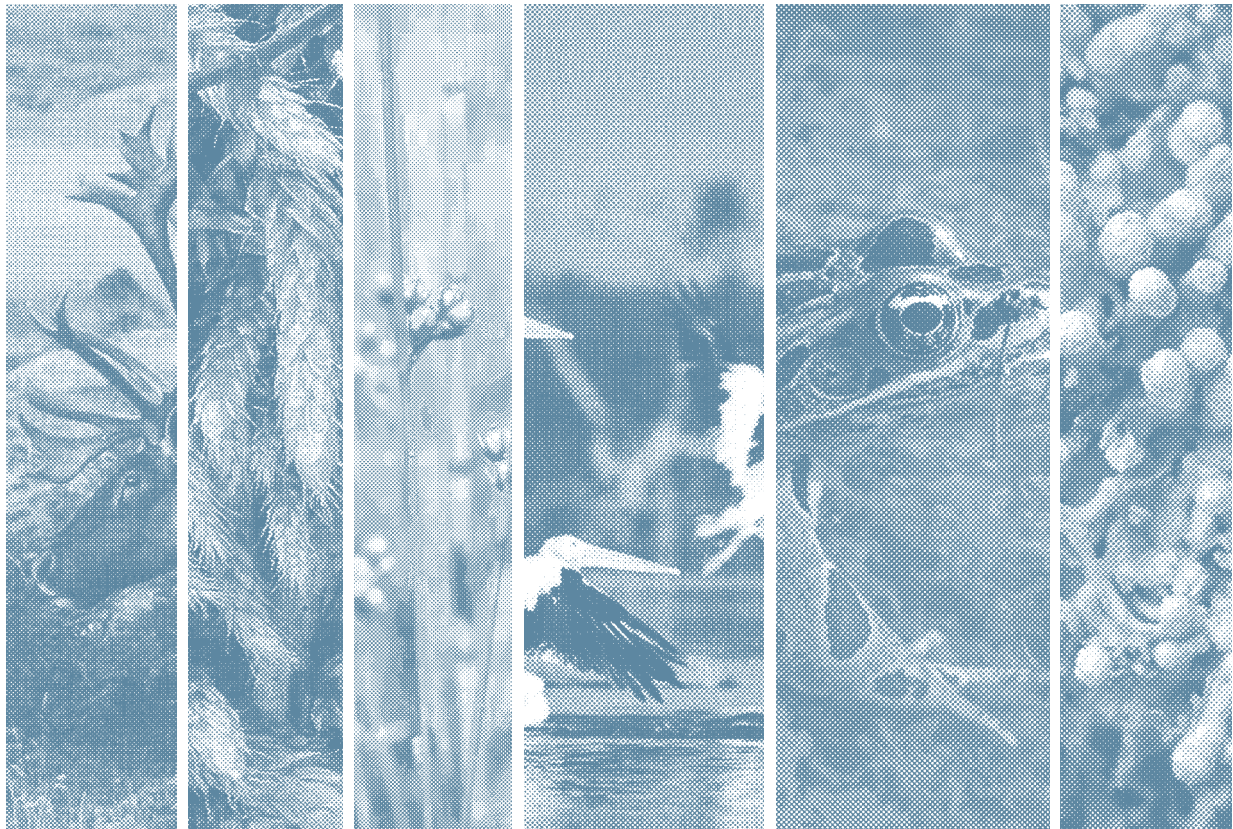


# SPECIES ACCOUNTS FOR HIGH-RISK FLORA AND FAUNA IN NORTHWEST ALBERTA

A Guide to Recognition, Species Issues, and Mitigation Opportunities





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Individual photo credits and species-specific research citations are also included following each species account.



# INTRODUCTION

The northwest region of Alberta is known to support a great diversity of flora and fauna, including a large collection of invertebrates that are understudied or have not been inventoried.

Within that diversity, a number of species are considered to be more sensitive to anthropogenic activity and habitat alteration than other species. Historically, extensive regulator and scientific attention has tended to focus on developing mitigative solutions for a small set of charismatic forest species that are of higher profile as a consequence of their “at-risk” status (endangered or threatened) and their public appeal. Relatively limited or sporadic attention has been invested in the broader collection of other forest species recognized to be sensitive, rare, isolated in range, of special concern, and/or potentially at-risk; these “high-risk” species are from a variety of taxa that occur in a broad range of habitat types. One of the primary objectives of this reference product is therefore to heighten awareness about the range of sensitive species within the region.

This reference product has been developed voluntarily by Daishowa Marubeni International Ltd. (DMI) to provide a consolidated information source of key facts on species status, distribution, ecology, and habitat requirements in northwest Alberta. Further, this document generally identifies limiting factors for species success, and identifies beneficial practices that may contribute to species persistence or recovery in areas impacted by human activity. As a condensed reference resource, its usefulness will serve a variety of regional forest industry corporations, forestry practitioners employed by industry, government or field-consultant employers within the region, as well as forest workers and general public interests. Improved awareness of these species and their sensitivities potentially represents new opportunities for natural resource professionals in the region to collaborate in innovative ways and to evaluate current practices, in an effort to prevent additional species from being designated “at-risk”.

While the most current literature was used to compile this document, information on species distribution, ecology, habitat requirements, and mitigation opportunities specific to northern Alberta is largely unavailable for many species. Consequently, this product also highlights the need for continued scientific research and inventories in northern Alberta which may be undertaken as a collaboration between forest managers in the region, the academic community, and other scientific organizations. At the very least, heightened awareness of these species should encourage increased reporting of sightings, since in some cases the range or distribution of individual species is in itself a subject of weak understanding in northern Alberta.

## SPECIES SELECTION CRITERIA

One of the objectives of this project was to foster a broader appreciation among forest practitioners and the local public about the extent of sensitive species, in all taxa, that occur within this region of the province. Northwest Alberta contains a distinct collection of forested natural regions defined by combinations of terrain, elevation, soil-type, vegetative cover and moisture regime. The region also contains a blend of forested lands, aquatic/riparian habitats, aspen parkland transition, and active agricultural (prairie) areas. Since historical industrial activities tend to operate within or near all of these areas, DMI deliberately elected to include sensitive species associated with all such areas in this reference guide. This distinctly recognizes the trans-boundary nature of ecological functions and species that persist within or across individual habitat types.

Additionally a number of species were included that might present debate concerning their presence, absence, or distribution in northwest Alberta. Despite weak understanding of the extent of their range within northern Alberta or a lack of robust data on the Alberta distribution of many lower profile species, a number have been observed in the region historically. Suitability of local habitat and climate conditions might also suggest reasonable expectation of their presence. In some cases, northwest Alberta is considered ‘fringe-range’ for these species. Recognizing that northwest Alberta’s biotic inventory is still fairly young or deficient in many cases, DMI has deliberately elected to compile a list of “high-risk” species for this area from a conservative or precautionary perspective. It is hoped that this product will assist the detection and reporting of future sightings by field-staff who learn to recognize the species included in this compilation, so that improved observation-records will result.

From the broad collection of wild species existing (or suspected to exist) within northwest Alberta, those of high-risk or potential sensitivity were identified and isolated by reviewing a variety of sources that regularly publish lists of species and their rankings, including:

- The General Status of Alberta Wild Species
- Alberta Natural Heritage Information Centre – ANHIC (S1 and S2 rated species only)
- Federal Species at Risk Act (SARA) (Schedules 1,2, and 3)
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Included in this product are species that are rated in any one of these organizations as: endangered or threatened (at-risk), may-be-at-risk, sensitive, vulnerable, special concern, S1 or S2, or similar. The defining descriptions of the various categories of sensitivity-status are available on the respective organization websites. Recognizing that status rankings are continually under review and changing within all of the above sources, the current list of species ‘included’ in this product reflect ratings available during the spring of 2007.



## USE OF THIS REFERENCE PRODUCT

While Alberta stipulates no specific requirements on forest companies to compile and produce a reference product on high-risk species, DMI believes that this 'region-specific' product will be highly useful for a variety of regional audiences including the forest practitioner community in particular.

This project addresses a common need in assisting to demystify the issues and mitigation opportunities associated with a lengthy list of sensitive species in northern Alberta, because it presents a consolidated, plain-language summary per species of general life history requirements and management opportunities to assist their persistence. The key practical application objective is to provide improved awareness of the large diversity of high-risk species in northwest Alberta, the general issues of impact(s) to their healthy persistence, central mitigation challenges, and general links to forest practices. The visual format has been designed to reach a variety of audiences: forest practitioners, forest contractors and operators, professional forestry-services consultants, public advisory groups, and the general public (adults and high school students).

Species accounts have been grouped into two main categories: flora (vascular and non-vascular plants) and fauna (vertebrates and invertebrates). Fauna species have been further divided into smaller taxonomic groupings, including: amphibians, reptiles, fish, birds, mammals, and arthropods. Within these smaller groupings, species are organized taxonomically by family, which represent more closely-related species. Similarly, flora have been organized by vascular or non-vascular plants and placed into one of the following functional groups: liverworts, mosses, lichens, ferns, aquatic plants, grass-like, wildflowers, and shrubs. Within these categories, species have been grouped alphabetically by family.

The organization and content of species summary-information varies between flora and fauna groupings. The emphasis of information presented for fauna was developed with the goal of providing a simple consistent format to assist clarity of linkages between species ecology and general habitat requirements, species sensitivity issues, and forest practice mitigation opportunities (beneficial practices). In contrast, flora species accounts focus on species identification and recognition, given the lack of basic ecology and habitat information for northern Alberta (and elsewhere) for the majority of these species. Also, given that the limiting factors and opportunities for management of flora are similar between functional groups, issues concerning limiting factors and opportunities for mitigation for all vascular and non-vascular plants are presented together in an introduction preceding the flora species accounts. Wherever available, images have been provided to assist species field-recognition for both flora and fauna.

In order to assist the user with a quick reference for general habitat associations for fauna species, habitat icons have been incorporated into each species account. Habitat icons representing the following habitats have been included:



**Aquatic:** represents species that are aquatic, semi-aquatic, or are associated with riparian habitats.



**Grassland:** represents species that occur in open habitats that are dominated by grasses or grass-like vegetation.



**Deciduous forest:** represents species that occur in forests that are dominated by trees with broad leaves that fall off at the end of each growing season, such as trembling aspen and balsam poplar.



**Coniferous Forest:** represents species that occur in forests dominated by cone-bearing trees that have needles or needle-like leaves that are generally considered to be "evergreen", such as pine and spruce.



**Mixedwood Forest:** represents habitats where there is a mixture of both deciduous and coniferous trees occurring together in the same forest stand.

Habitat icons were not included in species accounts for flora, given that many of the habitat associations of the plants included in this publication are understudied and/or not well established.

For each of the vertebrate and invertebrate species included in this document, a distribution map specific to northwest Alberta has been included for reference. The distribution maps were produced using a variety of sources, including species status reports published by Alberta Sustainable Resource Development and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Additionally, Alberta field guide references for amphibians and reptiles (Russell and Bauer 2000), fish (Nelson and Paetz 1992; Joynt and Sullivan 2003), birds (McGillivray and Semenchuck 1998), mammals (Pattie and Fisher 1999), and butterflies (Bird et al 1995) were used to supplement distribution information from federal and provincial status reports, or were used to create distribution maps where species status reports were unavailable. Species range maps were overlaid on a provincial base map using GIS, with major regional cities and towns (Grande Prairie, Peace River, and High Level), lakes and rivers, and roadways displayed for spatial reference. The maps portray, in yellow, combined species distribution including: year-round residence, summer/breeding-season residence, and area of winter residence specific to northwest Alberta. In instances where the area of interest falls outside of the species core range, but where historical records indicate potential occurrence, range maps were labelled "uncommon" to reflect the potential for occasional sightings of these species. In instances where species range information is lacking or incomplete for the area of interest, range maps were labelled "understudied" to reflect the lack of understanding with respect to that species distribution in northwest Alberta. Range maps for flora species were not included, given the lack of distribution information available for the majority of species included in this publication. Instead, a description of range and distribution has been provided, with specific information on distribution within Alberta, if available.

This reference product was specifically designed in a digital-format that would enable users to view the contents as-is, or to print the PDF-based (Adobe™) content for field-use (i.e. for compilation into binder-format). Our goal is widest distribution within the region. Copies of this product can be obtained by request to:

**Daishowa-Marubeni International Ltd, Peace River Pulp Division  
Forest Resources Business Unit**

Attention: Forest Resource Coordinator –Biodiversity Stewardship  
Postal Bag 6500, Pulp Mill Site  
Peace River, AB T8S 1V5  
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Forest Resource Coordinator -Biodiversity Stewardship  
Daishowa Marubeni International Ltd, Peace River Pulp Division



# AMPHIBIANS



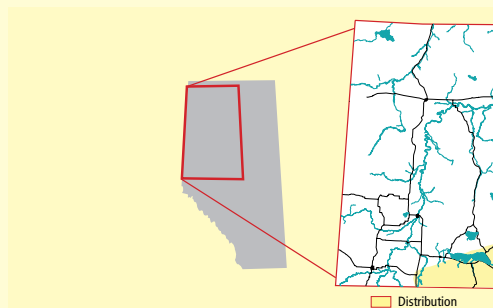




# NORTHERN LEOPARD FROG (*Rana pipiens*)



**THE NORTHERN LEOPARD FROG**, a pond-breeding amphibian, occurs mainly within the Grasslands and Parkland Natural Regions of Alberta. The only known remaining northern population occurs east of Wood Buffalo National Park, within the Canadian Shield Natural Region.



PROVINCIAL	ANHIC	SARA	COSEWIC
At risk	S2S3 G5	Special concern (Schedule 1)	Special concern

## HABITAT

Northern leopard frogs require both aquatic breeding habitat and terrestrial habitat, with good connectivity between these habitats, to fulfill biological requirements. These frogs are not forest-dwelling and are therefore not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT //** Northern leopard frogs breed from April to June in temporary ponds and shallow lakes with water that persists until late July or August.

Preferred breeding habitats include fishless ponds and lakes that contain a mixture of emergent vegetation and open water with a pH ~6.5.

Eggs are laid in shallow water on vegetation and branches, or on bottom substrates.

**SUMMER RANGE //** Following spring breeding and metamorphosis, juvenile and adult frogs move to summer feeding areas which are typically open or semi-open wetlands with short shoreline vegetation; they avoid water bodies with no vegetation or tall dense marsh vegetation. Summer feeding areas may also include native grasslands, pastures, and fields.

**WINTER RANGE //** Northern leopard frogs overwinter under rocks or in the mud at the bottom of well oxygenated (>7ppm dissolved oxygen) lakes, ponds, streams, or wetlands that do not freeze to the bottom, but have water temperatures <4°C.

**FORAGING //** Adult northern leopard frogs are carnivorous, foraging on moving prey such as insects, arachnids, small birds, garter snakes, and other invertebrates; they may also cannibalize newly metamorphosed frogs.

Tadpoles feed on floating vegetation and detritus.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Wetland loss.
- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.

### OTHER ISSUES //

- Climate change.
- Disease and pathogens.
- Chemical toxins and pollutants.
- Introduction of exotic species.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and aquatic habitat protection.

# NORTHERN LEOPARD FROG (*Rana pipiens*)

## SELECTED REFERENCES

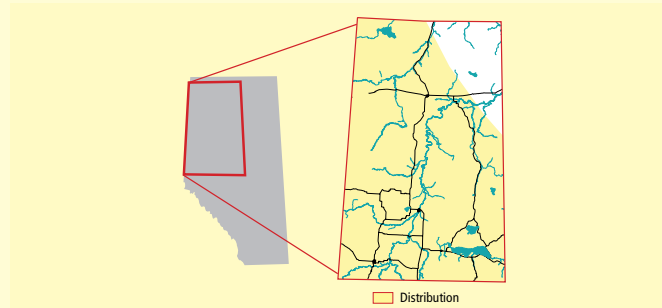
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**Photo Credit:** Kris Kendell, Alberta Conservation Association

# WESTERN TOAD (*Bufo boreas*)



**THE WESTERN TOAD**, also known as the boreal toad, is an aquatic-breeding amphibian found throughout the Rocky Mountain and Foothills Natural Regions, and in the western portions of the Parkland, Grasslands, and Boreal Forest Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S4 G5T5	Special concern (Schedule 1)	Special concern

## HABITAT

Western toads require aquatic-breeding habitat and terrestrial habitat to fulfill biological requirements. Metamorphosed toads spend the majority of their time in terrestrial upland habitats located near breeding ponds; while not associated with seral stage per se, adult toads are typically associated with cool, moist microclimates common in older forests.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT //** Western toads breed in both natural and artificial aquatic habitats preferring habitats with still water, shallow margins or depths ( $\leq 15$  cm), and permanent or semi-permanent water levels that persist from early spring to mid-summer.

Anthropogenic activities that create shallow, warm, and temporary breeding sites (such as ruts and ditches) may act as population sinks because these sites typically dry up before larvae can undergo metamorphosis.

Western toads exhibit high site fidelity to breeding ponds returning annually to the same pond to breed.

**SUMMER RANGE //** Adult toads spend 90% of their time in upland terrestrial habitats located in proximity to breeding ponds and are highly philopatric to their summer ranges.

Adult toads behaviorally thermoregulate during the summer and require cool, moist sites interspersed with open, warm sites to maintain

an ideal body temperature; consequently, western toads typically avoid young cutblocks ( $< 5$  years old) that lack sufficient cover, and forest stands with extensive canopy closure and few canopy gaps.

Underground burrows and cavities in logs are important microsites for both males and females; in the absence of standing water, these sites may be critical to toad survival in terrestrial habitats.

**HIBERNACULA //** Western toads hibernate communally in upland terrestrial habitats; a variety of hibernacula sites may be used, but the majority are located in the burrows of small mammals, particularly ground squirrels.

**FORAGING //** Tadpoles subsist primarily on filamentous algae and organic detritus, but they will also scavenge carrion.

Adults exclusively eat invertebrates, including: worms, spiders, bees, beetles, ants, grasshoppers, sow bugs, and crayfish.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- During the breeding season (April to June), western toads are vulnerable to disturbances that impact breeding habitats (e.g. wetland draining, alteration to water quality). However, because they spend the vast majority of their time on land, toads are most susceptible to forestry activities during the non-breeding season.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Wetland loss.
- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.
- Disruption of dispersal and/or movement patterns.

