: COSEWIC. 2022. COSEWIC assessment and status report on the Eastern Whip-poor-will *Antrostomus vociferus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 56 pp.

Habitat

For nesting, Eastern Whip-poor-will avoids both wide-open spaces and closed-canopy forests, favouring areas with little ground cover in semiopen or patchy forests with clearings, such as barrens or regenerating woodlands. Forest structure is more important than composition, although common tree associations in both summer and winter are pine and oak. In winter, Eastern Whip-poor-will occupies primarily mixed woods, commonly in broadleaf evergreen forests near open areas.

Biology

Eastern Whip-poor-will can breed the year after hatching and typically has a clutch size of two eggs laid directly on the leaf litter, with both parents contributing to raising the young. The incubation period is 19-21 days: young take their first flights in the third week following hatching. Pairs may raise one or two broods per year, although second broods are uncommon in Canada. The generation length is estimated to be approximately 3.7 years. The diet of Eastern Whip-poor-will consists of a variety of night-flying insects. including moths, beetles, flies. grasshoppers, and mosquitoes.

Population Sizes and Trends

The Eastern Whip-poor-will population in Canada is estimated to be 140,000 (95% CI [confidence interval] = 65,000 to 250,000) mature individuals, which amounts to 7.8% of the global population. Ontario has an estimated 64% (n = 89,000; 95% CI = 25,000 to 190,000) of the Canadian population.

Although the North American Breeding Bird Survey provides limited coverage for primarily nocturnal species such as Eastern Whip-poorwill, it is the only available source of long-term trend data for the species. From 1970 to 2019, there was an average annual trend of -0.9% (95% Crl [credible interval] = -3.2% to 1.2%) in Canada, amounting to a decline of -35.2% (95% Crl = -79.3% to 76.2%) over 49 years. During the most recent 10-year period (2009 to 2019) the data indicate an average annual population increase of 5.3% (95% Crl = -1.2% to 13.3%), amounting to 68.3% (95% Crl = -10.9% to 247.1%) over the decade. Although there is a 95% probability of population increase over this period, the shortterm estimate has broad uncertainty and low statistical reliability. The recent trend may therefore be better estimated by interpolating from the larger data set of the long-term trend, which gives a three-generation (11-year) estimate of -9.3% (95% Crl = -29.8% to 13.5%). Second-generation breeding bird atlases in Ontario, Quebec, and the Maritimes also show declines over periods of 20-25 years, but mostly to entirely prior to the most recent threegeneration period. Whether the population has actually rebounded or continued to decline, the best available evidence suggests that the most recent 11-year trend is substantially less severe

than the -35% decline over three generations estimated in the previous status report.

Threats and Limiting Factors

Remaining knowledge gaps limit the understanding of threats faced by Eastern Whippoor-will throughout its full annual cycle. Available data suggest that the greatest threats to the species are posed by natural systems modifications (via widespread pesticide use and suppression), agricultural expansion, fire residential and industrial development, and severe weather due to climate change (particularly strong storms). Additional factors threatening the species include direct human disturbance, energy production and mining, transportation corridors, as well as invasive and problematic species, and potentially pollution and logging, but more research is needed.

Protection, Status and Ranks

In Canada, Eastern Whip-poor-will has been listed as Threatened since 2011 under schedule 1 of the Species at Risk Act, 2002. It is also protected under the Migratory Birds Convention Act, 1994. It is listed as Threatened under provincial legislation in four provinces: Manitoba, Ontario, New Brunswick, and Nova Scotia. In Quebec, it is on the List of Plant and Wildlife Species Likely to be Designated Threatened or Vulnerable. Eastern Whip-poor-will is not afforded protection under the Endangered Species Act in the United States; however, it is protected under the Migratory Bird Treaty Act.

Globally, NatureServe ranks Eastern Whip-poorwill as Secure (G5), but the International Union for Conservation of Nature has recognized it as Near Threatened. In Canada, the breeding population is considered Vulnerable (N3B), while at a provincial level, it is ranked from S1 (Critically Imperilled) to S3 (Vulnerable) in the six provinces where it regularly occurs. In the United States, the breeding population is considered Secure (N5B). Eastern Whip-poor-will is listed as a "D" Yellow Watch List Species by Partners in Flight.

Source: COSEWIC. 2022. COSEWIC assessment and status report on the Eastern Whip-poor-will *Antrostomus vociferus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 56 pp. For more information, please visit https://species-registry.canada.ca/index-en.html



Canada

Foothill Sedge

Environment and



Photo: © Ryan Batten

Scientific Name Carex tumulicola

Taxon Vascular Plants

COSEWIC Status Special Concern

Canadian Range British Columbia

Reason for designation

This perennial species is characteristic of mesic to moist meadows and associated Garry Oak woodlands unique to the semi-Mediterranean climate of south-eastern Vancouver Island, British Columbia. The Canadian population

consists of a few thousand mature individuals and although sixteen subpopulations have recently been discovered, many have very low numbers of plants. The primary threat to the species is encroachment by non-native herbs and native and non-native trees and shrubs. Due to changes in the application of assessment criteria, the species is no longer severely fragmented, which reduced the at-risk status.

Wildlife Species Descriptions and Significance

Foothill Sedge is a grass-like plant that spreads through underground runners and forms large patches of leaves. The inconspicuous flowers are borne on the ends of stalks that are longer than the leaves and, like the leaves, often lie flat. Foothill Sedge is part of a suite of species that, in Canada, are found only in Garry Oak and associated ecosystems on south-eastern Vancouver Island and adjacent islands.

Distribution

Foothill Sedge is found west of the Cascade and Sierra Nevada mountains, from Vancouver Island to southern California. In Canada, it is found mainly in the Victoria area, with an outlying subpopulation near Nanaimo. Less than 1% of the species' global range is in Canada.



Distribution of Foothill Sedge in Canada and adjacent USA.

Source: COSEWIC. 2022. COSEWIC assessment and status report on the Foothill Sedge Carex tumulicola in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 34 pp.

Habitat

Throughout its range, Foothill Sedge is found in a variety of prairie, meadow, and open woodland habitats. In Canada, most plants are found in mesic meadows and Garry Oak woodland.

Biology

Foothill Sedge is a long-lived, slow-growing perennial. The species remains green through most of the year, with most growth occurring in fall and spring. Flowers are produced in June and July and seeds are ripe by late summer. Seeds germinate the following spring. Dispersal mechanisms are unknown but may include movement of seeds by birds or small mammals. The species does not appear to be an important forage species for herbivores.

Population Sizes and Trends

The total Canadian population is estimated at between 1660 and 3514 mature individuals. Approximately 85% of all plants are found in one subpopulation and several subpopulations consist of only one or two plants. In the last ten years, declines in the number of mature individuals have been observed at 7 of the 23 known subpopulations in Canada. Other subpopulations appear stable, although they may have experienced historical declines.

Threats and Limiting Factors

The potential habitat for Foothill Sedge has been substantially reduced through urbanization. These habitats are among the most endangered in Canada and have been reduced to a tiny fraction of their original extent. At remaining sites, Foothill Sedge is threatened by an overgrowth of woody vegetation, including non-native and native shrubs and trees. Lack of fire and the introduction of non-native shrubs have resulted in the conversion of meadows to thickets and forests. Human intrusions through mowing and recreational activities continue to threaten plants at some sites. The species appears to be limited by low rates of seedling establishment and the small size of many subpopulations.