### OTHER ISSUES //

- Climate change.
- Disease and pathogens.
- Chemical toxins and pollutants.
- Introduction of exotic species.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and aquatic habitat protection.
- Coarse woody debris recruitment.
- Retention of well-distributed mature/old forest patches.

## WESTERN TOAD (*Bufo boreas*)

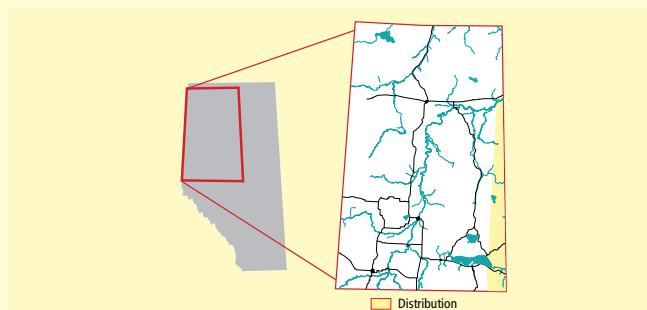
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- Photo Credit:** Shari Clare, Fiera Biological Consulting Ltd.

# CANADIAN TOAD (*Bufo hemiophrys*)



**THE CANADIAN TOAD** is a small, uncommon, aquatic-breeding amphibian found at elevations below 1200 m in the Parkland, Grassland, and Boreal Forest (eastern portions) Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S4 G4	No status	No status

## HABITAT

Canadian toads require both aquatic-breeding habitat and terrestrial habitat to fulfill biological requirements. While they are not associated with a particular forest structure or seral stage, upland areas provide important connectivity between breeding habitats and over-wintering habitats.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT //** Canadian toads prefer to breed in the shallow margins of lakes and rivers, but will also breed in small ponds, ditches, marshes, and other temporary water bodies.

Breeding ponds are generally characterized by stable water levels, gradually emerging shores, and mudflats surrounded by cattail and bulrush.

**SUMMER RANGE //** Following spring breeding, and after metamorphosis, toads move to grassed, herbaceous, or woodland upland areas where they remain until the next breeding season.

**WINTER RANGE //** Canadian toads are not freeze resistant and therefore need to burrow below the frost line to hibernate during the winter.

As Canadian toads are relatively poor burrowers, wintering sites are typically found in soft sandy soils in upland areas; many individuals may be found together at a wintering site.

**FORAGING //** Adult toads are insectivorous and eat a variety of small terrestrial arthropods, while Canadian toad larvae eat organic debris, algae, and plant tissue.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- During the breeding season (May to July), Canadian toads are vulnerable to disturbances that impact breeding habitats (e.g. alteration to water quality). However, because they spend the vast majority of their time on land, toads are most susceptible to forestry activities during the non-breeding season (July to April). Disturbance may lead to direct mortality (e.g. traffic mortality), or indirect mortality (e.g. loss of wintering sites).

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Wetland loss.
- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.

### OTHER ISSUES //

- Climate change.
- Disease and pathogens.
- Chemical toxins and pollutants.
- Introduction of exotic species.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and aquatic habitat protection.
- Coarse woody debris recruitment.
- Retention of well-distributed mature/old forest patches.



## CANADIAN TOAD (*Bufo hemiophrys*)

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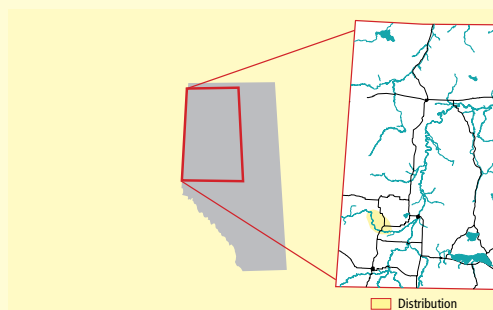
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**Photo Credit:** Connie Brown

# LONG-TOED SALAMANDER (*Ambystoma macrodactylum*)



**THE LONG-TOED SALAMANDER** is found in the Rocky Mountain, Foothills, Boreal Forest, and occasionally, the Grassland Natural Regions of Alberta. Their populations occur in small clusters along the western edge of the province as far north as the Peace River area.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G5	No status	Not at risk

## HABITAT

Long-toed salamanders require both aquatic breeding and terrestrial habitat to fulfill biological requirements. Transformed salamanders spend the majority of their time in terrestrial habitats and occur at a wide range of elevations and habitats (e.g. conifer, deciduous, mixedwood forests). They do not appear to be associated with seral stage as they can be found in 3 year old clearcuts to 180-year-old forests, as long as suitable microclimatic conditions are present.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Long-toed salamanders typically breed in permanent or semi-permanent ponds ( $\geq 10\text{cm}$  deep) that may be natural or artificial; lakes and streams may also be used.

Adults are highly philopatric to breeding sites, and migrate from hibernation sites to breeding ponds between mid-April and June.

**COVER //** During the non-breeding season, long-toed salamanders are typically found in small mammal burrows or natural crevices, or under fallen logs, debris, or leaf litter; these microhabitats are critical for salamanders to avoid desiccation.

**HIBERNACULA //** Little is known about long-toed salamanders overwintering habitats. The few salamanders that have been detected during the winter were found in dense forest stands (often in spruce) where the salamanders dig 50 to 70cm below the surface in loose gravel and hibernate in small groups.

**FORAGING //** Larvae primarily prey upon zooplankton, insects, snails, and other salamander larvae.

Adults will eat a wide variety of invertebrates and forage at night in the litter layer, or on moist nights, on the forest floor.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- During the breeding season (April to June), long-toed salamanders are vulnerable to disturbances that impact breeding habitats (e.g. wetland draining, alteration to water quality). However, because they spend the vast majority of their time on land, salamanders are most susceptible to forestry activities during the non-breeding season.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Human-caused mortality.
- Wetland loss.
- Habitat loss, alteration, and/or fragmentation.
- Disruption of dispersal and/or movement patterns (roads).
- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat patch size.
- Edge effects and core interior forest loss.

### OTHER ISSUES //

- Climate change.
- Disease and pathogens.
- Chemical toxins and pollutants.
- Introduction of exotic species (predatory fish).

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.
- Movement corridor retention.
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Coarse woody debris recruitment.

## LONG-TOED SALAMANDER (*Ambystoma macrodactylum*)

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**Photo Credit:** Stephen Hanus

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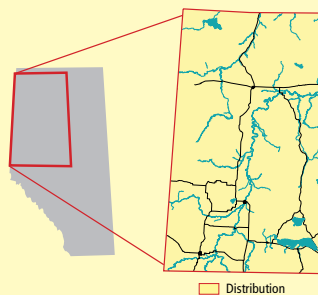




# RED-SIDED GARTER SNAKE (*Thamnophis sirtalis*)



**THE RED-SIDED GARTER SNAKE** is broadly distributed throughout the province of Alberta; however, it is most abundant in the Parkland and Boreal Forest Natural Regions.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G5	No status	No status

## HABITAT



Red-sided garter snakes have broad habitat preferences and may occur in wide variety of habitat types, including: forested areas, agricultural areas, and urban locations. Their summer range and breeding habitats are not associated with specific forest structure or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**SUMMER RANGE //** Wet areas appear to constitute important habitats for red-sided garter snakes as they are frequently found near streams, lakes, ponds, marshes, dugouts, and ditches throughout their provincial range.

**BREEDING //** Breeding occurs in the spring upon emergence from overwintering sites, but may also occur in the autumn. Red-sided garter snakes are live-bearers, giving birth between May and October; gravid (pregnant) females exhibit low rates of movement and occupy recessed areas with favorable thermal (~25°C) and security coverage.

**hibernacula //** Red-sided garter snakes overwinter communally in natural crevices or the abandoned burrows of small mammals. Hibernacula can contain as many as 5000 individual snakes, which may constitute an entire local population; high fidelity to hibernacula sites is exhibited over consecutive years.

**FORAGING //** Primary prey items include: insects, mollusks, worms, fish, amphibians, reptiles, small birds, small mammals, and carrion.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- This species is particularly vulnerable while hibernating during the winter months, and as such, the provincial Wildlife Act protects hibernacula from disruption or destruction between September 1 and April 30.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Human-caused mortality.
- Wetland loss.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.

## RED-SIDED GARTER SNAKE (*Thamnophis sirtalis*)

### SELECTED REFERENCES

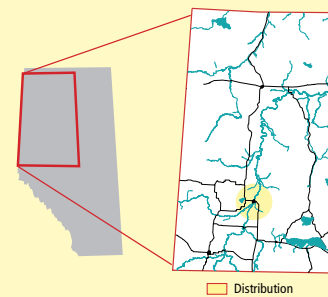
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**Photo Credit:** Rick Jobin

# WANDERING GARTER SNAKE (*Thamnophis elegans*)



**IN ALBERTA, THE WANDERING GARTER SNAKE** is primarily distributed to the south and west of the Red Deer River in the Grasslands, Foothills, and Rocky Mountain Natural Regions. Scattered, highly localized populations may also exist along the Peace and Athabasca Rivers, although its distribution in the Boreal Forest Natural Region is understudied.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3S4 G5	No status	No status

## HABITAT



Wandering garter snakes occur over a wide range of elevations and are associated with many cover types including: grasslands, shrublands, forested stands, and open areas within forests. Their summer range and breeding habitat are not associated forest structure or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**SUMMER RANGE //** The wandering garter snake is strongly associated with various types of water bodies as it frequents streams, lakes, ponds, marshes, and ditches throughout their Alberta range.

**BREEDING //** Breeding occurs in the spring upon emergence from overwintering sites. Wandering garter snakes are live-bearers giving birth to live young between July and September; gravid (pregnant) females exhibit low rates of movement and occupy recessed areas with favorable thermal (~25°C) and security coverage.

**DEN SITES (OVERWINTERING) //** Wandering garter snakes overwinter communally in natural crevices or the abandoned burrows of small mammals. Den sites can contain as many as 5000 individual snakes, which may constitute an entire local population.

**FORAGING //** Primary prey items include: insects, mollusks, worms, fish, amphibians, reptiles, small birds, small mammals, and carrion.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- This species is particularly vulnerable while hibernating during the winter months, and as such the provincial Wildlife Act protects den sites from disruption or destruction between September 1 to April 30.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Human-caused mortality.
- Wetland loss.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

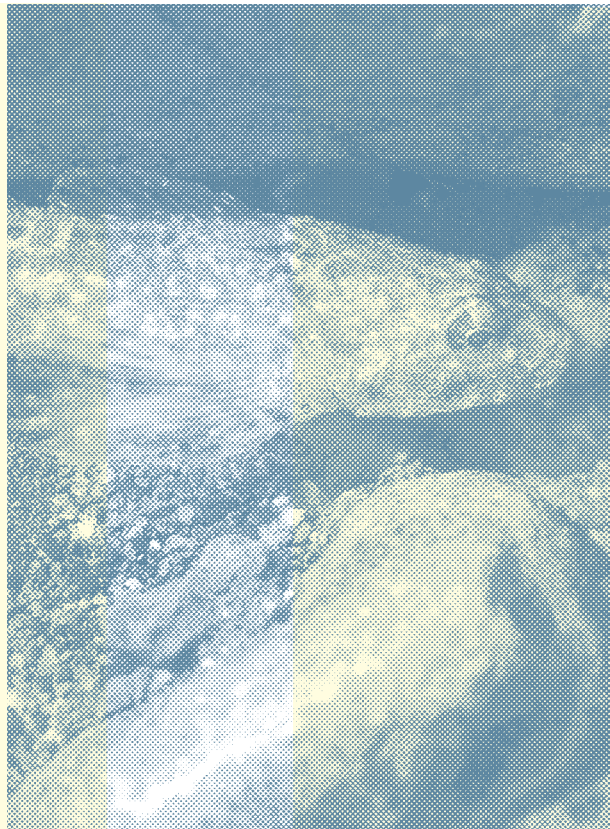
- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.

## WANDERING GARTER SNAKE (*Thamnophis elegans*)

### SELECTED REFERENCES

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- Photo Credit:** Kris Kendell, Alberta Conservation Association

# FISH



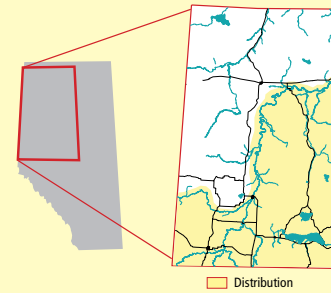




# SPOONHEAD SCULPIN (*Cottus ricei*)



**SPOONHEAD SCULPIN** are benthic fish found in the Grassland, Parkland, Foothills, and Boreal Forest Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S3 G5	No status	Not at risk

## HABITAT

Spoonhead sculpin occupy a variety of streams, rivers, and lakes in Alberta, and are not directly associated with forest structure or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**LAKE AND RIVER HABITAT //** Adult and juvenile spoonhead sculpin are associated with a wide range of substrates and water depths, but they characteristically occur in small, fast rocky streams and muddy turbid rivers; they are also occasionally found along inshore shallows and deepwater sections of lakes.

**SPAWNING HABITAT //** Spawning in Alberta occurs in April and May along rocky lakeshores, gravel creek bottoms, and river margins after water warms to 6°C.

Male spoonhead sculpin select a nest site under a large rock and attract female sculpin to the site through courtship displays.

**FORAGING //** Spoonhead sculpin diet consists primarily of aquatic insects, crustaceans, and plankton.

Spoonhead sculpin are an important prey species for numerous fishes, birds, and mammals.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.



## SPOONHEAD SCULPIN (*Cottus ricei*)

### SELECTED REFERENCES

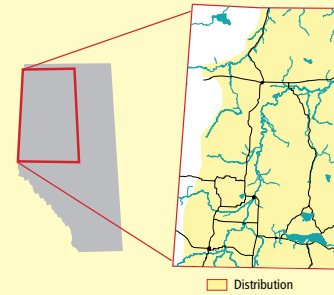
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**Photo Credit:** David Fairless, Alberta Conservation Association

# NORTHERN REDBELLY DACE (*Phoxinus eos*)



**THE NORTHERN REDBELLY DACE** is a short-lived (<6 years) cyprinid found in the Grassland, Parkland, Foothills, and Boreal Forest Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G5	No status	No status

## HABITAT

Northern redbelly dace typically occupy a variety of streams, rivers, and lakes in Alberta, and are not directly associated with forest structure or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**LAKE AND RIVER HABITAT //** Northern redbelly dace prefer quiet, warm waters of boggy ponds, small lakes, and pools within creeks that have silt and detritus bottoms; water in these habitats is often dark and slightly acidic.

Typically northern redbelly dace are found in water depths less than 2m, but they may migrate to deeper areas during the evening to feed on invertebrates.

**SPAWNING HABITAT //** Spawning occurs in the summer (June to August) among mats of filamentous algae in water temperatures between 13 and 18°C.

**FORAGING //** Northern redbelly dace are primarily herbivorous and feed mainly on algae and aquatic plants, but they will occasionally eat aquatic insects and zooplankton.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.

## NORTHERN REDBELLY DACE (*Phoxinus eos*)

### SELECTED REFERENCES

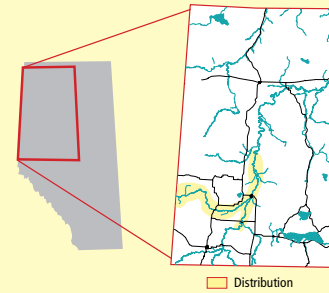
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**Photo Credit:** Shari Clare, Fiera Biological Consulting Ltd.

# NORTHERN PIKEMINNOW (*Ptychocheilus oregonensis*)



**THE NORTHERN PIKEMINNOW** is a large cyprinid that typically lives in riverine and lacustrine systems west of the continental divide; however, their range has expanded into Alberta through the Peace River. Currently their distribution in Alberta is restricted to the Peace River system in the Boreal Forest Natural Region of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT

Northern pikeminnow prefer slow moving waters typically found in lakes and small to large rivers, and are therefore not directly associated with forest structure or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**LAKE AND RIVER HABITAT //** In lakes and rivers, adults are usually found offshore in deeper areas; in contrast, young usually occur in inshore waters and shallows during the summer, but move to deeper waters during fall.

**SPAWNING HABITAT //** Spawning takes place during May to July over gravel substrates in shallow water of streams, tributary mouths, or lakes when water temperatures reach 12 to 18°C.

**FORAGING //** Adults are piscivorous bottom feeders but they may also feed on insects, insect larvae, crustaceans, and some plankton during the spring and summer; they have also been known to feed on the eggs of other northern pikeminnows.

Smaller individuals feed primarily on aquatic and terrestrial insects.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.
- Modified predator-prey dynamics.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.

## NORTHERN PIKEMINNOW (*Ptychocheilus oregonensis*)

### SELECTED REFERENCES

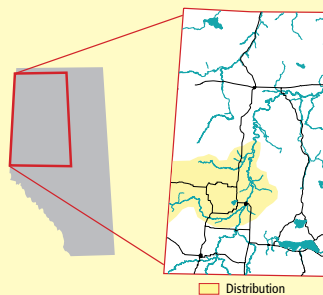
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**Photo Credit:** Mainstream Aquatics Ltd

# LARGESCALE SUCKER (*Catostomus macrocheilus*)



**THE LARGESCALE SUCKER** is a large bottom-dwelling fish that typically lives in riverine and lacustrine systems west of the continental divide; however, their range has expanded into Alberta through the Peace River. Currently their distribution in Alberta is restricted to the Peace River system in the Boreal Forest Natural Region of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2 G5	No status	No status

## HABITAT

Largescale suckers typically occupy lakes and medium to large rivers throughout their range; they are not directly associated with forest structure or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**LAKE AND RIVER HABITATS //** Largescale suckers are usually found in weedy sections of lakes, or moderate run and deep pool habitats of medium to large rivers and streams.

These fish are mainly bottom dwellers, but they migrate throughout the water column daily to feed; they are typically found feeding in shallower areas during the night.

**SPAWNING //** Largescale suckers spawn in creeks or lake outlets in the spring (May to June) when water temperatures reach 10 to 12°C; they spawn over a wide range of substrates including sand, gravel, and cobble.

Sucker populations in Alberta appear to be functioning as population sinks due to limited availability of spawning habitat; immigration from source (breeding) populations in British Columbia is likely maintaining sucker populations in northwestern Alberta.