Photo: © Ryan Batten

Protection, Status and Ranks

Foothill Sedge is listed as Endangered under the *Species at Risk Act.* It is not protected under any provincial legislation. Many subpopulations are located in parklands that have prohibitions against harm to native plants. It is not ranked as at risk in Washington, Oregon, or California.

Source: COSEWIC. 2022. COSEWIC assessment and status report on the Foothill Sedge Carex *tumulicola* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 34 pp.

For more information, please visit <u>https://species-registry.canada.ca/index-en.html</u>



Environment and

Great Blue Heron fannini subspecies



Photo: ©Ross Vennesland

Scientific name Ardea herodias fannini

Taxon Birds

COSEWIC status Not Applicable

Canadian range British Columbia

Reason for designation

Status is not assigned. This population is no longer a valid Designatable Unit, as it does not meet the 2020 revised COSEWIC criteria for discreteness and evolutionary significance and is, therefore, not eligible for COSEWIC status assessment.

Wildlife Species Description and Significance

The Great Blue Heron, Ardea herodias, is the largest wading bird in North America, standing over 1 m in height. On the coast of British Columbia the subspecies, Ardea herodias fannini, referred to as the Pacific Great Blue Heron in this report, resides year round. This subspecies is non-migratory and isolated in part by high mountain ranges to the east and a slightly earlier breeding season, compared to more continental herons. The Pacific Great Blue Heron is darker plumaged, smaller in size and has a smaller clutch size than continental herons.

The Pacific Great Blue Heron has high public appeal as a symbol of wetland conservation and environmental quality.

Distribution

The Great Blue Heron breeds across most of North America south of Alaska, and on the Galapagos Islands. The non-breeding distribution is south of freezing areas in the north, to as far south as Panama. The distribution of the Pacific Great Blue Heron is confined to the Pacific Coast from Prince William Sound, Alaska south to Puget Sound, Washington, where it resides year-round.

Canadian range of the Pacific Great Blue Heron showing potential area of occupancy (shaded area).

Source: COSEWIC. 2008. COSEWIC assessment and update status report on the Great Blue Heron fannini subspecies Ardea herodias fannini in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 39 pp.

Habitat

The Pacific Great Blue Heron forages along the seacoast, in fresh and saltwater marshes, along rivers and in grasslands. Smaller numbers of herons forage in kelp forests, from wharves and at anthropogenic waterbodies (e.g., ornamental ponds and fish farms). Most herons nest in woodlands near large eelgrass (Zostera marina) meadows, along rivers, and in estuarine and freshwater marshes. Nesting colony locations are dynamic, especially in areas of high disturbance. Some colonies are used for many years, but most colonies and especially those with fewer than 25 nests, are relocated every few years. In autumn, juvenile herons occupy grasslands on the Fraser River delta and southern Vancouver Island, and adults occupy estuarine marshes, riverine marshes and grasslands.

The size of Great Blue Heron populations is correlated with the area of foraging habitat available locally, and consequently the largest concentrations of Pacific Great Blue Herons occur around the Fraser River delta where extensive mudflats and eelgrass beds provide abundant foraging locations. Local declines in foraging habitat likely have been greatest in south-coastal British Columbia because most of the province's human population is located in this area. Further, the magnitude of use of some foraging locations currently may be limited by the amount of suitable nesting habitat that remains undeveloped.

Suitable tall trees as nesting habitat near foraging areas have declined in some parts of British Columbia over the past century due to increases in the size of human populations and industry. Especially hard hit is south-coastal British Columbia and especially the lower Fraser Valley, where the human population is large and still growing. In this region, nesting habitat might be limiting the size of the heron population. Habitat destruction in south-coastal British Columbia has resulted in the abandonment of at least 21 colonies (from 1972 to 1985 and from 1998 to 1999).

Biology

In springtime, most herons gather in colonies where they court, nest, and raise young. The principal diet is small fish during the breeding season augmented with small mammals in winter. Typically four eggs are laid and less than two chicks on average reach the fledgling stage and leave the nest to become juveniles. Fewer than 25% of juveniles survive their first winter, after which survival increases to about 75% per year for adults. Nests are generally in trees and are made using large sticks.

Population Sizes and Trends

Population size has been difficult to estimate for the Pacific Great Blue Heron because colonies are not stable and are difficult to track in a standardized fashion. The best available estimates suggest that the Pacific Great Blue Heron population size in Canada is 4000-5000 nesting adults. The global population of the Pacific Great Blue Heron is likely between 9 500 and 11 000 nesting adults.

Christmas Bird Count data show population declines over the past three generations, while Coastal Waterbird Surveys show increases over a recent five-year period. Colony surveys suggest that productivity has declined significantly since the 1970s.

Threats and Limiting Factors

Declines and other issues with productivity and population size are thought to primarily be due to Bald Eagle predation, human disturbance and destruction of nesting and foraging habitat. The projected doubling in the human population in the next 30 years in the core of the range threatens to exacerbate the human disturbance problem and habitat loss. In addition, the influence of predators may be reducing habitat quality by causing herons to move to new, and ever more limited, sites.

Protection, Status and Ranks

All Great Blue Herons are protected from hunting and molestation by the Migratory Birds Convention Act, Migratory Bird Regulations and the British Columbia Wildlife Act. Both subspecies of Great Blue Heron inhabiting British Columbia are at present on the provincial 'Blue List' compiled by the British Columbia Ministry of Environment. The Pacific Great Blue Heron was listed in 1997 as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Source: COSEWIC. 2023. Addendum to the 2008 COSEWIC Status Report on the Great Blue Heron fannini subspecies Ardea herodias fannini in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxii pp.

COSEWIC. 2008. COSEWIC assessment and update status report on the Great Blue Heron fannini subspecies Ardea herodias fannini in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 39 pp.

> For more information, please visit https://species-registry.canada.ca/index-en.html

Environnement et Changement climatique Canada

Gulf of St. Lawrence Aster

Photo: © David Mazerolle

Scientific name Symphyotrichum laurentianum

Taxon Vascular Plants

COSEWIC status Endangered

Canadian range

Quebec (Magdalen Islands), New Brunswick, Prince Edward Island

Reason for designation

This annual plant is endemic to Gulf of St. Lawrence coastal habitats. It grows mainly on brackish sands around coastal lagoons and ponds isolated from the sea by barrier beaches and in coastal marshes. The plant presently occurs in 12 subpopulations: four in the Magdalen Islands of Quebec, three in Prince Edward Island, and five in New Brunswick. An additional 13 subpopulations have not been seen in 15 years or more and are likely extirpated. The number of mature individuals at a site can fluctuate dramatically but long-term population averages that account for fluctuation have indicated population declines of more than 50 percent in the past 10 years. The change in status since the last assessment reflects these declines, which are considered to be primarily due to an increased frequency and severity of storms.

Wildlife Species Description and Significance

Gulf of St. Lawrence Aster is a small, halophytic, herbaceous annual aster that is endemic to Canada, occurring in coastal habitats in New Brunswick, Prince Edward Island, and Quebec's Magdalen Islands. It is of evolutionary and phytogeographic interest and often grows with other species of conservation concern.