**FORAGING //** Adult suckers are bottom feeders that consume molluscs, benthic invertebrates, algae, and detritus; young live near the water surface and feed on zooplankton and algae until their mouth becomes subterminal.

Largescale suckers are an important prey species for numerous fishes, birds, and mammals.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.
- Modified predator-prey dynamics.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.

## LARGESCALE SUCKER (*Catostomus macrocheilus*)

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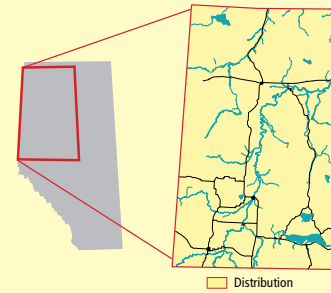
**Photo Credit:** Mainstream Aquatics Ltd



# ARCTIC GRAYLING (*Thymallus arcticus*)



**THE ARCTIC GRAYLING** is a freshwater salmonid typically found in the Boreal Forest and Foothills Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT

Arctic grayling occupy clear water in large cold rivers, smaller rocky streams, and lakes in Alberta. Optimal grayling habitat is determined by water temperature regulation (i.e. shading), nutrient input (i.e. detritus and invertebrates), cover (i.e. coarse woody debris), and water quality (i.e. sediment loads). In Alberta, stream conditions preferred by grayling are typically associated with mature/old forests.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**RIVER AND LAKE HABITATS //** Optimal arctic grayling riverine habitats are characterized by cold, clear water with abundant pools. In northern Alberta, grayling also occur in a few small clear lakes.

Adult arctic grayling are most frequently found in deep pools on the downstream-side of riffles; substrates and instream vegetation vary with stream type and region.

In the boreal forest, arctic grayling are often associated with clear, tannin-stained rivers that drain northern muskegs and bogs.

Arctic grayling fry inhabit the margins of slow-moving tributaries, as well as pools and side channels with water depths of 30 to 50cm and velocities  $\leq 0.8\text{m/s}$ ; boulder, cobble, and sand substrates are associated with these areas.

**SPAWNING HABITAT //** Arctic grayling are spring spawners (May to June), with spawning occurring over gravel and rock substrates in small tributary streams of large rivers immediately after ice breakup. Typical water temperatures during spawning are in the range of 5 to 10°C.

Male arctic grayling defend territories during the spawning season, but they do not construct a redd (i.e. nest).

**FORAGING //** Adult and juvenile arctic grayling feed primarily on aquatic and terrestrial insects, but will also eat benthic invertebrates and plants. On rare occasions, adult arctic grayling have been known to catch and eat fish and small mammals.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Stream crossing density.
- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.

### OTHER ISSUES //

- Over-fishing.
- Climate change.
- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.
- Access closure/reclamation.

## ARCTIC GRAYLING (*Thymallus arcticus*)

### SELECTED REFERENCES

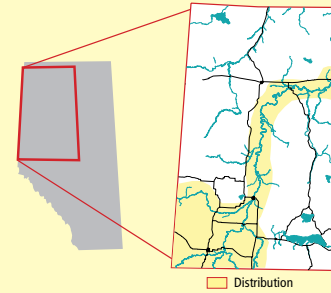
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**Photo Credit:** Phil Coleman, US Fish and Wildlife Service

# BULL TROUT (*Salvelinus confluentus*)



**THE BULL TROUT** is a freshwater salmonid found within the Rocky Mountain and Foothills Natural Regions, and portions of the Peace River basin in the Boreal Forest Natural Region of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G3	No status	No status

## HABITAT

Bull trout are typically associated with clear water in large cold rivers, small rocky streams, and lakes in Alberta. Optimal bull trout habitat is determined by water temperature regulation (i.e. shading), nutrient input (i.e. detritus and invertebrates), cover (i.e. coarse woody debris), and water quality (i.e. sediment loads). In Alberta, stream conditions preferred by trout are typically associated with mature/old forests.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**RIVER AND LAKE HABITATS //** Three life history strategies are exhibited by Alberta bull trout: non-migratory stream residents; mainstem river residents that migrate to spawn in small streams/tributaries; and lake residents that spawn in streams. Individuals exhibiting any of these strategies may co-exist in a single system.

Optimal bull trout habitats are characterized by cold, high gradient, unproductive waters; bull trout avoid warm water temperatures (i.e. >15°C).

Microhabitat selection varies with the life history strategy of an individual bull trout. In general, bull trout are constrained by water temperature and are therefore found primarily in large pools of rivers, or at the mouths of tributary streams. Lake residents typically use the entire lake throughout the year.

**SPAWNING HABITAT //** Bull trout are autumn spawners (mid-August through October), with spawning occurring in streams and rivers with medium to large gravel substrates. A redd, or nest, is constructed by the female and fertilized eggs are buried beneath the gravel; eggs incubate in the gravel over the winter and hatch in March or April of the following year.

Spawning takes place in slow-moving (0.14 to 0.52m/s), shallow (30 to 60cm) water in low gradient areas that have overhead and/or instream cover including: undercut banks, log jams, rootwads, woody debris, pools, and overhanging vegetation.

**FORAGING //** Bull trout feed primarily on benthic invertebrates and fish; insects on the water surface and the occasional small mammal are also eaten. Primary prey items vary with life history strategy.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Stream crossing density.
- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.

### OTHER ISSUES //

- Over-fishing.
- Climate change.
- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.
- Access closure/ reclamation.

## BULL TROUT (*Salvelinus confluentus*)

### SELECTED REFERENCES

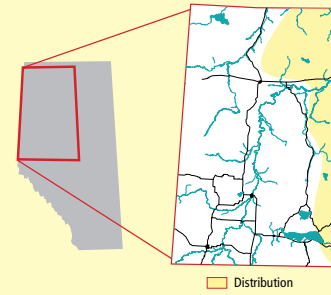
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**Photo Credit:** David Fairless, Alberta Conservation Association

# LAKE TROUT (*Salvelinus namaycush*)



**LAKE TROUT** are the largest freshwater salmonid native to North America; they are found in the Boreal Forest and Rocky Mountain Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G5	No status	No status

## HABITAT

Lake trout typically occupy large, deep cold lakes in Alberta, and are therefore not directly associated with forest structure or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**LAKE HABITAT //** Lake trout prefer water temperatures around 10°C and will behaviourally seek out preferred water temperatures. This means trout generally inhabit shallower regions of the lake during the spring and fall when water temperatures are cooler, but they will move to deeper, colder regions as the lake warms in the summer.

Water bodies with excellent water quality, including pH levels greater than 5.5 and dissolved oxygen levels exceeding 6 ppm, are required for lake trout survival.

**SPAWNING HABITAT //** Lake trout spawn in the fall (September to November) when lake water temperatures drop below 12°C and lake thermal stratification breaks down; trout typically spawn in lakes along rocky or gravel shoals, but they may occasionally spawn in rivers.

**FORAGING //** Adult lake trout are predacious and feed upon a variety of organisms including fish, crustaceans, and aquatic and terrestrial insects.

Juvenile lake trout typically feed on zooplankton, chironomids, and other aquatic invertebrates.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.
- Modified predator-prey dynamics.

### OTHER ISSUES //

- Over-fishing.
- Climate change.
- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.
- Access closure/ reclamation.

# LAKE TROUT (*Salvelinus namaycush*)

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**Photo Credit:** Tony Pletcher, BIO-DITRL



# BIRDS

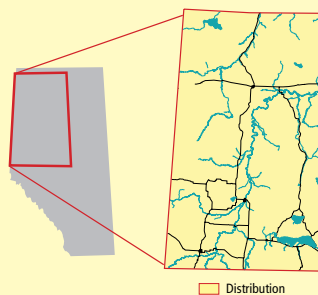




# HORNED GREBE (*Podiceps auritus*)



**THE HORNED GREBE**, a migratory waterbird, is a summer resident of the Grasslands, Parkland, and Boreal Forest Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT

Horned grebes are typically found breeding in marshes, wetlands, and lakes in Alberta; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** Horned grebes are generally solitary nesters, preferring small wetlands (0.1 to 2ha) for nesting, but they will occasionally use larger lakes and wetlands.

Horned grebes have been known to use both artificial wetlands and natural wetlands for foraging, nesting, and staging and may even prefer artificial wetlands over natural wetlands in some areas.

Given that horned grebes nest early in the spring (early May), an abundance of residual emergent vegetation (rush or reeds) for nest protection is important in nest site selection.

Horned grebes prefer water depths of at least 20cm at the nest site to allow access to the nest by diving.

**FORAGING //** Horned grebes are piscivorous and insectivorous, but they may also feed on mollusks, crustaceans, and amphibians.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Habitat loss, alteration, and/or fragmentation.
- Wetland loss.
- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.
- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.

## HORNED GREBE (*Podiceps auritus*)

### SELECTED REFERENCES

Fournier, M.A. and J.E. Hines. 1999. Breeding Ecology of the Horned Grebe *Podiceps auritus* in Subarctic Wetlands. Canadian Wildlife Service Occasional Paper Number 99. Ottawa, Ontario. Pp. 34.

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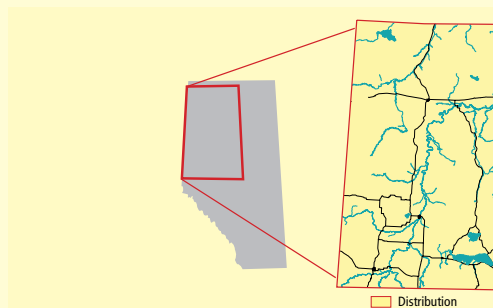
Osnas, E.E. 2003. The Role of Competition and Local Habitat Conditions for Determining Occupancy Patterns in Grebes. *Waterbirds* 26(2): 209-216.

**Photo Credit:** Donna Dewhurst, U.S. Fish and Wildlife

# PIED-BILLED GREBE (*Podilymbus podiceps*)



**THE PIED-BILLED GREBE** is a common but secretive migratory waterbird that is a summer resident of the Grasslands, Parkland, Boreal Forest, and Foothills Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT

Pied-billed grebes breed in marshes, wetlands, and lakes in Alberta; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** Pied-billed grebes are highly territorial solitary nesters, with one nesting pair typically occupying ponds less than 4ha in size; they will use both natural and artificial wetlands with stable water levels for nesting.

Pied-billed grebes build floating nests of decaying vegetative material in shallow water surrounded by dense emergent vegetation (cattails and/or bulrush).

**FORAGING //** Pied-billed grebes are typically piscivorous and insectivorous but they also have been known to feed on tiger salamanders, mollusks, and crustaceans.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Between May 1 and July 1, pied-billed grebe colonies are extremely sensitive to human disturbance caused by traffic, boating, off-highway vehicle use, and other human activities that cause shoreline disturbance.
- Disturbance may cause pied-billed grebes to abandon their nests and/or increase nest vulnerability to depredation by corvids.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Sensory disturbance and reduced habitat effectiveness.
- Habitat loss, alteration, and/or fragmentation.
- Wetland loss.
- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES //

- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Activity timing restrictions.
- Access control (duration, road density, traffic volume).

## PIED-BILLED GREBE (*Podilymbus podiceps*)

### SELECTED REFERENCES

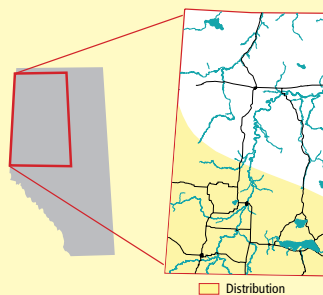
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- Photo Credit:** [www.istockphoto.com](http://www.istockphoto.com)



# WESTERN GREBE (*Aechmophorus occidentalis*)



**THE WESTERN GREBE**, the largest grebe in North America, is a migratory waterbird that breeds in the Grasslands, Parkland, Boreal Forest, and Foothills Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3B G5	No status	No status

## HABITAT

Western grebes breed in lakes and large wetlands in Alberta; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** Western grebes are colonial nesters that are highly philopatric to breeding locations.

Suitable breeding habitat is characterized by lakes or wetlands with relatively stable water levels, sufficient emergent vegetation (rush or reeds) for protection from waves, nearby open water areas free of aquatic vegetation for foraging, and isolation from human disturbance.

Grebes build floating nests in specialized habitats along the shallow margins of large inland lakes and wetlands; nest sites are typically located in water depths of at least 25cm to allow nesting birds to easily exit the nest by diving underwater.

**FORAGING //** Western grebes are gregarious, piscivorous waterbirds that require lakes and wetlands with sufficient fish populations for foraging; grebes will also feed on molluscs, crustaceans, and aquatic insects.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Between April 1 and August 1, western grebe colonies are extremely sensitive to human disturbance caused by traffic, boating, off-highway vehicle use, and other human activities that cause shoreline disturbance.
- Disturbance may cause western grebes to abandon their nests, dislodge eggs from the nest, and/or increase nest vulnerability to depredation by corvids and gulls.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Sensory disturbance and reduced habitat effectiveness.
- Habitat loss, alteration, and/or fragmentation.
- Modified predator-prey dynamics.
- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES //

- Chemical toxins and pollutants.
- Loss of migratory and/or winter habitat.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Activity timing restrictions.
- Access control (duration, road density, traffic volume).

## WESTERN GREBE (*Aechmophorus occidentalis*)

### SELECTED REFERENCES

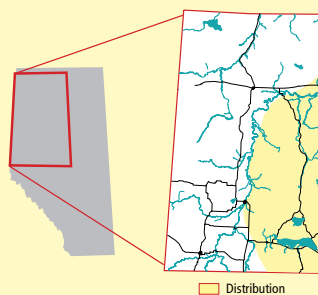
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**Photo Credit:** Time McCabe, U.S. Fish and Wildlife Service

# AMERICAN WHITE PELICAN (*Pelecanus erythrorhynchos*)



**THE AMERICAN WHITE PELICAN** is a large-bodied, migratory waterbird occurring throughout the Grassland, Parkland, and Boreal Forest Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2B G3	No status	Not at risk

## HABITAT

American white pelicans are typically found breeding on wetlands and large lakes in Alberta; breeding habitats are not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT & SUMMER RANGE //** American white pelicans are colonial nesters that are highly philopatric to breeding locations; they require large lakes or wetlands with relatively stable water levels for nesting.

Pelicans build ground nests on lake islands or peninsulas that are protected from human disturbance and nest predation.

**FORAGING //** American white pelicans are gregarious, piscivorous waterbirds that require lakes and wetlands with sufficient fish populations for foraging.

Foraging habitat is not necessarily the same as breeding areas; consequently, pelicans may travel over 100km from nest sites to suitable foraging areas in order to meet energy requirements.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Between April 1 and September 15, American white pelican colonies are extremely sensitive to human disturbance caused by traffic, boating, off-highway vehicle use, and other human activities that cause shoreline disturbance.
- Disturbance may cause American white pelicans to abandon their nests or may increase their vulnerability to nest predation.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Sensory disturbance and reduced habitat effectiveness.
- Watershed impacts and/or hydrology disruption.
- Wetland loss.
- Habitat loss, alteration, and/or fragmentation.
- Modified predator-prey dynamics.

### OTHER ISSUES //

- Disease and pathogens.
- Loss of migratory and/or winter habitat.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Activity timing restrictions.
- Access control (duration, road density, traffic volume).

## AMERICAN WHITE PELICAN (*Pelecanus erythrorhynchos*)

### SELECTED REFERENCES

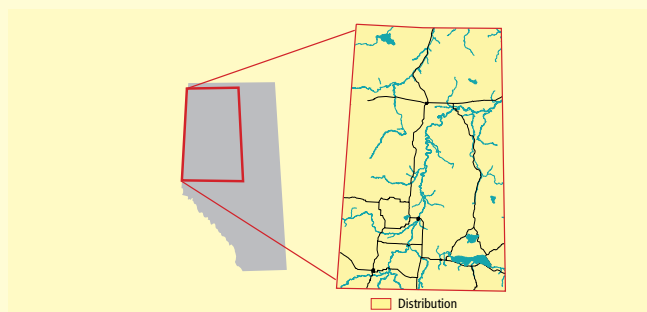
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**Photo Credit:** Tim McCabe, U.S. Fish and Wildlife Service

# AMERICAN BITTERN (*Botaurus lentiginosus*)



**THE AMERICAN BITTERN**, a large migratory waterbird, typically occurs in the Parkland Natural Region; however, records of this species also exist for the Boreal Forest, Foothills, and Rocky Mountain Natural Regions.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3S4B G4	No status	No status

## HABITAT

American bitterns are typically found breeding in marshy habitats in Alberta; breeding and summer habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**SUMMER RANGE //** American bitterns inhabit a range of wetland types including: emergent, shrub-scrub, and aquatic bed wetlands.

Large wetlands (>10ha) are preferred by bitterns. However, they will use a range of wetlands sizes (0.1 to 1000ha) provided there is sufficient horizontal cover of tall emergent vegetation, including: bulrushes, reeds, sedges, cattails, and occasionally, willows.

**BREEDING //** Females build platform nests consisting of reeds, sedges, cattails, and other available vegetation amongst dense emergent vegetation over water 5 to 20cm in depth.

**FORAGING //** American bitterns utilize their own cryptic colouration and vegetative cover along the margin of wetlands to stalk and seize prey items which include: insects, amphibians, fish, and small mammals.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Wetland loss.
- Watershed impacts and/or hydrology disruption.
- Sensory disturbance and reduced habitat effectiveness.

### OTHER ISSUES //

- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.

## AMERICAN BITTERN (*Botaurus lentiginosus*)

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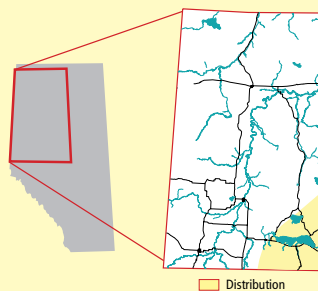
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**Photo Credit:** Gary Zahm, U.S. Fish and Wildlife Service

# GREAT BLUE HERON (*Ardea herodias*)



**GREAT BLUE HERONS** Great blue herons are large migratory waterbirds that nest colonially in the Parkland, Foothills, and Boreal Forest Natural Regions. There are fewer than 100 known nesting colonies in Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3B G5	No status; Pacific Great Blue Heron (subspecies <i>fannini</i> ): Special concern (Schedule 3)	No status; Pacific Great Blue Heron (subspecies <i>fannini</i> ): Special concern

## HABITAT

Great blue heron are typically found near large wetlands and lakes in Alberta; breeding habitat is not associated with forest age or seral stage, although large diameter, tall trees are required for nesting.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Great blue herons are colonial tree nesters; however, individual pairs will occasionally nest in solitude, and observations of ground-nesting have also been recorded.

Nesting colonies are located in forested stands with various levels of disturbance, including contiguous forest, fragmented forest, and solitary trees. No preference is apparent with respect to stand type or tree type (i.e. coniferous vs. deciduous); however, nests are typically located in tops of the tallest trees available in a given stand.

In Alberta, heron colonies are generally located in proximity to permanent water bodies, with most colonies located on lake islands.

**FORAGING //** Great blue herons are generalist predators primarily preying upon fish, but amphibians, invertebrates, reptiles, small mammals, and birds may also be taken.

Important foraging habitats are typically shallow aquatic areas, including lakeshores, slow-moving rivers, and wetlands, that must be located within 10km of heron breeding locations.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Great blue herons are particularly sensitive to disturbance early in the breeding season; in Alberta, this period of heightened sensitivity extends from late March through late May. Entire colonies have splintered and abandoned nesting areas when exposed to prolonged disturbance at this time.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Wetland loss.
- Watershed impacts and/or hydrology disruption.
- Sensory disturbance and reduced habitat effectiveness.
- Loss of mature/old forest (complex forest structure and large diameter attributes).

### OTHER ISSUES //

- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection.
- Access control (duration, road density, traffic volume).
- Activity timing restrictions.
- Sedimentation and erosion control.
- Retention of complex forest structure and recruitment of large diameter forest attributes.



## GREAT BLUE HERON (*Ardea herodias*)

### SELECTED REFERENCES

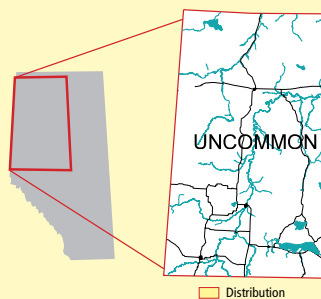
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**Photo Credit:** Lee Karney, U.S. Fish and Wildlife Service

# HARLEQUIN DUCK (*Histrionicus histrionicus*)



**HARLEQUIN DUCKS** are migratory sea birds that summer in the Foothills and Rocky Mountain Natural Regions of Alberta; adequate breeding habitat may also exist in the Caribou Mountains of north-central Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3B G4	No status; Eastern population: Special concern (Schedule 1)	No status; Eastern population: Special concern

## HABITAT

Harlequin ducks are typically found breeding on fast-moving streams and rivers in Alberta; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** Harlequin duck breeding habitat is generally characterized by rivers with braided channels and frequent vegetated islands for nesting.

Nesting areas occur in dense vegetation often within 1m of a swift moving stream.

Ideal breeding habitat includes loafing areas which consist of rock or gravel bars where harlequin duck broods can rest near the safety of a swift running channel; hanging vegetation and undercut banks also provide important hiding cover for broods during rearing.

**FORAGING //** Harlequin ducks are visual foragers that prey primarily on benthic or substrate-dwelling invertebrates

Effective foraging for harlequin ducks is likely influenced by clarity of streams, quality of gravel and boulder substrates, and health and abundance of macroinvertebrate populations.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Disturbance of harlequin ducks during their breeding season (April through August) may cause or contribute to brood failure.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Road density and traffic volumes.
- Habitat loss, alteration, and/or fragmentation.
- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES //

- Chemical toxins and pollutants (wintering habitat).
- Loss of migratory and/or winter habitat.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Access control (duration, road density, traffic volume).
- Activity timing restrictions.
- Access closure/reclamation.
- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.

## HARLEQUIN DUCK (*Histrionicus histrionicus*)

### SELECTED REFERENCES

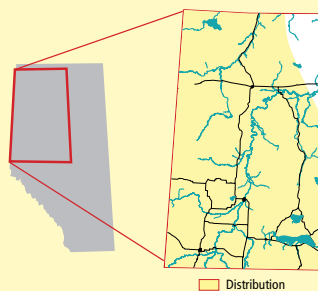
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**Photo Credit:** Glen Smart, US Fish and Wildlife

# TRUMPETER SWAN (*Cygnus buccinator*)



**THE TRUMPETER SWAN**, the largest native water fowl in North America, is a summer resident of the Parkland, Boreal Forest, and Foothills Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Threatened	S3B G4	No status	Not at risk

## HABITAT

Trumpeter swans are typically found breeding in lakes and large wetlands in Alberta; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING & SUMMER RANGE //** Trumpeter swans prefer to nest and breed on freshwater marshes, ponds, lakes, and rivers; they avoid acidic, stagnant, or eutrophic water bodies.

Ideal habitats have stable water levels, calm water without strong wave action or currents, diverse and abundant emergent vegetation, highly irregular shorelines, structures for nest building (e.g. islands or beaver lodges), shallow areas, and isolation and security from human disturbance.

**FORAGING //** Trumpeter swans depend solely on aquatic habitats for food. Juvenile swans feed on aquatic insects and crustaceans until they are approximately 5 weeks of age. Adult swans forage on pondweed, sedges, and the stems, roots, and shoots of horsetail, requiring up to nine kilograms of food per day to meet nutritional requirements.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Between April 1 and September 30, trumpeter swans are extremely sensitive to human disturbance caused by traffic, boating, off-highway vehicle use, and other human activities that cause shoreline disturbance.
- If disturbance is severe, breeding pairs may permanently abandon productive breeding habitats.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Wetland loss.
- Human caused mortality.
- Sensory disturbance and reduced habitat effectiveness.
- Road density and traffic volumes.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.
- Disease and pathogens.
- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone and aquatic habitat protection.
- Access control (duration, road density, traffic volume).
- Activity timing restrictions.

# TRUMPETER SWAN (*Cygnus buccinator*)

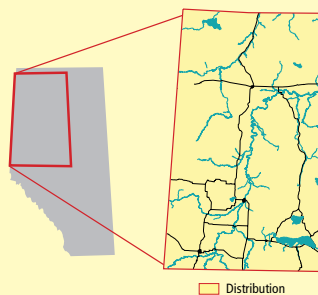
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- Photo Credit:** Donna Dewhurst, U.S. Fish and Wildlife Service

# WHITE-WINGED SCOTER (*Melanitta fusca*)



**THE WHITE-WINGED SCOTER** is a large-bodied migratory sea duck that breeds across the Parkland, Boreal Forest, and Foothills Natural Regions of Alberta. Relatively little is known about white-winged scoter life history and ecology, particularly within their summer range.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT

White-winged scoters are associated with dense forest vegetation near lakes or wetlands during the breeding season; however, no preferences for forest age or seral stage have been identified.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** White-winged scoters rely on vegetation for nest concealment and protection from predators such as gulls, corvids, foxes, and coyotes; therefore, scoters typically nest on the ground in dense, shrubby areas or in spruce stands around lakes and islands, with nests located up to 100m from the water.

Female scoters are highly philopatric to natal areas; therefore, population expansion to former or new breeding areas is limited.

**FORAGING //** White-winged scoters prefer aquatic invertebrates, such as fairy shrimp, as their primary food source within their summer range.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Sensory disturbance and reduced habitat effectiveness.
- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.
- Modified predator-prey dynamics.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.
- Chemical toxins and pollutants.
- Over-hunting.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and aquatic habitat protection.

## WHITE-WINGED SCOTER (*Melanitta fusca*)

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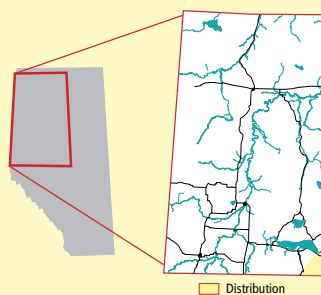
**Photo Credit:** U.S. Fish and Wildlife Service



# YELLOW RAIL (*Coturnicops noveboracensis*)



**THE YELLOW RAIL** is a small, secretive migratory marsh bird that is locally common in the Grasslands, Parkland, and Boreal Forest Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2B G4	Special concern (Schedule 1)	Special concern

## HABITAT

Yellow rails breed in marshes and wet meadows in Alberta; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** Yellow rail breeding habitat is characterized by wetlands of various sizes (0.5 to >10ha) with little (0 to 12cm) or no standing water, or wet meadows where the ground remains saturated throughout the summer.

Breeding wetlands are typically dominated by sedge but rails will also use wetlands consisting of rushes and grasses.

Yellow rails usually nest on the ground or slightly off the ground in areas where nests can be concealed in a dense canopy of senescent vegetation.

**FORAGING //** Yellow rails are herbivorous and insectivorous at all life stages and prefer to feed on small snails, insects, seeds, grasses, and clover leaves; snails may be an important food source during brood rearing.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Habitat loss, alteration, and/or fragmentation.
- Wetland loss.
- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.

## YELLOW RAIL (*Coturnicops noveboracensis*)

### SELECTED REFERENCES

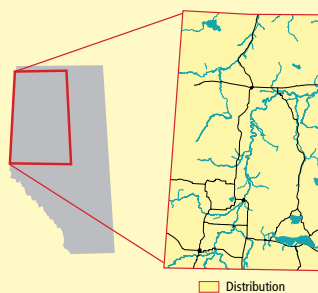
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**Photo Credit:** © Brian E. Small/[www.briansmallphoto.com](http://www.briansmallphoto.com)

# SANDHILL CRANE (*Grus canadensis*)



**SANDHILL CRANES** are large migratory waterbirds that nest in the Foothills and Boreal Forest Natural Regions of Alberta; nesting populations are sparsely distributed throughout these regions.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S4B G5	No status	No status

## HABITAT

Sandhill cranes are associated with open freshwater wetlands and shallow marshes, but they will use a broad range of habitat types from bogs, sedge meadows, and fens to open grasslands and cultivated lands; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Typical breeding habitats include: isolated bogs, marshes, swamps and meadows, and other secluded shallow freshwater wetlands generally >1ha in size surrounded by forest cover; forested buffers around small nesting marshes (1 to 10ha) provide important escape cover for young and provide a buffer against disturbance.

Nest sites are generally located over water on top of piles of emergent plants, sticks, grass, mud, and sphagnum moss, and less frequently on dry-land sites.

Emergent vegetation surrounding the nest site, such as sedges, cattails, bulrushes, willows, and Labrador tea, provide important cover for nesting and brood rearing.

**FORAGING //** Sandhill cranes are generalist omnivores feeding on a wide-variety of vertebrate and invertebrate prey. Roots and tubers of aquatic plants, berries, and seeds are also important food items.

Sandhill crane chicks forage primarily on invertebrates (earthworms and insect larvae) during their first few weeks after fledging, and prior to migration.

During spring and autumn migration, sandhill cranes forage primarily on cultivated grains including barley and wheat. Cultivated fields in proximity to large shallow water bodies constitute important food sources during staging and migration.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Wetland loss.
- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES //

- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection.
- Access control (duration, road density, traffic volume).
- Activity timing restrictions.

## SANDHILL CRANE (*Grus canadensis*)

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Cooper, J.M. 1986. Status of the Sandhill Crane in British Columbia. Ministry of Environment, Lands, and Parks, Wildlife Branch, Victoria, British Columbia. Wildlife Bulletin No. B-83. Pp. 43.

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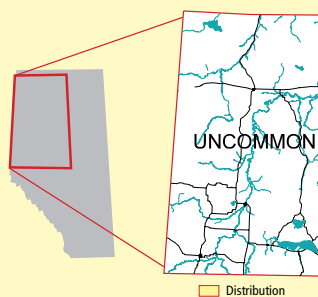
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**Photo Credit:** John and Karen Hollingsworth, US Fish and Wildlife

# WHOOPING CRANE (*Grus americana*)



**THE WHOOPING CRANE** is a rare, large-bodied, migratory water bird that has undergone severe population declines in Alberta. The crane's native breeding range has become limited to the central portion of Wood Buffalo National Park in the Boreal Forest Natural Region of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
At risk	S1B G1	Endangered (Schedule 1)	Endangered

## HABITAT

Whooping cranes are associated with marshes and lakes in black spruce/labrador tea bog forest types.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** Whooping crane nesting grounds in Wood Buffalo National Park consist of marshes, bogs, and shallow lakes separated by narrow elevated ridges; vegetation is dominated by black spruce, white spruce, tamarack, willow, labrador tea, dwarf birch and bearberry.

Nest sites are typically located amongst bulrushes, sedges or other emergent vegetation in the shallow, still waters of bogs, ponds, small lakes, or wet meadows.

**FORAGING //** Whooping cranes are generalist omnivores and feed on a wide-variety food items throughout the breeding season including: mollusks, crustaceans, insects, minnows, frogs, snakes, seeds, and berries.

Young whooping cranes primarily feed on aquatic insects, most notably dragonfly nymphs.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Between April 15 and October 15, whooping cranes are extremely sensitive to human disturbance caused by traffic, boating, off-highway vehicle use, and other human activities that cause shoreline disturbance.
- Disturbance may cause whooping cranes to abandon their nests and/or increase their vulnerability to nest predation.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Sensory disturbance and reduced habitat effectiveness.
- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.
- Modified predator-prey dynamics.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.
- Disease and pathogens.
- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Activity timing restrictions.
- Access control (duration, road density, traffic volume).

## WHOOPING CRANE (*Grus americana*)

### SELECTED REFERENCES

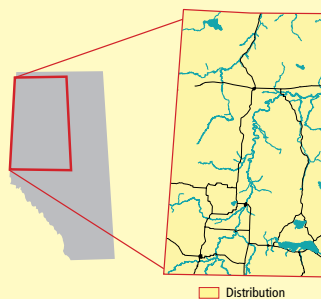
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**Photo Credit:** Ryan Hagerty, U.S. Fish and Wildlife Service

# BLACK TERN (*Chlidonias niger*)



**THE BLACK TERN**, a small neotropical migrant, is a summer resident in the Grasslands, Parkland, Boreal Forest, and Foothills Natural Regions of Alberta. Relatively little is known about black tern life history and ecology, particularly within Canada.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3B G4	No status	Not at risk

## HABITAT

Black terns are typically found breeding in marshes, wetlands, and lakes in Alberta; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** Black terns nest along the shallow margins of large (>20 ha) semi-permanent and permanent marshes, wetlands, and lakes characterized by relatively stable water levels and emergent vegetation interspersed with open water; terns build floating nests amongst emergent vegetation in these “hemi-marshes”.

Black terns are semi-colonial nesters that may occasionally nest with other colonial water birds such as: western grebes, eared grebes, Franklin’s gulls, and Forster’s terns.

**FORAGING//** Black terns are typically insectivorous foraging on aquatic and terrestrial insects, but they will also feed on small fish.

Terns may forage up to 4km from the nesting colony in seasonal wetlands or agricultural fields.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY//

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS//

- Habitat loss, alteration, and/or fragmentation.
- Wetland loss.
- Modified predator-prey dynamics.
- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES//

- Loss of migratory and/or winter habitat.
- Introduction of exotic species.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES)//

- Riparian zone protection and/or aquatic habitat protection.



## BLACK TERN (*Chlidonias niger*)

### SELECTED REFERENCES

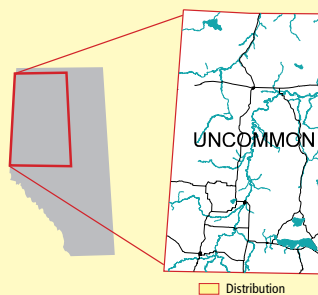
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**Photo Credit:** [www.istockphoto.com](http://www.istockphoto.com)

# CASPIAN TERN (*Sterna caspia*)



**THE CASPIAN TERN**, a large migratory, thick-billed gull-like bird, is a very rare summer resident of a few large lakes in the Grasslands, Boreal Forest, and Canadian Shield Natural Regions of Alberta. Relatively little is known about Caspian tern life history and ecology within Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2B G5	No status	Not at risk

## HABITAT

Caspian terns are typically found breeding in large lakes in Alberta; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** Caspian terns usually nest in colonies, requiring large lakes with stable water levels for nesting; nests are constructed in depressions located on sandy or cobbly beaches of small, sparsely vegetated, isolated islands.

Caspian terns are known to be attracted to artificial wetlands for nesting, as these wetlands often lack vegetation and mammalian predators.

**FORAGING //** Caspian terns are mainly piscivorous but they will occasionally feed on aquatic invertebrates; these terns generally feed by hovering in the air and diving to catch prey.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Between May 1 and July 31, nesting Caspian terns are extremely sensitive to human disturbance caused by traffic, boating, off-highway vehicle use, and other human activities that cause shoreline disturbance.
- Disturbance may cause Caspian terns to abandon their nests and/or increase their vulnerability to nest predation.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Sensory disturbance and reduced habitat effectiveness.
- Habitat loss, alteration, and/or fragmentation.
- Wetland loss.
- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.
- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Access control (duration, road density, traffic volume).

## CASPIAN TERN (*Sterna caspia*)

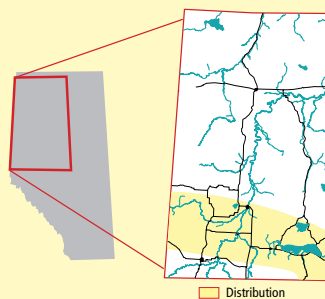
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- Photo Credit:** Lee Karney, U.S. Fish and Wildlife Service

# FORSTER'S TERN (*Sterna forsteri*)



**THE FORSTER'S TERN** is a common summer resident of the Grasslands, Parkland, and Boreal Forest (southern portion) Natural Regions of Alberta. Relatively little is known about Forster's tern life history and ecology within Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2S3B G5	No status	Data deficient

## HABITAT

Forster's terns are typically found breeding in marshes, wetlands, and lakes in Alberta; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** Forster's terns are typically colonial nesters; they nest atop floating vegetation, muskrat lodges, or old/abandoned grebe nests in emergent vegetation stands along the shallow margins of wetlands and lakes with stable water levels.

**FORAGING //** Forster's terns are mainly piscivorous and insectivorous diving birds; terns feed by hovering in the air and diving to catch small fish, or by capturing insects in the air or along the water surface.