Distribution

Gulf of St. Lawrence Aster occurs on Gulf of St. Lawrence shores in Quebec, New Brunswick, and Prince Edward Island. In Quebec it is restricted to the Magdalen Islands archipelago with the vast majority of mature individuals at two wetland complexes (Havre aux Basques and Le Barachois). In New Brunswick, the species is known from five subpopulations on the eastern shore, distributed from Kouchibouguac National Park (where recently re-introduced), north to Val-Comeau and Miscou Island. Prince Edward Island's subpopulations are present on the province's northern coast in Prince Edward Island National Park with an additional historical subpopulation 85 km northwest at Tignish.

Canadian distribution of Gulf of St. Lawrence Aster showing the minimum convex area polygon representing Extent of Occurrence. Dots appearing dark reflect a high density of occurrences.

Source: COSEWIC. 2023. COSEWIC assessment and status report on the Gulf of St. Lawrence Aster Symphyotrichum laurentianum in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv + 47 pp.

Habitat

Gulf of St. Lawrence Aster grows in brackish coastal sands that typically occur along the shores of barachois (coastal lagoon) ponds and in barrier dune salt marshes. Suitable microhabitats are characterized by moist bare sand, mud, or peat in areas of these communities with sparse vegetation cover. These areas are subject to periodic natural and anthropogenic disturbances that can drastically alter the amount of habitat available to the species year to year.

Biology

Gulf of St. Lawrence Aster is an annual that germinates in June, flowers from mid-August to mid-September, fruits in late-September, and disperses its fruit in late October. Most Gulf of St. Lawrence Aster seed is produced by selffertilization, but cross-pollination also occurs. Seed bank viability is relatively high for one year but is much lower over time. Natural seed bank viability is estimated at 10 years. Germination is negatively affected by flooding, low temperatures, and high salinity.

Population Sizes and Trends

Numbers of mature individuals of Gulf of St. Lawrence Aster can exhibit very large year-toyear fluctuations but the soil seed bank is assumed to stabilize the population such that extreme fluctuation does not apply. Because of high variability, population is estimated as an average over three generations (~15 years, since 2007; 208,186 mature individuals; 88% in Quebec, 12.0% in New Brunswick, < 1% in Prince Edward Island). Most (98%) of the Canadian population is within just four subpopulations: Havre aux Basques, QC (68%), Le Barachois, QC (19%), Windsors Malbaie, NB (8%), and Lac Frye / Miscou Lighthouse, NB (3%). This concentration makes the species more sensitive to impacts from stochastic storm events or anthropogenic habitat alteration.

The number of subpopulations is continuing to decline. Of the 25 subpopulations ever documented, eight were extirpated prior to 2000 and five Magdalen subpopulations were potentially extirpated between 2000 and 2008. Of 12 extant subpopulations, 3 to 5 subpopulations in Prince Edward Island and Kouchibouguac National Parks are potentially dependent on continuing reintroductions.

The Canadian population has experienced a 90% decline over the 15 years (~3 generations) when comparing values from the 2007 to 2022 period against subpopulation counts from the 1999 to 2006 period. Declines were substantial in Prince Edward Island (98.9% decline) and in the Magdalen Islands (90.3% decline), but there was a large increase when comparing the same periods in New Brunswick (1721% increase).

The cause of long-term decline on the Magdalen Islands may include alterations of habitat by climate change-linked storm events and human alteration of drainage. Large, long-term declines at Blooming Point, PE, are attributed to natural succession of vegetation that has removed most suitable habitat.

Threats and Limiting Factors

The most significant threats to Gulf of St. Lawrence Aster are habitat change caused by severe storms and sea-level rise associated with climate change, human-driven modifications of water cycles at the site level, and shoreline development. Lesser or potential threats include habitat damage from all-terrain vehicle use and trampling, competition from exotic and native species, and potential hybridization with the introduced Rayless Alkali Aster. Insect herbivory and low rates of successful dispersal may be limiting factors for Gulf of St. Lawrence Aster.

Protection, Status and Ranks

Gulf of St. Lawrence Aster is afforded protection as a Threatened species under Schedule 1 of the federal Species at Risk Act. The species is legally designated as Threatened in Quebec and Endangered in New Brunswick. In Prince Edward Island, it has no formal protection under the Wildlife Conservation Act, but all extant occurrences are protected within Prince Edward Island National Park. In Quebec, all Gulf of St. Lawrence Aster sites (beaches and dune slacks) are under provincial jurisdiction and three of the four extant subpopulations are within designated Plant Habitat or Provincial Faunal Wildlife Reserves. extant New Brunswick Two occurrences are within Kouchibouquac National Park, and one is within a Nature Conservancy of Canada nature reserve.

Source: COSEWIC. 2023. COSEWIC assessment and status report on the Gulf of St. Lawrence Aster *Symphyotrichum laurentianum* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv + 47 pp.

For more information, please visit https://species-registry.canada.ca/index-en.html

Half-moon Hairstreak (Okanagan-Similkameen population)

Photo: © Jennifer Heron

Scientific name Satyrium semiluna

Taxon Arthropods

COSEWIC status Threatened

Canadian range

British Columbia

Reason for designation

The butterfly occurs at fewer than 10 disjunct sites in southern British Columbia at the northern extreme of the species' range. Changes in fire regime and invasion by non-native plants are reducing habitat quality, and some sites are under pressure from development. Combining these threats could reduce population size in the near future.

Wildlife Species Description and Significance

Half-moon Hairstreak is in the large family Lycaenidae (gossamer-winged butterflies). Adults are small (2.5-3.4 cm wingspan) with the dorsal wing surfaces a uniform sooty brownishblack. In contrast with other hairstreaks, adults lack small extensions ('tails') on their hindwings. Sexes differ slightly; females tend to be larger and paler than males. Half-moon Hairstreak is one of a group of butterflies that reach their northern distribution limit in southern Canada. There are no described subspecies, however there is evidence for two designatable units: the Okanagan-Similkameen population and the Waterton Lakes population.

Distribution

Globally, Half-moon Hairstreak ranges in western North America from south-central British Columbia (BC), south through eastern Washington to northeastern California, and northern Nevada. The eastern boundary is from Colorado to Waterton Lakes National Park (WLNP), Alberta (AB). Less than 1% of the global range of Half-moon Hairstreak is in Canada.

In Canada, Half-moon Hairstreak occurs as two designatable units (DU; also referred to as populations): Okanagan-Similkameen population and Waterton Lakes population. The Okanagan-Similkameen population occurs as six extant subpopulations in south central BC. The northernmost subpopulation is southwest of Penticton in the White Lake basin and the southernmost is about 6 km west of Osoyoos, adjacent to the United States border. The Waterton Lakes population is in WLNP in extreme southwestern Alberta. There is one subpopulation and it is extant.

Canadian range of Half-moon Hairstreak, showing both the Okanagan-Similkameen population in British Columbia and the Waterton Lakes population in Alberta. Map created by Greg Amos (B.C. Ministry of Environment and Climate Change Strategy 2021).

Source: COSEWIC. 2022. COSEWIC assessment and status report on the Half-moon Hairstreak Satyrium semiluna Okanagan-Similkameen and population Waterton Lakes population in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xvi + 66 pp.

Habitat

In BC, Half-moon Hairstreak inhabits the dry Big Sagebrush / Bluebunch Wheatgrass ecological community, at an elevation of 600 – 1000 m above sea level (asl), most with reduced relief in comparison to surrounding steeper areas. In AB, Half-moon Hairstreak occurs only in the Blakiston Creek alluvial fan, which is dry grassland and aspen parkland, at an elevation of ~1290 m asl. The soils were formed on rapidly to moderately well drained, coarse-textured fluvial landforms.

Biology

Half-moon Hairstreak has an annual life cycle and complete metamorphosis with four stages (egg, larva [four instars], pupa, and adult). Adults in the Okanagan-Similkameen population have been recorded from late May through early July, and in the Waterton Lakes population from early July to early August.

The caterpillars feed on lupines. For the Okanagan-Similkameen population hosts are likely Silky Lupine and Sulphur Lupine. For Waterton Lakes population hosts are Silvery Silky Lupine. The presumed lupine larval food plants are abundant and widespread in BC and AB and their presence does not limit the Half-moon Hairstreak's range (i.e., the geographic ranges of these plants are wider than that of the butterfly). For nectar plants, Half-moon Hairstreak adults are likely opportunistic, with a perceived preference for buckwheat (*Eriogonum* spp.).

Numerous lycaenid butterflies in North America are myrmecophilous: there is a mutualism between ants (Formicidae) and caterpillars. The butterfly larvae secrete honeydew while feeding, which attracts ants and which then groom the larvae for more honeydew. Larval secretions are ant food, and the larvae secure ant defense against parasitoids. The mutualism between ants and Half-moon Hairstreak is being studied in WLNP and appears to involve both Lasius and wood ants.

Population Sizes and Trends

Half-moon Hairstreak adults have been recorded in Canada from 1895 to 2021. Surveys in both BC and AB have focused on recording new subpopulations, natural history, confirming threats, and habitat information. The primary survey method has been wandering transects through potential habitat, changing course where host and nectar plants are abundant. No information on the Canadian population size or trends for either the Okanagan-Similkameen or Waterton Lakes populations is available.

Photo: © Jennifer Heron

Threats and Limiting Factors

The primary threats to the Okanagan-Similkameen population are changes to the larval plant abundance, nectar plant abundance (ecosystem modifications from fire suppression, the spread and continued introduction of invasive non-native plants), and changes to the ecological community from domestic livestock grazing. Wildfires are direct threats to these same habitats.

The primary threat to the Waterton Lakes population is the spread of non-native plants, such as Spotted Knapweed. Increased abundance of knapweed reduces habitat quality by reducing abundance of the larval host, lupines, and nectar sources for adults.

Limiting factors include the presence and abundance of healthy larval host plants. This butterfly's larvae may depend on a mutualistic relationship with ants and if that is the case, the presence of the appropriate species of ant will also be a limiting factor.

Protection, Status and Ranks

Half-moon Hairstreak was assessed as Endangered by COSEWIC in 2006, listed as Endangered on Schedule 1 of the federal *Species at Risk Act* (SARA) in 2007 and Critical Habitat for the species was designated under this act in 2016. The Waterton Lakes population of Halfmoon Hairstreak is only in WLNP and both the host species and its habitat are afforded protection under the *Canada National Parks Act*. In BC, the species is identified as a Species at Risk under the provincial *Forest and Range Practices Act* and is listed as Identified Wildlife under the Identified Wildlife Management Strategy.

Globally, Half-moon Hairstreak is ranked apparently secure (G4), nationally it is Critically Imperilled (N1) and provincially ranked S1 in both BC and AB. The larval host plants are not at risk. The Okanagan-Similkameen population has been recorded from private properties, private conservation land, provincial protected areas, federal property leased to a private ranch operator, and parcels of unprotected provincial land.

Source: COSEWIC. 2022. COSEWIC assessment and status report on the Half-moon Hairstreak *Satyrium semiluna* Okanagan-Similkameen and population Waterton Lakes population in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xvi + 66 pp.

For more information, please visit https://species-registry.canada.ca/index-en.html

Hoary Bat

Photo: © Brock and Sherri Fenton

Scientific name

Lasiurus cinereus

Taxon Mammals

COSEWIC status

Endangered

Canadian range

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

Reason for designation

This large-bodied bat has light yellow-brown fur on its face and neck and white tipped hairs over most of its body. It is found across Canada in the summer months and during fall migration. Seasonal migration exposes individuals to a variety of threats including a high risk of mortality at wind energy facilities. Although there is considerable uncertainty regarding the exact rates of decline for these bats across Canada, declines in carcass counts at wind energy facilities suggest declines far in excess of 50% over three generations. The planned increase in wind power capacity will increase this threat but mitigation is possible. Population viability modeling estimates the probability of extinction is least at the 20% threshold by 2050 (3 generations). Additional threats to this species include ongoing and widespread declines in insect abundance, loss of forested roosting and foraging habitat, and pollution.

Wildlife Species Description and Significance

Hoary Bats, Eastern Red Bats, and Silver-haired Bats are medium to large in body size relative to other bats species in Canada, with Hoary Bats being the largest species in Canada. All three species have complex and varied colouration that aids in camouflage while roosting or hibernating. These three species of bats are similar in that they mostly roost in trees, migrate long distances between summer breeding grounds and their winter range, are long-lived, give birth to more than one pup per year, and share similar diets and ecomorphology.

There is no evidence of population genetic structure in any of these three species. There is only one designatable unit for each species in Canada.

Distribution

All three species of these bats are widely distributed in North America, found from the northern boreal forest to central Mexico. In Canada, the three species have a range that extends from British Columbia to the Atlantic provinces during the summer, although their extent of occurence in Prince Edward Island, and the territories is uncertain. These species migrate seasonally from northern summer ranges to southern wintering areas outside of Canada; however, some Silver-haired Bats overwinter in British Columbia and around the Great Lakes.

Approximate distribution of Hoary Bat

Source:Hitchcock 1943, Shump and Shump 1982, Anand-Wheeler 2002, Maisonneu et al. 2008, Stantec Consulting Ltd 2012, Blejwas et al. 2014, Mora and López 2014, Slough et al. 2014, Wilson et al. 2014, Hansen et al. 2018, de Lacoste and SFEPM 2020, Faure-Lacroix et al. 2020, GBIF.org 2020, Washinger et al. 2020, Rae and Lausen 2021, Slough et al. 2022, Humber pers. comm. 2023, New Brunswick Museum (NBM-5801, NBM-1202).

Habitat

Habitat requirements for these species include foraging, drinking, and roosting habitats, with the latter considered the most limiting. All three species roost in trees; however, Hoary Bats and Eastern Red Bats roost by hanging from branches, and Silver-haired Bats roost in tree cavities or under exfoliating bark.

All three species catch aerial insects while in flight. Foraging habitats vary for all three species but include wetlands, open areas, and edge or gap habitats in forested landscapes.

Biology

All three species migrate seasonally. They are relatively fast flyers that hunt most often in open habitats or along habitat edges and within canopy gaps in forested landscapes. They are obligate insectivores that prey on aerial insects.

These species are relatively fecund compared to other bats. They likely first give birth in their second year. Hoary Bats and Silver-haired Bats usually have twins, but Eastern Red Bats may have up to four pups.

Vital rates (survival, longevity, age-structure, etc.) are mostly unknown but it is infered from similar, related species that they are relatively long-lived, with maximum lifespans of at least 12–15 years. Generation time is unknown but estimated at 2-6 years based on IUCN methodology and inferences for similar bats.