Foraging areas may not be the same as nesting areas; therefore, terns travel up to 3km from their nests to forage.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- During nesting (May 1 to July 1) Forster's terns are sensitive to human disturbance caused by traffic, boating, off-highway vehicle use, and other human activities that cause shoreline disturbance.
- Disturbance may cause Forster's tern to abandon their nests, or may increase nest vulnerability to depredation by gulls, herons, and mink.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Sensory disturbance and reduced habitat effectiveness.
- Habitat loss, alteration, and/or fragmentation.
- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES //

- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Access control (duration, road density, traffic volume).
- Activity timing restrictions.

## FORSTER'S TERN (*Sterna forsteri*)

### SELECTED REFERENCES

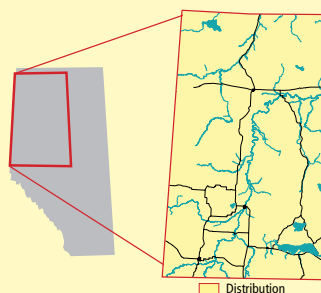
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**Photo Credit:** © Brian E. Small/[www.briansmallphoto.com](http://www.briansmallphoto.com)

# BALD EAGLE (*Haliaeetus leucocephalus*)



**BALD EAGLES** are large raptors often associated with fish-bearing water bodies. These eagles occur throughout Alberta in all Natural Regions, usually at low densities; they can be migratory or year-round residents.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	Not at risk

## HABITAT



Optimal bald eagle habitat is characterized by older forests that contain large structural attributes (e.g. tall trees) that offer nesting sites and above-canopy perching opportunities near habitat edges and fish-bearing water bodies.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**NESTING //** Nest trees are located within 2km of large water bodies in areas that are at least 500m from human development or disturbance (e.g. road or pipeline, residence).

Nests are typically built near the top of live, large diameter trees without preference for tree species.

**FORAGING //** Bald eagles are carnivorous predators and scavengers that commonly prey on fish; however, they will utilize a wide range of prey items and take advantage of what is available.

Eagles that overwinter in Alberta are often scavengers, foraging opportunistically on carrion.

High quality foraging habitat (e.g. edges and water bodies) is determined by high diversity and availability of prey species.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Disturbance of bald eagles during the nesting season (April through July) may result in nest abandonment and reproductive failure.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Road density and traffic volumes.
- Human-caused mortality.
- Loss of mature/old forest (complex forest structure and large diameter attributes).

### OTHER ISSUES //

- Chemical toxins and pollutants.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Activity timing restrictions.
- Riparian zone protection and/or aquatic habitat protection.
- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Retention of well-distributed mature/old forest patches.

## BALD EAGLE (*Haliaeetus leucocephalus*)

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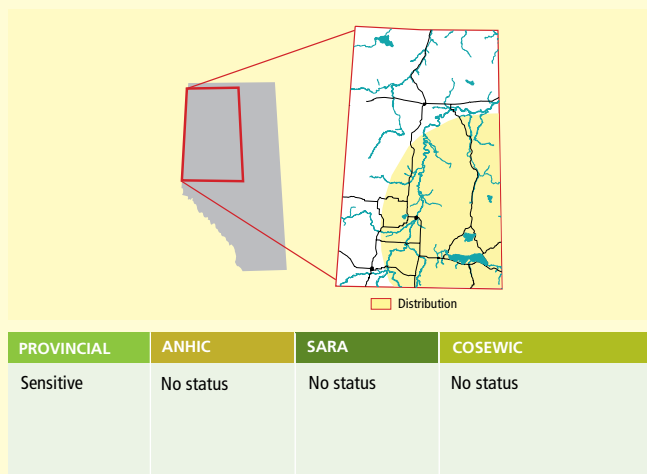
**Photo Credit:** Dave Menke, US Fish and Wildlife



# BROAD-WINGED HAWK (*Buteo platypterus*)



**THE BROAD-WINGED HAWK** is an uncommon migratory hawk that breeds in the southern portion of the Boreal Forest Natural Region and throughout the Parkland Natural Region of Alberta.



## HABITAT



The broad-winged hawk is associated with contiguous mature/old (>80 year old) deciduous and mixedwood forests in Alberta.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Broad-winged hawks nest in continuous deciduous or mixedwood stands, often in association with wetland or stream riparian zones and/or natural forest openings.

Broad-winged hawks build their nest in the primary forks of deciduous trees; use of coniferous trees for nesting may occur but is considered rare. Nests are typically 10 to 15m above ground, in trees larger than 25cm DBH.

Stick nests are constructed primarily by the female and consist of fresh twigs and old dead sticks of deciduous trees; the nests of other

birds or squirrels may also be modified and used by nesting broad-winged hawks.

Nests are not typically re-used in successive seasons.

**FORAGING //** The broad-winged hawk is a carnivorous, opportunistic feeder, hunting from perches located near forest openings and the margins of seasonal and permanent water bodies.

Typical prey items include: small mammals, birds, snakes, frogs, and large invertebrates.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Harvesting of mature/old forest and large diameter forest attributes.
- Habitat loss, fragmentation, and connectivity.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Retention of well-distributed mature/old forest patches.
- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Riparian zone protection and/or aquatic habitat protection.

## BROAD-WINGED HAWK (*Buteo platypterus*)

### SELECTED REFERENCES

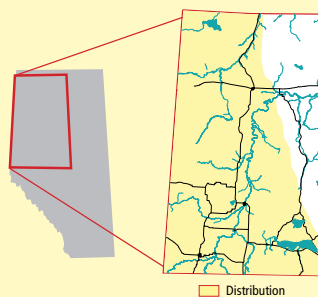
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**Photo Credit:** Peter Stahl

# GOLDEN EAGLE (*Aquila chrysaetos*)



**GOLDEN EAGLES** are one of the largest predatory bird species in North America; scattered breeding of these partial migrants occurs throughout most of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3B G5	No status	Not at risk

## HABITAT



Golden eagles prefer open landscapes and steep terrain, typically avoiding dense forests; while golden eagles may be associated with large structural attributes (e.g. large trees for nesting), they do not appear to be associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**NESTING //** Golden eagles typically nest on cliffs or in large trees in riparian areas near large openings (<500m).

Golden eagles show fidelity to breeding sites and may reuse nests for several consecutive breeding seasons.

**FORAGING //** Golden eagles are carnivorous predators and scavengers that forage opportunistically on such items as carrion, snowshoe hares, ground squirrels, grouse and marmots.

Availability of prey or carrion likely limits golden eagle density and breeding success.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Disturbance of golden eagles during the nesting season (February through July) may result in nest abandonment and reproductive failure.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Road density and traffic volumes.
- Human-caused mortality.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Activity timing restrictions.
- Retention of complex forest structure and recruitment of large diameter forest attributes.

## GOLDEN EAGLE (*Aquila chrysaetos*)

### SELECTED REFERENCES

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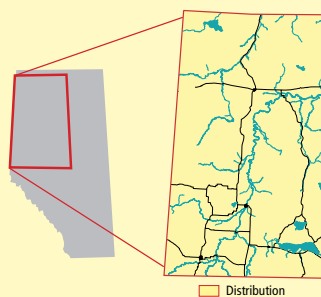
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**Photo Credit:** Peter Stahl

# NORTHERN GOSHAWK (*Accipiter gentiles atricapillus*)



**THE NORTHERN GOSHAWK**, a large forest-dwelling raptor, is a year round resident of the Boreal Forest, Rocky Mountains, Foothills, and Parkland Natural Regions of Alberta, although it may undertake short distance migrations in some areas.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	Not at risk

## HABITAT



Northern goshawks will live in a variety of stands (e.g. coniferous, mixwood, deciduous) provided specific structural attributes are present that are typical of late successional forests, including: large trees, dense canopy cover, and a relatively open understory.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**NESTING //** Northern goshawk nesting stands range in size from approximately 10ha to over 100ha, with stands >20ha considered optimal.

Nest stands are characterized by mature forest on moderate slopes, composed of large trees with a dense canopy ( $\geq 50\%$  closure), an open understory, and high lower canopy heights.

Goshawks will nest in a wide variety of tree species but nest trees are typically the largest available in the stand; nests in Alberta are almost exclusively found in trembling aspen trees regardless of stand type, with these trees being the largest available in the stand (average dbh >30cm, average tree height >21m).

**ROOSTING //** Understudied.

**FORAGING //** Considered a generalist predator, goshawks prey upon a wide variety of medium-sized birds and mammals, and will occasionally forage on carrion; snowshoe hares and red squirrels made up 88% of the goshawk's diet in mixedwood forests in Alberta.

Prey availability is determined by forest structural characteristics that favour goshawk hunting strategies, such as dense canopy cover, large trees, and an open understory; stand composition has little or no influence on goshawk foraging habitat selection.

Large territories (average 2000ha) are required to meet goshawk foraging requirements with a threshold of approximately 50% mature forest required for territory occupancy.

Foraging areas may be geographically separated from the nest stands.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Road density and traffic volumes.
- Habitat loss, alteration, and/or fragmentation.
- Sensory disturbance and reduced habitat effectiveness.
- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat patch size.
- Edge effects and core interior forest loss.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Access control (duration, road density, traffic volume).
- Access closure/reclamation.
- Coordinated resource activity planning (footprint reduction).
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Retention of well-distributed mature/old forest patches.

# NORTHERN GOSHAWK (*Accipiter gentiles atricapillus*)

## SELECTED REFERENCES

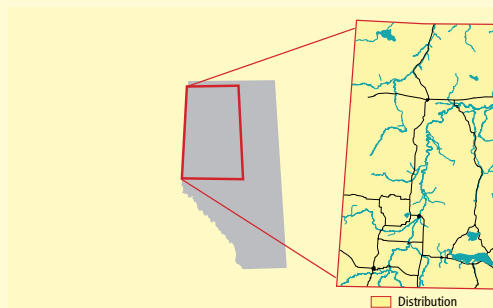
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**Photo Credit:** © Brian E. Small/www.briansmallphoto.com

# OSPREY (*Pandion haliaetus*)



OSPREYS are large migratory raptors found throughout the Rocky Mountain, Foothills, Boreal Forest, and Parkland Natural Regions of Alberta; this species is absent from the southeastern corner of the province.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT



Ospreys occupy a wide variety of habitat types provided essential habitat components are present, including: proximity to large shallow fish-bearing water bodies and the presence of suitable nesting sites (often tall, large diameter trees).

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** The large stick nests of ospreys are typically located within 500m of fish-bearing water bodies. Nests are commonly found on cliff tops, at the tops of large diameter trees, in crotches formed by tree branches, and on the tops of tall artificial structures including power poles.

Nesting pairs show fidelity to nest sites used in previous seasons, and routinely refurbish and re-use nests over consecutive years.

Few detailed descriptions of "natural" nest sites are available for boreal ecosystems; however, in eastern boreal forests, ospreys prefer tall spruce trees (15 to 18m) for nesting.

Beaver ponds may provide important osprey habitats in boreal regions because they contain nesting structures (snags) in close proximity to potentially fish-bearing foraging areas.

**FORAGING //** Ospreys feed almost exclusively on fish throughout their range. Productive foraging habitats are shallow fish-bearing water bodies, including: lakeshores, slow-moving rivers, and wetlands.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Wetland loss.
- Watershed impacts and/or hydrology disruption.
- Habitat loss, alteration, and/or fragmentation.
- Loss of mature/old forest (complex forest structure and large diameter attributes).

### OTHER ISSUES //

- Chemical toxins and pollutants.
- Loss of migratory and/or winter habitats.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Retention of complex forest structure and recruitment of large diameter forest attributes.

## OSPREY (*Pandion haliaetus*)

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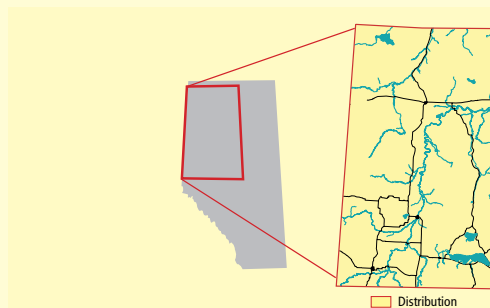
**Photo Credit:** Peter Stahl



# PEREGRINE FALCON (*Falco peregrinus anatum*)



**THE PEREGRINE FALCON** is an uncommon migratory bird that breeds locally throughout the province. Known nest sites occur in the Canadian Shield, Boreal Forest, Foothills, and Grassland Natural Regions, and within the cities of Edmonton and Calgary; as of 2005, between 40 and 50 pairs were known to breed in Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
At risk	S3B G4	No status	Special concern

## HABITAT



The peregrine falcon uses cliffs near water for nesting, and open fields, swamps, and marshes for hunting; tall buildings and bridges have replaced nesting cliffs in urban settings.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Historically, peregrine nest sites were located on the cutbanks of major rivers and streams as well as on stone cliffs in the foothill and shield areas of the province.

In recent years, a substantial proportion of nest sites in Alberta have been observed on anthropogenic structures in urban centres, including artificial nest boxes and the roofs of skyscrapers.

**FORAGING //** Peregrine falcons are opportunistic predators. They generally prey on a variety of wetland-associated bird species from passerines to small geese, but will also hunt mammals, fish, and invertebrates. It is estimated that 77% to 99% of the peregrine's diet consists of birds (by frequency rather than biomass).

During the breeding season, surplus prey is cached and stored. Cache sites are highly variable and include: holes or crevices on cliff faces, cliff ledges beneath dense shrubs, at the base of standing snags, under logs or driftwood, tree cavities or crotches, building ledges, drainholes, and urban billboards.

Marsh wetlands, lakes, and rivers are important foraging habitats for peregrine falcons.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Sensitive to disturbance throughout the breeding period (courting to fledging), which in Alberta ranges from mid-April to as late as September. Individuals in remote locations are more sensitive than those habituated to human activity.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Wetland loss.
- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.

## PEREGRINE FALCON (*Falco peregrinus anatum*)

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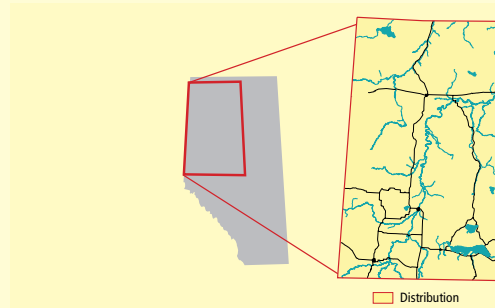
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**Photo Credit:** Peter Stahl

# SHARP-TAILED GROUSE (*Tympanuchus phasianellus*)



**THE SHARP-TAILED GROUSE** is an uncommon flocking bird found year-round in the Grasslands, Parkland, Boreal Forest, and Foothills Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S4 G4	No status	No status

## HABITAT

Sharp-tailed grouse are associated with early to mid-seral forests, in particular, edge and open shrubby habitats surrounded by deciduous stands; however, sharp-tailed grouse use a wide variety of habitats including open grasslands, shrub-steppe communities, and riparian habitats.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**SUMMER RANGE //** In the summer, grouse are found singly or in small groups throughout open grassland habitats or patchy open brushy areas interspersed with trees; high quality grouse habitat includes areas of perennial bunchgrasses, forbs, and shrubs.

**WINTER RANGE //** Large groups of grouse overwinter together in shrub and deciduous stands (aspen and birch) and/or riparian areas where buds, catkins, berries, and grain are available for food.

**BREEDING HABITAT //** Leks (i.e. traditional dancing grounds for courtship displays and mating) are found on elevated ground with sparse vegetation which provide a highly visible stage for male courtship displays and allow males to detect potential predators.

Females choose a nest site near the lek characterized by dense vegetative cover that provides concealment for the nest and escape cover.

**FORAGING //** Sharp-tailed grouse prefer feeding on native vegetation (forbs, grasses, berries, buds, etc.), but will occasionally eat insects and agricultural grains.

Young grouse rely on a diet of insects during their first month.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Between April 1 and May 31, sharp-tailed grouse are sensitive to human disturbance such as traffic and off-highway vehicle use near their lek sites.
- Disturbance may cause sharp-tailed grouse, particularly males, to abandon the lek.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Sensory disturbance and reduced habitat effectiveness.
- Habitat loss, alteration, and/or fragmentation.
- Modified predator-prey dynamics such as increased densities of corvids and greater availability of perching structures and platforms (i.e. power poles and fence posts) that enhance hunting efficiency of raptors.
- Fire suppression and salvage logging.

### OTHER ISSUES //

- Chemical toxins and pollutants.
- Over-hunting.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Activity timing restrictions.

## SHARP-TAILED GROUSE (*Tympanuchus phasianellus*)

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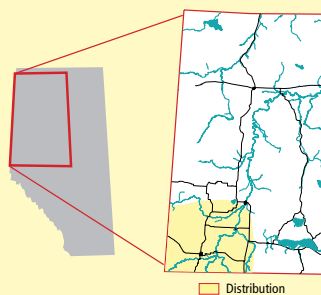
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**Photo Credit:** [www.istockphoto.com](http://www.istockphoto.com)

# UPLAND SANDPIPER (*Bartramia longicauda*)



**THE UPLAND SANDPIPER**, a migratory shorebird, is a regular breeder in the Grassland Natural Region of Alberta. The range of the upland sandpiper once extended into the Parkland and Boreal Forest Natural Regions, but due to recent range retractions, only localized breeding currently occurs in the Grande Prairie/Peace River region.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3B G5	No status	No status

## HABITAT



Upland sandpipers require large open habitats for breeding, including: native prairie, grassy uplands, hay fields, and wet meadows. Breeding habitat is not directly associated with forest structure or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Breeding upland sandpipers are associated with large tracts of open grassland. Optimal breeding habitat contains a mosaic of short grassy areas used for feeding and courtship, interspersed with areas of taller grasses and forbs used for nesting and brood cover.

Fence posts, rocks, tree stumps, and telephone poles may be important breeding habitat features because upland sandpipers regularly use platforms for courtship and territorial displays.

Nesting upland sandpipers select vegetative cover ranging between 15 to approximately 30cm in height, and appear to avoid cover over 61cm.

**FORAGING //** Upland sandpipers feed almost exclusively on low-flying and ground-dwelling insects, especially grasshoppers, crickets, and beetles. Seeds, grasses, and waste grains may constitute a small portion of their diet.

Throughout their range, upland sandpipers typically prefer shorter vegetation (<10cm) for foraging compared to nesting or brooding habitat.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Habitat patch size.
- Wetland loss.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.