Population Sizes and Trends

The primary means used to assess relative abundance of bats include mark-recapture studies, and emergence counts. However, coordinated North American wide monitoring for bats (e.g., NABat) has not occurred for long enough in Canada to generate population trend data. Given the limitations, multiple sources of information were used to assess population trends, including carcass searches at wind energy facilities, changes in capture and acoustic detection rates, rabies submission rates, and population viability modeling that relied on expert estimates.

Current population levels for all three species are unknown; however, experts postulated that the most-likely population size of Hoary Bats across North America is approximately 2.25 million individuals. Given the similarities in life-history and ecology, it was assumed that this estimate can also be broadly applied to Silver-haired Bats and Eastern Red Bats.

In 2007, expert elicitation and projected fatality rates were used to model the effect of wind energy production on Hoary Bat populations in North America. Models were based on variable initial population size, levels of wind energy buildout and fatality rates from the year 2014 and favourable population growth rates without mortality due to wind turbines. That is, the models only considered additive mortality as a result of fatalities at wind turbines, not other threats. Some plausable models suggested that Hoary Bats will decline by 50% to 90% in the next 50 years; a 1.4% to 4.5% annual decline. The "most likely" demographic scenario predicted that fatalities associated with wind energy facilities would result in a 90% population decline over a 50 years with a probability of extinction of 22% over the next 100 years. Follow-up studies that included population models accounting for projected buildout, with and without any mitigation to reduce

fatality rates, estimated extinction risk at 0-40% by 2050 based on various build out senarios with a mid-point of 20%. These results suggest that significant population declines may have already occurred if the initial population size of Hoarv Bats was below 3 million individuals. Recently, independently-derived multiple. genetic estimates of effective population size of all three species across North America also suggest their current population sizes are well below 3 million. It is expected that similar probabilities apply to Eastern Red Bats and Silver-haired Bats; however, neither of these species has been explicitly modelled.

In support of the decline suggested by population modelling for Hoary Bats, there are multiple lines of evidence to suggest that population declines are occurring in migratory tree-roosting bats including declining capture rates of lasiurine (bats within the genus *Lasiurus*) bats, and a decrease of annual rabies submissions. Change in fatality rates at wind turbines, change in capture and acoustic detection rates, and change in rabies submission rates all suggest declines for all species.

In Ontario, the number of carcasses found under wind turbines during the late summer and autumn migration declined significantly over seven years and recent occupancy modelling in the US Pacific Northwest provides evidence of decline in the regional occurrence probability of Hoary Bats (2016–2018 relative to 2010). Multi-year acoustic and capture studies also provide evidence for population changes for all three species. In the US, all three species have declined in terms of the proportion of overall bat submissions for rabies testing.

Photo: © Brock and Sherri Fenton

Threats and Limiting Factors

These three bat species face several threats, some of which are common to all bats found in Canada, while others are more specific to these migratory species. Several threats contribute cumulatively to suspected declines for all three species. Based on the IUCN threats calculator, the threats assessment is High to Very High for Hoary Bats, Eastern Red Bats, and Silver-haired Bats.

Wind energy development is the most immediate and concerning threat. Hoary Bats, followed by Silver-haired Bats, and then Eastern Red Bats, account for most fatalities at wind turbines in Canada. The number and extent of wind energy facilities (hereafter "buildout") will continue to increase substantially across the range of these species.

As obligate insectivores, the global decline of insects is of particular concern for these bats, similar to that for migratory birds that are also aerial insectivores. The causes of insect declines are likely multifactorial, cumulative, and difficult to reverse. While long-term abundance data do not exist for migratory bats, they are likely just as affected by widespread declines in prey as birds with similar diets.

Other threats include chemical and noise pollution, as well as deforestation that results in the loss of roosting habitat. However, these threats are considered to have a low impact over the next three generations for all three species.

Protection, Status and Ranks

None of these bats receive special protection in Canada, except in Québec where they are integrated on the Liste des espèces susceptibles d'être désignées menacées ou vulnérables (list of wildlife species likely to be designated threatened or vulnerable). Québec is also the only province to have established a recovery strategy for Eastern Red Bats. In most jurisdictions, in conjunction with other wildlife, they are provided general protection by provincial and territorial wildlife acts. In 2018, Hoary Bats and Eastern Red Bats were added to Appendix II of the Convention on Migratory Species (CMS), based on their "unfavourable conservation status" related to the rapid expansion of wind energy and a need for international cooperation for their conservation.

All three species are ranked as Least Concern in the IUCN Red List, but key threats identified in this assessment were not considered. In contrast, NatureServe's global status (G ranks) for all three species is G3G4 rounded to G3 (Vulnerable). The national status (N ranks) for all of these bats in Canada by NatureServe is N5B, NUM; that is the breeding population is assessed as Secure, while the status of the migratory population is Undetermined. Status of each of these three bat species assessed in each province, territory, or state (S ranks) is variable, likely reflecting more about the state of knowledge in each jurisdiction rather than their actual conservation status.

Source: COSEWIC. 2023. COSEWIC assessment and status report on the Hoary Bat Lasiurus cinereus, Eastern Red Bat Lasiurus borealis and Silver-haired Bat, *Lasionycteris noctivagans*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxi + 100 pp.

> For more information, please visit https://species-registry.canada.ca/index-en.html

Riverine Clubtail

Environment and

Photo: © Allan Harris

Scientific name Stylurus amnicola

Taxon Arthropods

COSEWIC status **Special Concern**

Canadian range

Manitoba, Ontario, Quebec

Reason for designation

This rare dragonfly is known in Canada from at least 17 subpopulations found on 22 rivers across Manitoba, Ontario, and Quebec. In the last decade, there have been records from several new rivers although the species is cryptic and occurs in low abundance, thus these records do not suggest a range expansion. The species appears to favour rivers with mostly sandy substrates with clear to slightly turbid water. It is vulnerable to the cumulative threats, primarily those that have the potential to impact water quality and riparian habitat, including pollution, loss of forest cover from agricultural, forestry, industrial and residential, development, and transportation.

Wildlife Species Description and Significance

Riverine Clubtail (Stylurus amnicola) is a medium-sized (47-49 mm long), slender, blackish dragonfly, with yellow spots on the abdomen. In males, the abdomen terminates in a prominent club. The front of the thorax has a distinctive Tshaped thoracic collar that distinguishes this species from other clubtails in the genus Stylurus. Many odonate species are considered indicators of good water quality. Riverine Clubtail is rare and not well known by the public.

Distribution

Globally, Riverine Clubtail ranges in North America from Manitoba eastward to Quebec in the north, southward through Minnesota and Vermont to Louisiana and central Georgia. In Canada, Riverine Clubtail ranges from southeastern Manitoba through southwestern Ontario, to southeastern Quebec. In Canada. there are 17 extant subpopulations located on 22 rivers.

In the first COSEWIC status report, Riverine Clubtail was assessed as three separate Designatable Units (DUs): the Boreal population (Ottawa River and St. Lawrence River valleys of Quebec): the Great Lakes Plains population (central north shore of Lake Erie in Ontario), and the Prairie population (southcentral Manitoba). Since this initial assessment, the species has been recorded at several new sites on rivers in Ontario and Quebec, as well as additional sites in the United States. These new data occur within areas that show the three DUs are geographically connected and no longer support a three DU structure. Riverine Clubtail is now being assessed as one DU.

Canadian range of Riverine Clubtail (*Stylurus amnicola*) including all 17 known subpopulations. Map by Alain Filion (COSEWIC Secretariat).

Source: COSEWIC. 2023. COSEWIC assessment and status report on the Riverine Clubtail Stylurus amnicola in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 78 pp.

Habitat

Riverine Clubtail occurs in riverine habitats ranging in size from the large St. Lawrence River to medium-sized creeks, generally where the riparian canopy does not completely cover the width of the channel. The species is typically found in rivers with predominantly sandy substrates, and clear to slightly turbid water; these waters are required for larval development and adult breeding habits (e.g., mate selection and egg laying). After emerging from the water, adults disperse and feed in the forest canopy before returning to find a mate and lay eggs at the water's surface.

Biology

Riverine Clubtail has three distinct morphological forms: egg, larvae (nymph) and adults. Female adults lay eggs over fast-flowing, open sections of the river; eggs then drift downstream to hatch in pools and slower-flow waters. Larvae remain in the water and bury under soft sediments, with only the tip of the abdomen extended into the water column for respiration. Larvae rapidly extending their mouthparts to capture small benthic invertebrates and as larvae get larger, prey items include small fish and tadpoles. Larvae spend 2-4 years in aquatic habitats and when larvae are ready to become adults, they crawl onto sandy banks or nearby vegetation, shed their skin through a process called ecdysis, and emerge as adults. In Canada, adult emergence occurs from late June or early July and adults fly until early September. Males establish small territories and swiftly patrol small sections of river, often around fast, open water, waiting for females to fly into their territories.

Photo: © Peter Mills

Population Sizes and Trends

Population sizes or trends for Riverine Clubtail in Canada are unknown.

Threats and Limiting Factors

The primary threats to Riverine Clubtail are those that impact water quality and riparian habitat. Several subpopulations in Ontario and Manitoba occur in a landscape dominated by agricultural land use. Dams continue to alter water levels on the rivers where Riverine Clubtail occurs, although the species persists at these sites. Climate change may also be a threat to this species, since more extreme weather events increase the chance of mortality particularly for emerging larvae and adults. The habitat for subpopulations located in central/northern Ontario and the more northern areas of Quebec are heavily forested, and as a result are likely to maintain good water quality and shoreline habitats. Riverine Clubtail habitat is likely limited by the species' preference for sandy bottomed rivers with riparian vegetation.

Protection, Status and Ranks

The Great Lakes Plains population (DU) is listed as Endangered under the federal *Species at Risk Act* (SARA) and provincially

in Ontario under the *Endangered Species Act.* Critical Habitat for the Great Lakes Plains population of Riverine Clubtail (as per the federal recovery strategy) includes instream environments where the species occurs and 200 m of surrounding shoreline habitat. Riverine Clubtail is not protected under the *Loi sur les espèces menacées ou vulnérables du Québec* (Act representing threatened or vulnerable species) or under Manitoba's *Endangered Species and Ecosystems Act.*

Source: COSEWIC. 2023. COSEWIC assessment and status report on the Riverine Clubtail *Stylurus amnicola* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xii + 78 pp.

For more information, please visit <u>https://species-registry.canada.ca/index-en.html</u>

lScalv Frinae Lichen

Environment and

Photo: © Alain Belliveau

Scientific name Heterodermia squamulosa

Taxon Lichens

COSEWIC status Threatened

Canadian range New Brunswick, Nova Scotia

Reason for designation

Within Canada, this lichen only occurs only in Nova Scotia and New Brunswick on old undisturbed hardwood or mixedwood forests without signs of past forest harvesting. The small Canadian population (less than 550 thalli on 145 known host trees) is projected to decline as a result of threats. These include forest harvesting, road construction, and residential development that lead to the loss of host trees or open the forest canopy that makes the habitat unsuitable for the lichen. In addition, air pollution, and the Emerald Ash Borer are other factors that are likely to contribute to the projected decline.

Wildlife Species Description and Significance

Scaly Fringe Lichen (Heterodermia squamulosa) is a rare lichen that grows on the bark of hardwood trees in old forests, which are now rare in Atlantic Canada. This leafy lichen usually has small pale grey lobes and numerous upright lobules. The disc shaped fruiting bodies (apothecia) have only once been found in Canada and once in the USA, being extremely rare in North America.

Distribution

Scaly Fringe Lichen has a disjunct global distribution across North, Central and South America, and also occurs in Africa and Asia. The global population is primarily concentrated in the southern and central Appalachians of the USA. In Canada, this lichen is at the northern, colder, limit of its range. It is found mainly in Nova Scotia but is also known from New Brunswick.

Subpopulations of Heterodermia squamulosa in Canada. Green dashed polygons and blue dashed polygons group together occurrences within each subpopulation in New Brunswick and Nova Scotia, respectively (Map: Alain Belliveau).

Source: COSEWIC. 2022. COSEWIC assessment and status report on the Scaly Fringe Lichen Heterodermia squamulosa in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 54 pp.

Habitat

In Canada, Scaly Fringe Lichen is only found within 50 km of the coast and lives almost exclusively in old hardwood or mixedwood forest with no obvious signs of past forest harvesting. It is found on living Yellow Birch, Sugar Maple, Red Maple, and White Ash trees that grow on reasonably nutrient-enriched soils in both wetland and upland habitats.

Biology

Lichens are symbiotic organisms, formed by the association of a fungus and a photosynthetic green alga or cyanobacterium. Scaly Fringe Lichen is a symbiosis between the *Heterodermia squamulosa* fungus and *Trebouxia*, a green alga. The generation time for Scaly Fringe Lichen individuals is thought to be 19 years. The lichen's primary means of reproduction is by vegetative lobules, which are relatively heavy, or thallus fragments which means that dispersal is mostly limited to short distances (i.e., within a forest stand). The species very rarely forms fruit bodies in North America.

Population Sizes and Trends

Scaly Fringe Lichen occurs in Nova Scotia and New Brunswick where 31 occurrences have been found. These occurrences form 14 subpopulations. The enumerated population is 515 thalli growing on 145 trees. The occurrence at Cape Split (Scots Bay subpopulation) comprises approximately 50% of all the known thalli on about 50% of the colonized host trees. While more than 73 previously-undocumented thalli and 31 previously-unknown host trees were discovered in the extensive 2019-2020 surveys that were done in association with this report, the total known number of thalli is still small. The total population in Canada is estimated to be fewer than one thousand thalli. Overall, as a result of the threats described below, the population appears to be in decline at sites where remeasurements exist.

Threats and Limiting Factors

The main threats to Scaly Fringe Lichen are the harvesting of host trees and the construction of roads leading to habitat disruption. Other threats that affect the Scaly Fringe Lichen or its host trees include climate change, air pollution (particularly acid rain), the invasive Emerald Ash Borer, and land development. The limiting factors for this lichen include short dispersal distance, a limited amount of suitable habitat and being, in Canada, at the northern edge of its climatic and geographic range.