## UPLAND SANDPIPER (*Bartramia longicauda*)

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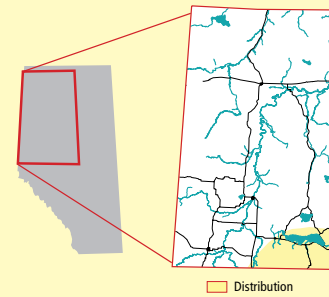
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**Photo Credit:** © Brian E. Small/[www.briansmallphoto.com](http://www.briansmallphoto.com)

# BARRED OWL (*Strix varia*)



**THE BARRED OWL** is a large woodland owl that resides year-round in the southern Boreal Forest and Foothills Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3S4 G5	No status	No status

## HABITAT

In Alberta, barred owls require large contiguous tracts of mature/old (>80 year old) mixedwood forests to meet their life requisites.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Barred owls nest in large natural cavities, selecting the largest deciduous trees or snags available in a stand.

In boreal Alberta, barred owls strongly prefer balsam poplar trees for nesting with nest trees averaging at least 51.6cm DBH and 16m in height.

Nest trees are located in areas with higher than average densities of suitable nest trees, which often occur in association with riparian areas of permanent water bodies.

The territorial nature of barred owls, combined with the scarcity of suitable nest trees on the landscape, may limit the abundance and distribution of this species.

**ROOSTING //** Barred owls roost in trees and cavities throughout the year, using both coniferous and deciduous trees; in Alberta, roost trees average 35.7cm (range 17.0 to 69.7cm) in DBH.

Large coniferous trees appear to provide thermal cover for roosting barred owls during inclement weather.

Old mixedwood stands may be preferred by roosting barred owls because of their microclimatic properties (cooler in the summer, warmer in the winter).

**FORAGING //** Barred owls are generalist sit-and-wait predators that primarily forage on small mammals, but birds, amphibians, and invertebrates are also eaten.

Foraging habitats are closely linked to prey abundance and availability.

Late successional stands with limited understory development are preferred foraging habitats due to the abundance and diversity of prey species, as well as the ease of hunting associated with this stand type.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Habitat loss, alteration, and/or fragmentation.
- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat patch size.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Retention of complex forest structure and recruitment of large diameter forest attributes).
- Retention of well-distributed mature/old forest patches.
- Variable retention harvesting practices (e.g. irregular edges, within block patches).
- Riparian zone protection and/or aquatic habitat protection.

## BARRED OWL (*Strix varia*)

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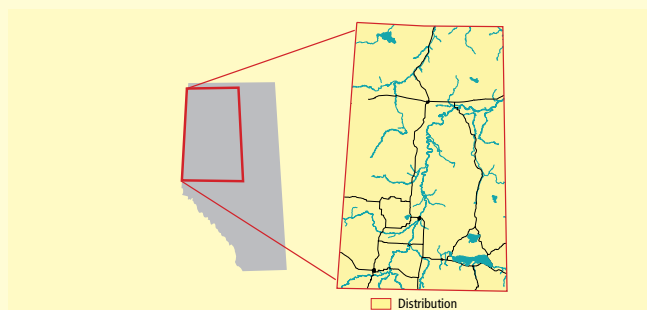
**Photo Credit:** Peter Stahl



# GREAT GRAY OWL (*Strix nebulosa*)



**THE GREAT GRAY OWL** is an uncommon year-round resident of the Boreal Forest and Foothills Natural Regions of Alberta; it occurs less frequently in the Parkland Natural Region and is absent from the southeast portion of the province.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	Not at risk

## HABITAT



Great gray owls are associated with dense northern boreal forests. They are commonly found in forested stands containing a diverse mixture of treed muskeg and/or mature/old mixedwood (>80 years old) forests in close proximity to open areas.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Breeding great gray owls do not build their own nests but instead require pre-existing nest structures in the form of stick nests (often old northern goshawk nests) or the broken tops of standing snags; the availability of appropriate nest structures is an important limiting factor for this species.

In Alberta, nest trees are typically large diameter (>35cm DBH) mature deciduous trees; coniferous trees are used less frequently.

Preferred nest sites are located under dense canopy cover with an abundance of leaning trees which provide escape terrain for flightless juvenile great gray owls faced with predatory attacks.

**FORAGING //** Great gray owls are sit-and-wait predators that specialize on hunting small rodents.

Preferred foraging habitats contain hunting perches adjacent to open areas, and are further characterized by low canopy closure and shrub cover which provide open flight paths for hunting owls.

Foraging habitats are closely linked to prey abundance and availability; in years of low prey abundance, great gray owls will travel extensively in search of areas with high prey abundance.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Habitat loss, alteration, and/or fragmentation.
- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat patch size.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Retention of well-distributed mature/old forest patches.

## GREAT GRAY OWL (*Strix nebulosa*)

### SELECTED REFERENCES

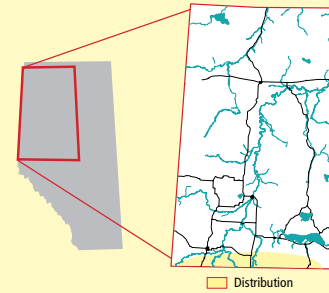
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**Photo Credit:** Peter Stahl

# NORTHERN PYGMY-OWL (*Glaucidium gnoma*)



**THE NORTHERN PYGMY OWL**, a small woodland owl, is a year-round resident of the Rocky Mountain, Foothills, and southwest portion of the Boreal Forest Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G5	No status	No status

## HABITAT

In Alberta, northern pygmy-owls prefer old (>81 years), structurally complex mixedwood forests with small clearings to meet their life requisites.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**STAND CHARACTERISTICS //** In the Foothills Natural Region of Alberta, northern-pygmy owls select older (>81 years old), taller (21 to 30m), structurally complex mixedwood stands with an aspen component, and avoid younger, shorter, and/or more open stands.

At the home range scale, these owls select for larger patch sizes, steeper slopes, and habitats in proximity to wet areas.

**BREEDING //** Little is known about northern pygmy-owl breeding habitat requirements in boreal Alberta.

Northern pygmy-owls nest in tree cavities created by woodpeckers, insects, and fungal decay.

Aspen trees may be an important nesting habitat component for pygmy owls because they mature faster, grow to larger diameters, and experience more advanced fungal decay at a younger age as compared to conifers.

**FORAGING //** Northern pygmy-owls are opportunistic sit-and-wait predators that hunt from perches by day.

Small mammals and birds are the primary prey items for pygmy owls, but birds, amphibians, and invertebrates are also eaten. Prey selection is thought to change with seasons as mammals are mainly eaten in the summer and birds in the winter.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Habitat loss, alteration, and/or fragmentation.
- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat patch size.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Retention of well-distributed mature/old forest patches.
- Variable retention harvesting practices (e.g. irregular edges, within block patches).
- Riparian zone protection and/or aquatic habitat protection.

## NORTHERN PYGMY-OWL (*Glaucidium gnoma*)

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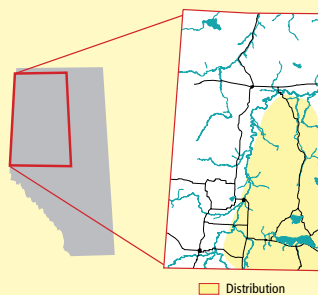
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**Photo Credit:** © Brian E. Small/www.briansmallphoto.com

# SHORT-EARED OWL (*Asio flammeus*)



**THE SHORT-EARED OWL**, a medium-sized grassland owl, is a year-round resident of the Grassland and Parkland Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S3B G5	Special concern (Schedule 3)	Special concern

## HABITAT



Short-eared owls require large open habitats, including grasslands, wetlands, native prairie, brushy meadows, and wet meadows that support high densities of meadow vole populations; breeding habitat is not associated with forest structure or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Breeding short-eared owls are associated with large (e.g. >100ha) open areas, such as: grasslands, grain stubble fields, hayfields, and shrubby areas.

Nests are typically built on the ground on dry upland sites and may be fully, partially, or poorly concealed by surrounding vegetation.

**ROOSTING //** It appears that roosting behaviour is influenced by ground moisture. During the breeding season short-eared owls roost on the ground; however, during periods of snow cover, short-eared owls may roost communally in trees.

**FORAGING //** Voles and small rodents are the primary prey of short-eared owls, but other mammals and birds are also eaten.

Prey availability is likely the most important factor in determining breeding habitat suitability; therefore, breeding and foraging habitats are inextricably linked.

Short-eared owls are considered nomadic and population will irrupt on a broad geographic scale in response to high concentrations of small rodents.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Habitat patch size.
- Wetland loss.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.

## SHORT-EARED OWL (*Asio flammeus*)

### SELECTED REFERENCES

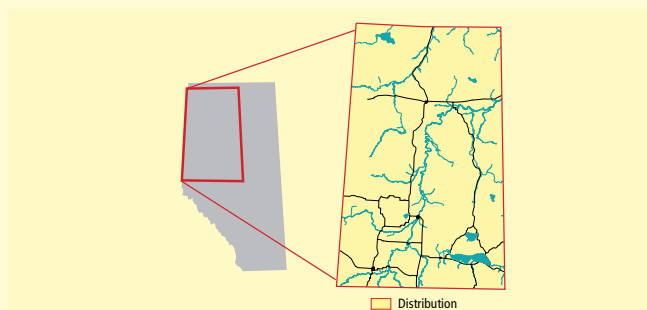
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**Photo Credit:** Peter Stahl

# COMMON NIGHTHAWK (*Chordeiles minor*)



**THE COMMON NIGHTHAWK** is a long-distance migrant that breeds locally throughout Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	Threatened

## HABITAT



Common nighthawks are habitat generalists and appear to adapt well to anthropogenic influences on the landscape, including forestry-related activities. Common nighthawks utilize many habitat types, including forested and urbanized areas, provided there are flat, relatively open areas available.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Common nighthawks do not construct a nest, but lay eggs directly on the ground.

Nesting habitat is diverse and includes logged or burned areas of forest, open forests and natural forest clearings, grassland habitats, rocky outcrops, and gravelly beaches of large permanent water bodies. Less common habitats include anthropogenically influenced areas such as: farmland and pasture lands, old gravel pits, and gravel rooftops in urban areas.

**ROOSTING //** Nighthawks roost in trees and on fence posts in nesting habitats.

**FORAGING //** Common nighthawks are crepuscular aerial insectivores; they feed on a wide variety of flying insects captured on the wing.

Foraging occurs over permanent water bodies, particularly rivers, or in forest openings at canopy height; nighthawks are also known to forage above highways and gravel roads, which make them susceptible to vehicular collisions.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Human-caused mortality.

### OTHER ISSUES //

- Chemical toxins and pollutants (i.e. non-selective pesticide spraying programs for control of mosquitoes).

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.

## COMMON NIGHTHAWK (*Chordeiles minor*)

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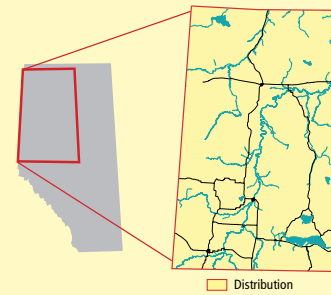
**Photo Credit:** Steve Symes, Fiera Biological Consulting Ltd.



# BLACK-BACKED WOODPECKER (*Picoides articus*)



**THE BLACK-BACKED WOODPECKER**, a medium-sized primary cavity nester, is a year round resident of the Boreal Forest, Foothills, and Rocky Mountain Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2S3 G5	No status	No status

## HABITAT

Black-backed woodpeckers are burn specialists found almost exclusively in recent burns (usually <5 years old); however, they will use structurally diverse mature/old coniferous forests when burned stands are unavailable.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**NESTING //** There is limited information currently available on black-backed woodpecker nest tree and/or nest stand characteristics in Alberta.

In the Rocky Mountain foothills, woodpeckers were observed to nest in spruce, aspen, and balsam poplar trees with dbh averaging 20 to 22cm; recently dead or dying conifer trees of larger than average diameter are preferred for nesting in other geographical areas.

**FORAGING //** The black-backed woodpecker is an insectivorous woodpecker with a strong preference for foraging in recently burned coniferous forests due to their high concentrations of wood-boring insects; conifer trees of larger than the average diameter snags are typically preferred foraging substrates.

In Alberta boreal forests, black-backed woodpeckers selected jack pine for foraging more than expected, and spruce less than expected based on availability.

In the Rocky Mountain foothills, woodpeckers foraged on moderately burned trees with bark still intact, as well as on downed wood the second and third year after fire. Birds were also regularly observed foraging great distances from their nests (>1km) suggesting habitat requirements for nesting and foraging may not be the same.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Fire suppression and salvage logging.
- Habitat loss, alteration, and/or fragmentation.
- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat patch size.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Partial retention during wildfire salvage (maintain conifer snags 15cm dbh with some >25cm dbh).
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Coarse woody debris recruitment.
- Retention of well-distributed mature/old forest patches.

## BLACK-BACKED WOODPECKER (*Picoides arcticus*)

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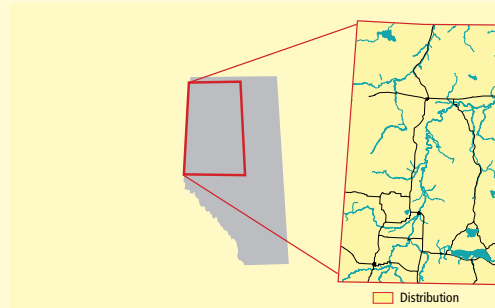
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**Photo Credit:** Peter Stahl

# PILEATED WOODPECKER (*Dryocopus pileatus*)



**THE PILEATED WOODPECKER**, a large primary cavity nester, is a year round resident of the Boreal Forest, Rocky Mountains, and Foothills Natural Regions, as well as wooded valleys in the Grassland Natural Region of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT



At a variety of spatial scales, pileated woodpeckers are associated with large diameter dead and dying wood (i.e. trees, snags, coarse woody debris) typical of mature/old forests; however, pileated woodpeckers will use a variety of stand types and stand ages provided these old forest attributes are present.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**NESTING //** Pileated woodpeckers generally excavate a new nest each year and rarely re-nest in pre-existing cavities.

Pileated woodpeckers select nest trees based on size, favouring the largest trees available in a stand; in the Rocky Mountain foothills, pileated woodpeckers excavated cavities in the largest trees available, with all cavities located in trees greater than 29cm dbh (average 45cm).

Where available, pileated woodpeckers exhibit a strong preference for nesting in trembling aspen trees.

**ROOSTING //** Pileated woodpeckers roost in declining trees or snags in advanced states of decay that have multiple openings (both natural and excavated), and extensive hollows created by heartwood rot; like nesting trees, pileated woodpeckers select the largest roosting trees available in a stand.

Individual woodpeckers use several different roost trees in their territory; alternate roost sites are thought to be important to minimize predation risk, provide alternate sites in case of disturbance, or if roost trees are lost due to competition for cavity sites, windthrow, or disease.

**FORAGING //** Pileated woodpeckers are insectivorous, using a variety of habitat structures for foraging including: live trees, declining trees, snags, coarse woody debris, and stumps.

The largest available substrates are selected for foraging, regardless of stand type; in the Rocky Mountain foothills, preferred foraging substrates ranged in size from 20cm to 50cm in dbh (average = 29cm dbh).

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Habitat loss, alteration, and/or fragmentation.
- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat patch size.
- Edge effects and core interior forest loss.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Retention of complex forest structure and recruitment of large diameter forest attributes (cavity trees  $\geq 30$  cm dbh; foraging substrates  $\geq 20$ cm dbh).
- Retention of well-distributed mature/old forest patches.

## PILEATED WOODPECKER (*Dryocopus pileatus*)

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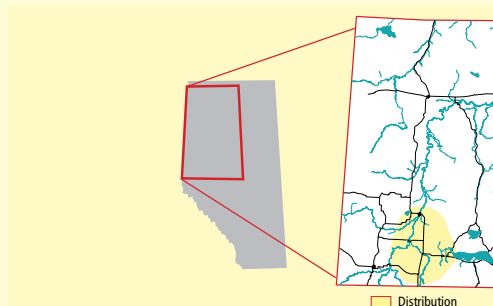
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**Photo Credit:** Peter Stahl

# PURPLE MARTIN (*Progne subis*)



**THE PURPLE MARTIN** is a migratory songbird that breeds in the Parkland Natural Region and southern portions of the Boreal Forest Natural Region in Alberta. The purple martin range is expanding north in the province, tracking urban expansion.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT



Purple martin prefer riparian habitats, forest edges, and burnt-over forest where insects are abundant and snags are available for nesting; however, they will use artificial cavities (i.e. nest boxes) in the absence of natural cavities, provided that nest boxes are located in areas where insects are plentiful.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Natural breeding habitats of the purple martin include forest edges and riparian areas, provided that sufficient natural cavities created by woodpeckers are present. Areas flooded by beaver activity with abundant standing dead snags may also provide suitable natural breeding habitats.

In Alberta, burnt-over forests and logged areas with residual standing snags provided natural nesting habitats prior to 1975. At present, purple martin nest almost exclusively in artificial nest boxes associated with human settlements. Purple martins construct nests in compartments of artificial nest boxes, and individuals return to the same nest box in consecutive years.

The availability of appropriate nesting structures is likely an important limiting factor for this species; moreover, competition from European starlings and house sparrows for nest boxes likely reduces the nesting success of purple martins.

**ROOSTING //** Purple martins roost in available compartments of artificial nest boxes.

**FORAGING //** Purple martins are aerial insectivores that capture and eat a wide variety of insects, including: ants, wasps, flies, mosquitoes, moths, butterflies, dragonflies, and damselflies.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Wetland loss.
- Fire suppression and salvage logging.
- Habitat loss, alteration, and/or fragmentation.

### OTHER ISSUES //

- Introduction of exotic species.
- Chemical toxins and pollutants (i.e. non-selective pesticide spraying programs for control of mosquitoes).

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Partial retention during wildfire salvage of snag and cavity habitats.
- Variable retention harvesting practices (e.g. retention of standing snag and cavity habitats).