Protection, Status and Ranks

Scaly Fringe Lichen has a global rank of G3G5 (Vulnerable to Secure), a national rank of N3 (Vulnerable), a New Brunswick rank of S1 (Critically Imperiled), and a Nova Scotia rank of S3 (Vulnerable). It has a status of SNR (unranked) in Québec where the lichen was reported in the past, based on an incorrectly identified specimen that was a different species. Approximately 32% of Scaly Fringe Lichen host trees in Canada currently occur within protected areas.

Source: COSEWIC. 2022. COSEWIC assessment and status report on the Scaly Fringe Lichen Heterodermia squamulosa in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 54 pp.

For more information, please visit <u>https://species-registry.canada.ca/index-en.html</u>

Silver-haired Bat

Photo: © Brock and Sherri Fenton

Scientific name

Lasionycteris noctivagans

Taxon Mammals

COSEWIC status Endangered

Canadian range

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

Reason for designation

This large-bodied bat has black to dark brown fur often with silver or grey tips and is found across Canada in the summer months and during fall migration. Some individuals overwinter in British Columbia and southern Ontario, however most migrate out of Canada annually. This seasonal migration exposes individuals to a variety of threats including risk of mortality at wind energy Although there is considerable facilities. uncertainty regarding the exact rates of decline for these bats across Canada, declines in carcass counts at wind energy facilities suggest declines far in excess of 50% over three generations. The planned increase in wind power capacity will increase this threat but mitigation is possible. Other threats to this species include ongoing and widespread declines in insect abundance. loss of forested roosting and foraging habitat, and pollution.

Wildlife Description Species and Significance

Hoary Bats, Eastern Red Bats, and Silver-haired Bats are medium to large in body size relative to other bats species in Canada, with Hoary Bats being the largest species in Canada. All three species have complex and varied colouration that aids in camouflage while roosting or hibernating. These three species of bats are similar in that they mostly roost in trees, migrate long distances between summer breeding grounds and their winter range, are long-lived, give birth to more than one pup per year, and share similar diets and ecomorphology.

There is no evidence of population genetic structure in any of these three species. There is only one designatable unit for each species in Canada.

Distribution

All three species of these bats are widely distributed in North America, found from the northern boreal forest to central Mexico. In Canada, the three species have a range that extends from British Columbia to the Atlantic provinces during the summer, although their extent of occurence in Prince Edward Island, and the territories is uncertain. These species migrate seasonally from northern summer ranges to southern wintering areas outside of Canada; however, some Silver-haired Bats overwinter in British Columbia and around the Great Lakes.

Approximate distribution of Silver-haired Bat

Source: Nagorsen and Nash 1984, Parker et al. 1997, Lucas and Hebda 2011, Stantec Consulting Ltd 2012, Blejwas et al. 2014, Wilson et al. 2014, GBIF.org 2020, Lausen et al. in press, BC Community Bat Program unpub. data.

Habitat

Habitat requirements for these species include foraging, drinking, and roosting habitats, with the latter considered the most limiting. All three species roost in trees; however, Hoary Bats and Eastern Red Bats roost by hanging from branches, and Silver-haired Bats roost in tree cavities or under exfoliating bark.

All three species catch aerial insects while in flight. Foraging habitats vary for all three species but include wetlands, open areas, and edge or gap habitats in forested landscapes.

Biology

All three species migrate seasonally. They are relatively fast flyers that hunt most often in open habitats or along habitat edges and within canopy gaps in forested landscapes. They are obligate insectivores that prey on aerial insects. These species are relatively fecund compared to other bats. They likely first give birth in their second year. Hoary Bats and Silver-haired Bats usually have twins, but Eastern Red Bats may have up to four pups.

Vital rates (survival, longevity, age-structure, etc.) are mostly unknown but it is infered from similar, related species that they are relatively long-lived, with maximum lifespans of at least 12–15 years. Generation time is unknown but estimated at 2-6 years based on IUCN methodology and inferences for similar bats.

Population Sizes and Trends

The primary means used to assess relative abundance of bats include mark-recapture studies, and emergence counts. However, coordinated North American wide monitoring for bats (e.g., NABat) has not occurred for long enough in Canada to generate population trend data. Given the limitations, multiple sources of information were used to assess population trends, including carcass searches at wind energy facilities, changes in capture and acoustic detection rates, rabies submission rates, and population viability modeling that relied on expert estimates.

Current population levels for all three species are unknown; however, experts postulated that the most-likely population size of Hoary Bats across North America is approximately 2.25 million individuals. Given the similarities in life-history and ecology, it was assumed that this estimate can also be broadly applied to Silver-haired Bats and Eastern Red Bats.

In 2007, expert elicitation and projected fatality rates were used to model the effect of wind energy production on Hoary Bat populations in North America. Models were based on variable initial population size, levels of wind energy buildout and fatality rates from the year 2014 and favourable population growth rates without mortality due to wind turbines. That is, the models only considered additive mortality as a result of fatalities at wind turbines, not other threats. Some plausable models suggested that Hoary Bats will decline by 50% to 90% in the next 50 years; a 1.4% to 4.5% annual decline. The "most likely" demographic scenario predicted that fatalities associated with wind energy facilities would result in a 90% population decline over a 50 years with a probability of extinction of 22% over the next

100 years. Follow-up studies that included population models accounting for projected buildout, with and without any mitigation to reduce fatality rates, estimated extinction risk at 0-40% by 2050 based on various build out senarios with a mid-point of 20%. These results suggest that significant population declines may have already occurred if the initial population size of Hoarv Bats was below 3 million individuals. Recently, independently-derived multiple. genetic estimates of effective population size of all three species across North America also suggest their current population sizes are well below 3 million. It is expected that similar probabilities apply to Eastern Red Bats and Silver-haired Bats; however, neither of these species has been explicitly modelled.

In support of the decline suggested by population modelling for Hoary Bats, there are multiple lines of evidence to suggest that population declines are occurring in migratory tree-roosting bats including declining capture rates of lasiurine (bats within the genus *Lasiurus*) bats, and a decrease of annual rabies submissions. Change in fatality rates at wind turbines, change in capture and acoustic detection rates, and change in rabies submission rates all suggest declines for all species.

In Ontario, the number of carcasses found under wind turbines during the late summer and autumn migration declined significantly over seven years and recent occupancy modelling in the US Pacific Northwest provides evidence of decline in the regional occurrence probability of Hoary Bats (2016–2018 relative to 2010). Multi-year acoustic and capture studies also provide evidence for population changes for all three species. In the US, all three species have declined in terms of the proportion of overall bat submissions for rabies testing.

Threats and Limiting Factors

These three bat species face several threats, some of which are common to all bats found in Canada, while others are more specific to these migratory species. Several threats contribute cumulatively to suspected declines for all three species. Based on the IUCN threats calculator, the threats assessment is High to Very High for Hoary Bats, Eastern Red Bats, and Silver-haired Bats. Wind energy development is the most immediate and concerning threat. Hoary Bats, followed by Silver-haired Bats, and then Eastern Red Bats, account for most fatalities at wind turbines in Canada. The number and extent of wind energy facilities (hereafter "buildout") will continue to increase substantially across the range of these species.

As obligate insectivores, the global decline of insects is of particular concern for these bats, similar to that for migratory birds that are also aerial insectivores. The causes of insect declines are likely multifactorial, cumulative, and difficult to reverse. While long-term abundance data do not exist for migratory bats, they are likely just as affected by widespread declines in prey as birds with similar diets.