## PURPLE MARTIN (*Progne subis*)

### SELECTED REFERENCES

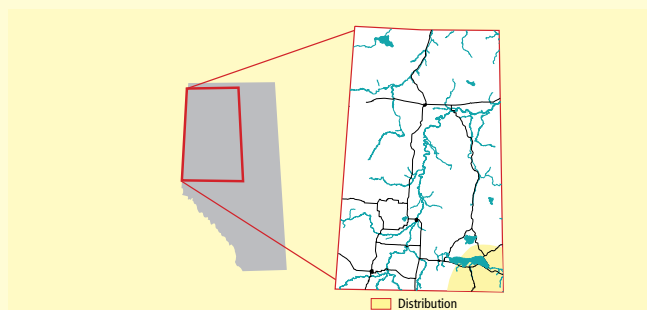
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**Photo Credit:** Peter Stahl

# SEDGE WREN (*Cistothorus platensis*)



**THE SEDGE WREN** is an uncommon migratory songbird that breeds in the eastern portion of the Parkland Natural Region, as well as southeastern portions of the Boreal Forest Natural Region.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2B G5	No status	No status

## HABITAT



Sedge wrens prefer sedge and grass dominated wetlands, wet meadows, and sphagnum bogs; breeding habitat is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Sedge wren nesting habitats are highly transitory and are characterized by vegetation types and soil moisture regimes that fluctuate dramatically with annual and seasonal variations in precipitation. As such, sedge wrens rarely return to the same breeding sites over consecutive years.

Dense nesting cover is a key habitat component for sedge wrens; they prefer mesic or upland sites where they nest among dense, tall sedges and grasses in wet meadows, hayfields, upland margins of ponds and marshes, and sphagnum bogs. Open areas with short or sparse vegetative cover, flooded areas, and cattail wetlands tend to be avoided.

Nests are attached to live stems of sedges and grasses generally less than 0.5m from the ground; occasionally nests are located in the lower branches of small trees or shrubs, or on the ground at the base of a sedge clump.

**FORAGING //** Sedge wrens are generalist insectivores gleaning insects and spiders from low foliage and the ground. Common prey items include: ants, beetles, caterpillars, and grasshoppers.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY//

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS//

- Wetland loss.
- Watershed impacts and/or hydrology disruption.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES)//

- Riparian zone protection and/or aquatic habitat protection.

## SEDGE WREN (*Cistothorus platensis*)

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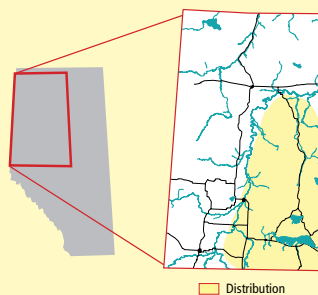
**Photo Credit:** © Brian E. Small/[www.briansmallphoto.com](http://www.briansmallphoto.com)



# BAY-BREASTED WARBLER (*Dendroica castanea*)



**THE BAY-BREASTED WARBLER** is an uncommon neotropical migrant songbird that breeds in the Boreal Natural Region of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3B G5	No status	No status

## HABITAT



The bay-breasted warbler is associated with mature/old (>80 year old) coniferous and mixedwood stands that have a large diameter white spruce tree component; it occurs infrequently in younger stands.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** There is very little information regarding the ecology of bay-breasted warblers in Alberta.

What little information is available suggests that this species prefers to nest in dense conifer stands, although mixedwood stands may also be used.

Bay-breasted warblers usually select conifer trees for nesting. Black spruce or balsam fir are typically preferred; however, all 4 nests documented in Alberta have occurred in white spruce (range 24-53 cm in diameter and 9-12 m in height).

**FORAGING //** Bay-breasted warblers are insectivorous on their breeding grounds, foraging almost exclusively on the larvae of butterflies and moths found in conifer trees.

Bay-breasted warbler population density is strongly correlated with spruce budworm outbreaks, and to a lesser degree forest tent caterpillar outbreaks; therefore, attempts to control these outbreaks may negatively impact bay-breasted warblers.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat loss, alteration, and/or fragmentation.
- Habitat patch size.
- Edge effects and core interior forest loss.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.
- Spruce budworm and tent caterpillar outbreak control.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Retention of well-distributed mature/old forest patches.
- Movement corridor retention (continuous/unbroken corridors or stepping stones).
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).

## BAY-BREASTED WARBLER (*Dendroica castanea*)

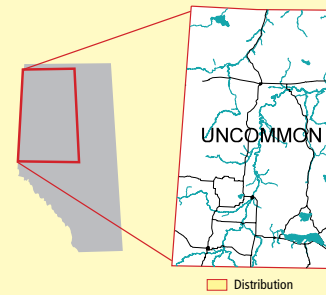
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- Photo Credit:** Katrina Cameron, Fiera Biological Consulting Ltd.

# BLACKBURNIAN WARBLER (*Dendroica fusca*)



**THE BLACKBURNIAN WARBLER** is an uncommon neotropical migrant that breeds in the Boreal Forest Natural Region of Alberta; it is considered a regular breeder in the Cold Lake region, but rare elsewhere in the boreal forest.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2B G5	No status	No status

## HABITAT

The blackburnian warbler is associated with contiguous mature/old (>80 year old) coniferous and mixedwood stands that have a large diameter white spruce tree component; it occurs infrequently in younger stands.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**STAND CHARACTERISTICS //** Blackburnian warblers have a strong, positive association with large trees, particularly white spruce, regardless of forest type.

Blackburnian warblers are associated with conifer-dominated mixedwood stands with high canopy closure (average 80%).

**BREEDING //** There is little information available on blackburnian warbler nest stand and nest site preferences in Alberta.

Elsewhere in their breeding range, blackburnian warblers prefer tall (average stand height  $\geq 18\text{m}$ ) spruce-dominated stands for nesting.

Coniferous trees are generally selected for nesting, but deciduous trees may also be used.

**FORAGING //** The blackburnian warbler is an insectivorous, foliage-gleaning songbird feeding almost entirely on insects, with moth and butterfly larvae often making up a large volume of the prey ingested; mayflies, spiders, and beetles are also eaten.

Foraging habitat preferences have been little studied; in old, mixedwood boreal forests in New Brunswick, blackburnian warblers used large diameter trees for foraging with no preference for tree species.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat loss, alteration, and/or fragmentation.
- Habitat patch size.
- Edge effects and core interior forest loss.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Retention of well-distributed mature/old forest patches.
- Movement corridor retention (continuous/unbroken corridors or stepping stones).
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).

## BLACKBURNIAN WARBLER (*Dendroica fusca*)

### SELECTED REFERENCES

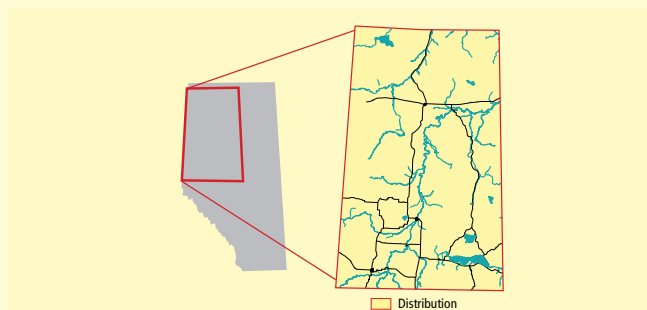
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**Photo Credit:** © Brian E. Small/www.briansmallphoto.com

# BLACK-THROATED GREEN WARBLER (*Dendroica virens*)



THE BLACK-THROATED GREEN WARBLER is an uncommon neotropical migrant songbird that breeds in the Boreal Forest and Foothills Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT



In Alberta, black-throated green warblers are most abundant in mature/old (>80 year old) coniferous and mixwood stands with a white spruce component; they occur infrequently in younger stands.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**STAND CHARACTERISTICS //** In Alberta, black-throated green warblers have a strong positive association with large trees, particularly white spruce, regardless of forest type; white spruce trees are preferred sites for foraging as well as singing posts.

**NESTING //** There is little information available on black-throated green warbler nest site preferences.

Coniferous trees are generally selected for nesting; however, of the six documented nest sites in mixwood boreal forests in Alberta, five nests were in deciduous trees (four in paper birch) and only one in a conifer tree.

**FORAGING //** The black-throated green warbler is an insectivorous, foliage-gleaning songbird feeding almost entirely on insects, with moth and butterfly larvae making up a large volume of the prey ingested.

Foraging habitat preferences of these warblers has been little studied; in old, mixwood boreal forests in Alberta, black-throated green warblers strongly select white spruce trees for foraging and avoid trembling aspen and balsam poplar.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Habitat loss, alteration, and/or fragmentation.
- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat patch size.
- Edge effects and core interior forest loss.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Retention of complex forest structure and recruitment of large diameter forest attributes (large white spruce trees).
- Retention of well-distributed mature/old forest patches.

# BLACK-THROATED GREEN WARBLER (*Dendroica virens*)

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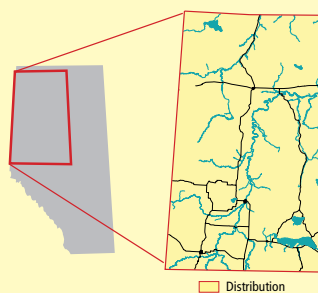
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**Photo Credit:** [www.istockphoto.com](http://www.istockphoto.com)

# CANADA WARBLER (*Wilsonia canadensis*)



**THE CANADA WARBLER** is an uncommon neotropical migrant that occurs throughout the Boreal Forest Natural Region, with scattered breeding records in the northern portion of the Parkland Natural Region.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT



The Canada warbler is associated with mature/old (>50 year old) mixedwood and deciduous (aspen-dominated) forests with a dense deciduous shrub understory.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**STAND CHARACTERISTICS //** Moist forest stands and shrubby riparian areas are important habitats for Canada warblers.

High shrub densities is a key habitat component regardless of stand type or seral stage.

**BREEDING //** Canada warblers are ground-nesters with nests situated on or near the ground, often on slopes, knolls, in earthen banks, or in rocky areas.

Dense vegetative cover is an important nesting habitat requirement; nests are well concealed in deciduous shrub thickets or in wet, mossy areas among ferns, stumps, and fallen logs.

**FORAGING //** The Canada warbler is an insectivorous songbird which feeds primarily on the wing in a flycatching manner; but it also gleans insects from foliage in the fashion typical of most wood-warblers. Prey includes flying insects and spiders.

Canada warblers typically forage in the lower branches of trees and shrubs. Nearly all foraging occurs below 5 m, without clear preference for coniferous or deciduous tree types.

In British Columbia, Canada warblers most frequently foraged on understory red-osier dogwood and young birch trees.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat loss, alteration, and/or fragmentation.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Retention of complex forest structure and recruitment of large diameter forest attributes (with dense deciduous shrubs in understory).
- Riparian zone protection and/or aquatic habitat protection.

## CANADA WARBLER (*Wilsonia canadensis*)

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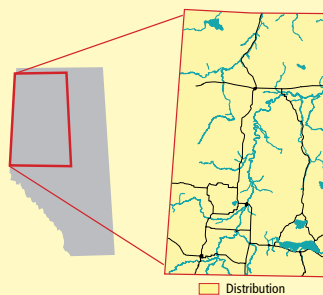
**Photo Credit:** Katie Cameron, Fiera Biological Consulting Ltd.



# CAPE MAY WARBLER (*Dendroica tigrina*)



**THE CAPE MAY WARBLER** is an uncommon neotropical migrant songbird that breeds in the Boreal Forest Natural Region of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2B G5	No status	No status

## HABITAT



The Cape May warbler is associated with mature/old (>80 year old) coniferous and mixedwood stands with a large white spruce component and occurs infrequently in younger stands.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**STAND CHARACTERISTICS //** Cape May warblers have a strong, positive association with large trees, particularly white spruce, regardless of forest type; white spruce are preferred sites for foraging as well as singing posts.

**BREEDING //** In Alberta, Cape May warbler breeding habitats are associated with dense mature and old white spruce stands.

Cape May warblers usually select conifer trees for nesting; large white spruce are preferred nest trees in Alberta.

**FORAGING //** On their breeding grounds, Cape May warblers are insectivorous foliage-gleaning songbirds, foraging almost exclusively on the larvae of butterflies and moths found in conifer trees.

Cape May warbler population density is strongly correlated with spruce budworm outbreaks; therefore, attempts to control these outbreaks through the spraying of insecticides may negatively impact this species.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat loss, alteration, and/or fragmentation.
- Habitat patch size.
- Edge effects and core interior forest loss.

### OTHER ISSUES //

- Loss of migratory and/or winter habitat.
- Spruce budworm outbreak control.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Retention of well-distributed mature/old forest patches.
- Retention of complex forest structure and recruitment of large diameter forest attributes (spruce trees).
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).

## CAPE MAY WARBLER (*Dendroica tigrina*)

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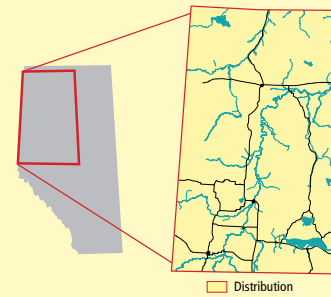
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**Photo Credit:** [www.istockphoto.com](http://www.istockphoto.com)

# WESTERN TANAGER (*Piranga ludoviciana*)



**THE WESTERN TANAGER** is a widespread neotropical migrant that occurs in the Boreal Forest, Rocky Mountain, and Foothills Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT

In Alberta, western tanagers are associated with small clearings or openings occurring in late-successional coniferous and mixed wood forests. Clearings, clear-cuts, burned areas, and open wetlands provide breaks in the forest canopy that are favorable to this species.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**STAND CHARACTERISTICS //** Western tanagers prefer stands with lower tree densities, and are positively correlated with tree height and coarse woody debris. These tanagers also prefer areas with more conifers, grass cover, and larger trees.

**BREEDING //** Western tanagers typically nest at heights >6m in the forest canopy, building loose, open-cup nest in conifers, and occasionally deciduous trees. In conifer trees, the nest is placed distally on branches where they are surrounded by many smaller branches; the location of the nest in deciduous trees is varied.

**FORAGING //** Western tanagers feed on insects (mainly wasps and ants), but will occasionally eat fruit.

Tanagers forage by moving slowly through the forest canopy and picking insects off the foliage. Insects are also caught on the wing (hawking) similar to a flycatcher.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Disturbance, especially during egg laying and early-incubation (late May to mid July) may cause female tanagers to abandon their nests.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Road density and traffic volumes.
- Habitat loss, alteration and or fragmentation

### OTHER ISSUES //

- Loss of migratory (molting) and/or winter habitat.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Access control (duration, road density, traffic volume).
- Activity timing restrictions.
- Coarse woody debris recruitment.
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Retention of well-distributed mature/old forest patches.

## WESTERN TANAGER (*Piranga ludoviciana*)

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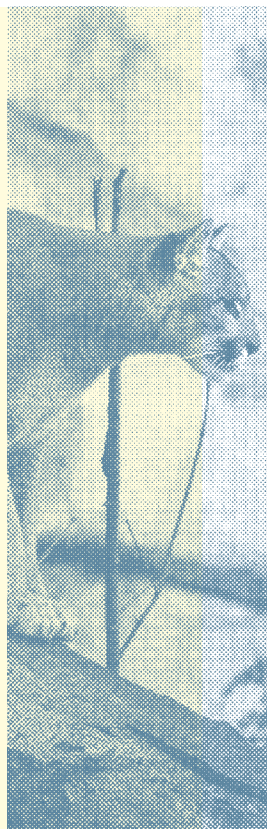
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**Photo Credit:** Dave Menke, US Fish and Wildlife

# MAMMALS



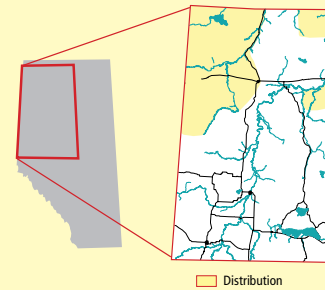




# WOOD BISON (*Bison bison athabasca*)



**WOOD BISON** are North America's largest terrestrial mammal, and are recovering from near extinction due to over hunting during settlement of western North America. Isolated herds currently populate the Boreal Forest Natural Region of Alberta; however, these herds are under persistent threat from disease.



PROVINCIAL	ANHIC	SARA	COSEWIC
At risk	S1 G4T?Q	Threatened (Schedule 1)	Threatened

## HABITAT

Wood bison use a variety of seral/structural stages and forest cover types, with a preference for wet meadows and early successional forests.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**WINTER RANGE //** Winter range includes areas of high forage volume, such as wet sedge meadows or early successional forests that also provide cover or shelter during extreme weather.

**SUMMER RANGE//** Bison use a variety of habitats during the summer, including wet sedge meadows, shrub-lands, and upland forest.

**OPEN WATER //** Due to their large daily water requirements, wood bison are often found in close proximity to open water sources.

**FORAGING //** Wood bison are obligate grazers as they depend almost exclusively on sedges and grasses to meet their foraging requirements.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- None

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Human-caused mortality.
- Road density and traffic volumes.
- Habitat loss, alteration, and/or fragmentation.
- Wetland loss.
- Watershed impacts and/or hydrology disruption.
- Disruption of dispersal and/or movement patterns.

### OTHER ISSUES //

- Disease and pathogens: brucellosis, bovine tuberculosis, and anthrax.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Landscape-level planning for movement corridors and migration routes.
- Movement corridor retention (continuous/unbroken corridors or stepping-stones).
- Activity timing restrictions.

## WOOD BISON (*Bison bison athabasca*)

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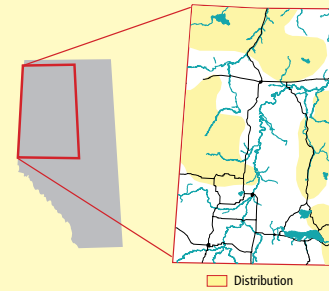
**Photo Credit:** Karl Zimmer, Fiera Biological Consulting Ltd.



# WOODLAND CARIBOU (*Rangifer tarandus caribou*)



**WOODLAND CARIBOU** (boreal ecotype) are wide-ranging ungulates that are year-round residents of the Foothills and Boreal Forest Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
At risk	S2 G5T4	Boreal population: Threatened (Schedule 1)	Boreal population: Threatened

## HABITAT

Woodland caribou generally prefer landscapes of continuous mature coniferous forest; however, landscapes that support caribou populations include a matrix of habitats as long as there are adequate forage opportunities and minimal predation risk.

### IMPORTANT HABITATS & HABITAT ELEMENTS

**HOME RANGE //** At the coarse scale (i.e. annual home range and seasonal range) caribou select habitats that are less likely to contain high densities of other ungulates (i.e. moose and deer) and their predators (i.e. wolves), thereby reducing predation by creating spatial separation, particularly during the winter and calving seasons.