Other threats include chemical and noise pollution, as well as deforestation that results in the loss of roosting habitat. However, these threats are considered to have a low impact over the next three generations for all three species.

Protection, Status and Ranks

None of these bats receive special protection in Canada, except in Québec where they are integrated on the Liste des espèces susceptibles d'être désignées menacées ou vulnérables (list of wildlife species likely to be designated threatened or vulnerable). Québec is also the only province to have established a recovery strategy for Eastern Red Bats. In most jurisdictions, in conjunction with other wildlife, they are provided general protection by provincial and territorial wildlife acts. In 2018, Hoary Bats and Eastern Red Bats were added to Appendix II of the Convention on Migratory Species (CMS), based on their "unfavourable conservation status" related to the rapid expansion of wind energy and a need for international cooperation for their conservation.

All three species are ranked as Least Concern in the IUCN Red List, but key threats identified in this assessment were not considered. In contrast, NatureServe's global status (G ranks) for all three species is G3G4 rounded to G3 (Vulnerable). The national status (N ranks) for all of these bats in Canada by NatureServe is N5B, NUM; that is the breeding population is assessed as Secure, while the status of the migratory population is Undetermined. Status of each of these three bat species assessed in each province, territory, or state (S ranks) is variable, likely reflecting more about the state of knowledge in each jurisdiction rather than their actual conservation status.

Source: COSEWIC. 2023. COSEWIC assessment and status report on the Hoary Bat Lasiurus cinereus, Eastern Red Bat Lasiurus borealis and Silver-haired Bat, *Lasionycteris noctivagans*, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxi + 100 pp.

> For more information, please visit https://species-registry.canada.ca/index-en.html

Small-flowered Sand-verbena

Environment and

Photo: © Candace Neufeld

Scientific Name Tripterocalyx micranthus

Taxon Vascular Plants

COSEWIC Status Special Concern

Canadian Range

Alberta, Saskatchewan

Reason for designation

The population of this annual, drought-tolerant plant, which occurs in sand dune and coulee/river valley complexes in prairie grasslands, varies annually depending upon the conditions for germination and growth. The seed bank maintains the population during times of drought, until environmental conditions spark germination. The stabilization of its habitat due to fire suppression, changing grazing regimes, changing climate, and encroachment of invasive species are an ongoing concern. However, the discovery of more sites, improved monitoring of subpopulations, and a change in the application of criteria for assessment have resulted in an improved at-risk status.

Wildlife Species Description and Significance

Small-flowered Sand-verbena (Tripterocalyx micranthus) is a drought-adapted, annual, vascular plant species, and one of only a few plant species in the four o'clock family (Nyctaginaceae) that occur in the dry grasslands of Canada.

Distribution

Small-flowered Sand-verbena occurs in the dry ecoregions of western North America. In Canada, it occurs at the northern edge of its range in southeastern Alberta (six subpopulations) and Saskatchewan southwestern (four subpopulations).

Source: COSEWIC. 2022. COSEWIC assessment and status report on the Small-flowered Sand-verbena Tripterocalyx micranthus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 45 pp.

Habitat

Small-flowered Sand-verbena plants occur in patches of open sand found within two types of dynamic landscape mosaics: active sand dunes (low and high) and active coulee/river valley complexes. Within these landscape mosaics, suitable habitat patches appear and disappear over time, in response to disturbance and stabilization processes. Dynamic landscape mosaics appear to be available across the Mixed Grassland Ecoregion of Canada, providing habitat for potential subpopulation and population expansion. Within available landscape mosaics, the number and distribution of suitable habitat patches is not known, but there has been a general increase in patch stabilization in the sand dunes of southern Canada. In addition to plant habitat patches, the seed bank occupies a different distribution within a landscape mosaic, with the buried seed bank occurring in threedimensional patches that do not precisely correspond to the same area occupied by the plants. Suitable habitat for maintaining high viability of seeds in the seed bank for long-term storage is not known.

Biology

Small-flowered Sand-verbena is an annual plant that is adapted for hot, dry, and windy conditions with succulent leaves, sturdy taproot, lowgrowing form, and ability to grow fast and reproduce rapidly once it has germinated. The large, winged seeds of this species have a chemical in the seedcoat that prevents premature germination in potential drought conditions, and as such has specific moisture requirements needed to break dormancy and promote germination. Seeds can initiate germination at any point in the growing season when conditions are appropriate. Once ripe, winged seeds drop to the ground and overwinter in the seed bank, germinating in future years. Large, hardened seeds are often buried as a result of the dynamic processes that shape the landscape mosaic, potentially creating a deep seed bank and a longterm seed source, regardless of the conditions at the surface. Some individuals may spend more time as a seed than a plant due to the exacting germination needs coupled with this species' long-term survival strategy. Seed bank viability has not been studied for this species, but there are sufficient indications that suggest that the reduction in seed viability is slower than previously reported and seeds may even remain viable for decades.

Population Sizes and Trends

Population size and trends for the Canadian population of this annual plant species cannot be accurately described because the current data compilation does not represent annual observations for each subpopulation. However, by summing the average plant count between 2000 and 2021 for each subpopulation, the Canadian population size was estimated at 5,152 plants. Some insight into plant population trends for this species are available for the CFB Suffield NWA subpopulation because of a ten-year monitoring program between 2011 and 2020. This subpopulation exhibited a stable to increasing trend in number of plants and areal extent. For this subpopulation, both number of plants and areal extent fluctuated from year to year, and in one case the number of plants fluctuated by an order of magnitude within the span of a year but because of the seed bank, the species does not undergo extreme fluctuations.

Threats and Limiting Factors

Threats to this species include encroachment of open habitat patches by native and non-native plants; destruction of plants through heavy trampling, road grading, and off-road vehicle use; conversion of land through oil and gas, sand extraction, transportation, and cultivation activities, which remove habitat patches and, in some cases, portions or all of the seed bank.

The primary limiting factor for this annual plant is associated with the specific environmental conditions needed for germination-these appear less frequently in a changing climate. The availability of suitable habitat patches also limits Small-flowered Sand-verbena. Within а landscape mosaic, the cumulative effect of land uses and land management practices on the disturbance and stabilization regimes threatens the natural dynamic equilibrium, which could result in reducing the number of suitable patches needed by the species.

Protection, Status and Ranks

Small-flowered Sand-verbena was originally designated by COSEWIC as Threatened in 1992.

Status was re-examined and designated Endangered in 2002 and Special Concern in 2022. In 2005, Small-flowered Sand-verbena was listed as Endangered under Canada's *Species at Risk Act* (SARA). In the provinces where it exists, this species is listed as Threatened under Alberta's *Wildlife Act Regulations* and Endangered under Saskatchewan's *Wild Species at Risk Regulations*.

In Canada, Small-flowered Sand-verbena's national conservation status rank is Imperilled (S2). It is also ranked as Imperilled in both Alberta and Saskatchewan. In the United States where this species is ranked, ranks range between Critically Imperilled (S1) and Secure (S5), and in the neighbouring states of Montana and North Dakota, this species is unranked and not ranked, respectively.

Source: COSEWIC. 2022. COSEWIC assessment and status report on the Small-flowered Sandverbena *Tripterocalyx micranthus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiii + 45 pp.

For more information, please visit <u>https://species-registry.canada.ca/index-en.html</u>