**LATE-SUCCESSIONAL PEATLANDS //** Boreal caribou in Alberta show a strong preference for old (>51 years) peatland habitats, with treed bogs and fens selected over non-treed peatland habitats.

**UPLAND CONIFER STANDS //** Mature conifer forests (black spruce, jack pine, and mixed conifer) are considered important winter habitat for caribou, as these habitats provide terrestrial lichen forage and may provide escape habitat from wolves in deep snow conditions.

**FORAGING //** Terrestrial lichens make up the bulk of the winter diet of woodland caribou; arboreal lichens, shrubs, graminoids, and conifer needles are also eaten and may become primary forage when deep, crusted snow makes accessing ground lichens difficult.

The spring and summer diet is somewhat more diverse, including: terrestrial lichens, shrubs, graminoids, horsetails, forbs, fungi, and arboreal lichens.

### SPECIES STATUS ISSUES & OPPORTUNITIES

#### TEMPORAL VULNERABILITY //

- Caribou, particularly pregnant cows, are most likely to be negatively affected by human activity during the late winter and spring.

#### LIMITING FACTORS FOR SPECIES SUCCESS //

- Road density and traffic volumes.
- Human-caused mortality.
- Habitat loss, fragmentation, and connectivity.
- Disruption of dispersal and/or movement patterns.
- Sensory disturbance and reduced habitat effectiveness.
- Modified predator-prey dynamics.
- Loss of mature/old forest (complex forest structure and large diameter attributes).

- Habitat patch size.
- Fire suppression and salvage logging.

#### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Access control (duration, road density, traffic volume).
- Access closure/reclamation.
- Coordinated resource activity planning (footprint reduction).
- Activity timing restrictions.
- Movement corridor retention (continuous/unbroken corridors or stepping-stones).
- Retention of well-distributed mature/old forest patches.

## WOODLAND CARIBOU (*Rangifer tarandus caribou*)

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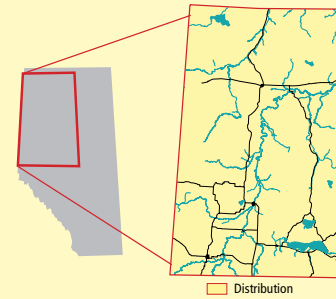
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**Photo Credit:** Stephen Hanus

# FISHER (*Martes pennanti*)



**THE FISHER**, a medium-sized member of the weasel family, is a year-round resident of the Rocky Mountain, Foothills, and Boreal Forest Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## HABITAT

Fishers require continuous mixedwood habitats with late successional attributes to meet life history requirements, and are associated with closed canopy forests with abundant large woody debris, large snags, tree cavities, and understory vegetation.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**RIPARIAN AREAS //** Riparian areas are important to fishers because they typically provide an abundance of late successional habitat features, abundant prey, and connectivity between habitat patches.

**RESTING SITES //** Fishers use rest sites for a variety of purposes, but most importantly, for thermal and security cover. Resting sites include: tree branches, tree cavities, logs (hollow or solid), root wads, willow thickets, underground burrows, and rock falls.

**DEN SITES //** Female fishers typically use large diameter tree cavities for both natal and maternal dens.

**FORAGING //** Fishers are generalist predators that feed on a wide variety of prey species including: snowshoe hares, porcupines, squirrels, mice, and voles. Carrion, birds, fish, herpetiles, and vegetation may also be eaten.

Fishers forage in a wide variety of habitat-types provided there is dense canopy or shrub cover.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Human-caused mortality.
- Habitat loss, alteration, and/or fragmentation.
- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat patch size.

### OTHER ISSUES //

- Trapping mortality

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Coarse woody debris recruitment.
- Movement corridor retention (continuous/unbroken corridors or stepping-stones).
- Riparian zone protection and/or aquatic habitat protection.
- Retention of well-distributed mature/old forest patches.

## FISHER (*Martes pennanti*)

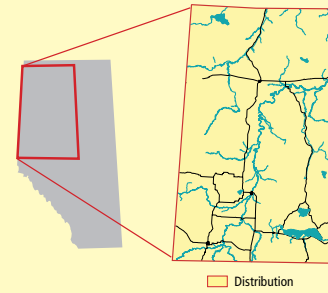
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- Photo Credit:** Alberta Research Council, Alberta Wolverine Experimental Project

# WOLVERINE (*Gulo gulo*)



**THE WOLVERINE** is the largest member of the weasel family and is a year-round resident of the Rocky Mountain, Foothills, and Boreal Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S3 G4	No status	Eastern population: Endangered; Western population: Special concern

## HABITAT

Wolverines will use a variety of seral/structural stages and forest cover types, with a preference for mature/old forests at both the stand- and landscape-level.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**REFUGIA //** Optimal habitats occur in protected or remote wilderness with low road densities and minimal human activity.

Large intact areas protected from anthropogenic disturbances, including trapping, may be the single most important landscape management consideration for wolverines.

**DEN SITES //** Wolverine dens are typically located in snow tunnels under boulders/large woody debris or in large tree cavities near abundant food supplies and away from disturbance.

Females may abandon their den if disturbed.

### MOVEMENT CORRIDORS AND/OR STEPPING STONES //

Wolverines typically travel along watercourses and low elevation passes between valleys and will avoid crossing young (<25 years)

cutblocks. Therefore, human activity may displace wolverines or alter their movements across the landscape.

Forested corridors that connect habitat patches are critical to wolverine survival and reproductive success.

**FORAGING //** Wolverines are carnivores that actively hunt during the summer, and primarily scavenge for carrion of large ungulates during the winter.

Because wolverines scavenge for food during the winter, survival and success is closely tied to ungulate abundance; therefore, activities that decrease ungulate populations, such as loss or alteration of winter range, may negatively impact wolverines.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Females are susceptible to disturbance during the denning season (November to March).

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Human-caused mortality.
- Habitat loss, alteration, and/or fragmentation.
- Sensory disturbance and reduced habitat effectiveness.
- Modified predator-prey dynamics.

### OTHER ISSUES //

- Trapping mortality.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Access control (duration, road density, traffic volume).
- Coordinated resource activity planning (footprint reduction).
- Activity timing restrictions.
- Movement corridor retention (continuous/unbroken corridors or stepping-stones).
- Riparian zone protection.
- Retention of well-distributed mature/old forest patches.

## WOLVERINE (*Gulo gulo*)

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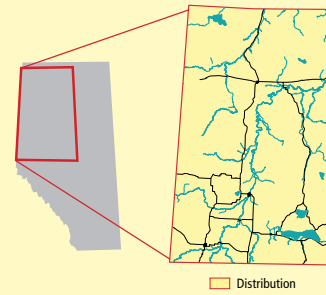
**Photo Credit:** Steve Hillebrand, U.S. Fish and Wildlife Service



# CANADA LYNX (*Lynx canadensis*)



**CANADA LYNX** are medium-sized cats that are year-round residents of the Rocky Mountain, Foothills, and Boreal Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	Not at risk

## HABITAT

Lynx require a mosaic of early and late successional habitats to meet their life requisites.

### IMPORTANT HABITATS & HABITAT ELEMENTS

**COARSE WOODY DEBRIS //** Lynx require coarse woody debris >15cm diameter (i.e. fallen trees, root piles) for denning, security cover, and thermal cover.

**DEN SITES //** Dens are typically located under dense tangles of blown-down trees; density and positioning of coarse woody debris appears to influence den site selection more than seral stage or stand type.

Degree of human disturbance, proximity to high quality foraging areas, and habitat patch size also influence den site selection.

#### MOVEMENT CORRIDORS AND/OR STEPPING STONES //

Lynx require cover for travel, security, and stalking prey; they typically avoid crossing open areas >100m across.

Travel habitat includes conifer and deciduous stands situated along ridges, saddles, rivers, and streams where average snow accumulation is 1m.

**FORAGING //** Lynx are considered snowshoe hare specialists, as hare make up 33-97% of prey items consumed.

At northern latitudes, lynx density follows the cyclical density of snowshoe hare, with a one or two year lag.

Due to the dependence of lynx on snowshoe hare, lynx foraging habitat is closely tied to snowshoe hare habitat; therefore, managing for adequate densities of snowshoe hare will likely ensure adequate densities of lynx.

### SPECIES STATUS ISSUES & OPPORTUNITIES

#### TEMPORAL VULNERABILITY //

- Understudied; however, there is suggestion that lynx are negatively affected by human disturbance during the denning period.

#### LIMITING FACTORS FOR SPECIES SUCCESS //

- Human-caused mortality.
- Disruption of dispersal and/or movement patterns.
- Habitat patch size.
- Habitat loss, fragmentation, and/or connectivity.
- Modified predator-prey dynamics.

#### OTHER ISSUES //

- Trapping mortality.

#### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Access control (duration, road density, traffic volume).
- Coordinated resource activity planning (footprint reduction).
- Movement corridor retention (continuous/unbroken corridors or stepping-stones).
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Coarse woody debris recruitment.

## CANADA LYNX (*Lynx canadensis*)

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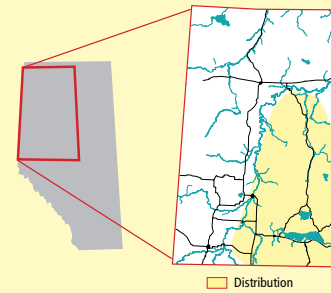
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- Photo Credit: Bauer, Erwin and Peggy, U.S. Fish and Wildlife Service



# COUGAR (*Puma concolor*)



**COUGARS** are large-sized cats that are year-round residents of the Rocky Mountain and Foothills Natural Regions of southwestern Alberta. This species is thought to be expanding its range eastward in Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status; Eastern population: Data deficient

## HABITAT

Cougars require structurally complex forested habitats to meet their life requisites. They benefit from dense understory vegetation, high canopy closure, coarse woody debris, and diverse topography. While not associated with forest age or seral stage, they tend to avoid open areas including recent clearcuts.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**DEN SITES //** Cougar den sites are typically used only for raising and protecting kittens.

Den site selection may be influenced by topography; in rugged terrain, dens are usually located in a shallow nook on the face of a cliff or rock outcrop, whereas in less mountainous areas, dens are located in dense shrub or under fallen logs.

### MOVEMENT CORRIDORS AND/OR STEPPING STONES //

Movement corridors are critical for maintaining stable cougar populations in landscapes influenced by forestry because they connect seasonal foraging areas and provide security cover during dispersal.

Movement corridors are characterized by abundant horizontal cover and are often associated with riparian areas; widths are thought to vary

with distance between habitat patches, but suggested corridor widths range from 100m to 1.6km.

**FORAGING //** Cougars are carnivorous predators that prey almost exclusively on deer in Alberta, although moose and elk are also important prey items. Other prey items may include: mountain goats, mountain sheep, porcupines, beaver, snowshoe hare, and rarely coyotes, foxes, and lynx.

Cougars require stalking cover while hunting potential prey; optimal stalking cover usually consists of dense vegetative cover and/or diverse topography. Increased cover in foraging habitats may provide cougars with thermal protection, feeding security, and cache sites.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Human-caused mortality.
- Disruption of dispersal and/or movement patterns.
- Habitat patch size.
- Habitat loss, fragmentation, and/or connectivity.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Access control (duration, road density, traffic volume).
- Coordinated resource activity planning (footprint reduction).
- Movement corridor retention (continuous/unbroken corridors or stepping-stones).
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Coarse woody debris recruitment.

## COUGAR (*Puma concolor*)

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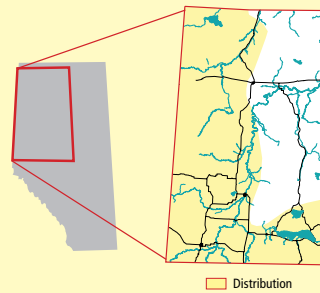
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**Photo Credit:** [www.istockphoto.com](http://www.istockphoto.com)

# GRIZZLY BEAR (*Ursus arctos*)



**THE GRIZZLY BEAR** is a landscape species that requires large areas of habitat to maintain viable populations. It is a year-round resident of the Rocky Mountain, Foothills, and Boreal Natural Regions of Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	No status	No status	Prairie population: Extirpated; Northwestern population: Special concern

## HABITAT

Optimal habitats consist of roadless areas with a mosaic of early seral stage forests and natural openings, located in proximity to late-successional forest stands that provide day beds and hiding cover. Northern Alberta populations and habitat preferences are currently being studied.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**COVER //** Thermal and security cover is important for regulating body temperature and avoiding humans and other bears; dense closed canopy forests or shrub lands are preferred cover habitats.

**RIPARIAN AREAS //** Riparian areas are considered key habitats because they provide an abundance of food and cover resources, particularly during the spring and summer.

**MOVEMENT CORRIDORS AND/OR STEPPING STONES //** Grizzly bears typically travel along heights of land and riparian networks, and avoid crossing large openings.

Forested corridors in proximity to high quality foraging habitat are important for maintaining demographic connectivity of populations and re-colonizing available habitats.

**DEN SITES //** Grizzly bears hibernate in dens excavated in slopes ranging from 22 to 45 degrees, but dens may also be located in other structures (caves, tree cavities, uprooted tree bases).

Den sites are typically found in mature or old forest, in areas with minimal human activity; grizzly bears will abandon their den site if repeatedly disturbed.

**FORAGING //** Grizzly bears are opportunistic omnivores and major food items include grasses, forbs, roots, berries, rodents, and ungulates.

Foraging requirements primarily drive habitat selection by grizzly bears; preferred forage is most abundant in non-forested or partially forested sites, older forests with abundant canopy gaps, and regenerating forests initiated by forest fire or harvesting.

Because grizzly bears primarily eat plant material, they hibernate to survive winter food shortages.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Individuals are susceptible to disturbance during hibernation (November to May).

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Road density and traffic volumes.
- Human-caused mortality.
- Habitat loss, fragmentation, and connectivity.
- Sensory disturbance and reduced habitat effectiveness.
- Fire suppression.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Access control (duration, road density, traffic volume).
- Access closure/reclamation.
- Coordinated resource activity planning (footprint reduction).
- Activity timing restrictions.
- Movement corridor retention (i.e. continuous/unbroken corridors or stepping-stones).
- Riparian zone protection.
- Variable retention harvesting practices (i.e. irregular edges, within-block patches).

## GRIZZLY BEAR (*Ursus arctos*)

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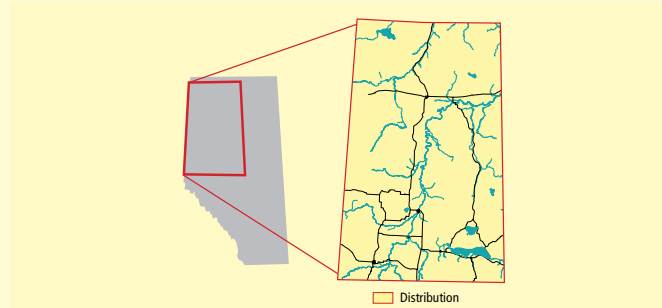
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**Photo Credit:** Terry Tollefsbol, U.S. Fish and Wildlife Service

# NORTHERN LONG-EARED BAT (*Myotis septentrionalis*)



**THE NORTHERN LONG-EARED BAT** is an insectivorous forest-dwelling bat that is relatively uncommon throughout Alberta. They are year-round residents most frequently found in the Boreal Forest Natural Region and the northern portion of the Foothills Natural Region; they are conspicuously absent from the southern portion of the province.



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S2S3 G4	No status	No status

## HABITAT

There is little information available about the specific habitat requirements of the northern long-eared bat in Alberta because of its low abundance and inconspicuous nature; however, this species generally prefers mature or old-growth mixedwood habitats that provide tall, large diameter, newly dead or dying trees for roosting.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**STAND CHARACTERISTICS //** Late-successional mixedwood forests (>120 years) likely provide ideal habitat for northern long-eared bats because these forests provide suitable roosting sites, greater foraging opportunities due to reduced clutter, increased canopy gaps and edges, and greater insect densities.

**SUMMER ROOSTS //** The availability of suitable roosting sites appears to be the primary factor driving habitat choice by northern long-eared bats; both males and females select snags that are larger than average, with reproductive females preferring deciduous snags and males preferring conifer snags.

**HIBERNACULA //** There are two known northern long-eared bat hibernacula in Alberta: Cadomin Cave and Wood Buffalo National Park.

**FORAGING //** Viable bat populations typically occur in areas where suitable roosting sites are available within commuting distances to foraging areas; foraging activity is likely associated with older forests.

Northern long-eared bats are generalist insectivores, feeding exclusively on insects such as: moths, beetles, mosquitoes, black flies, leafhoppers, aphids, bees and wasps.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Northern long-eared bats are extremely sensitive to disturbance during hibernation (October to May); if bats are repeatedly aroused they can expend all their energy reserves and die.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Human-caused mortality.
- Habitat loss, fragmentation, and connectivity.
- Loss of mature/old forest (complex forest structure and large diameter attributes).
- Habitat patch size.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Retention of well-distributed mature/old forest patches.

## NORTHERN LONG-EARED BAT (*Myotis septentrionalis*)

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**Photo Credit:** Dr. Brock Fenton



# ARTHROPODS



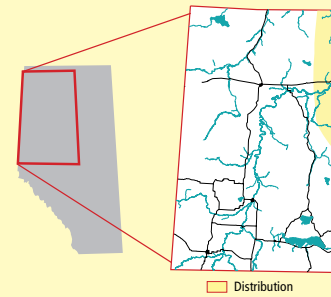




# RIVER JEWELWING (*Calopteryx aequabilis*)



**RIVER JEWELWINGS** are large uncommon damselflies that occur in Alberta's Boreal Forest and Canadian Shield Natural Regions. This species is thought to be restricted to the northeast corner of the province; however, river jewelwings have been observed near the Chinchaga River, west of High Level. Relatively little is known about river jewelwing life history and ecology within Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Undetermined	S1	No status	No status

## HABITAT

River jewelwings are primarily aquatic, inhabiting low flowing, small to medium-sized streams and rivers; clear waters with abundant submergent vegetation appear to be important habitat features. Forested, partially-forested, and non-forested areas adjacent to streams are frequented by this species. Their association with forest age or seral stage has not been studied.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**STREAM & RIVER HABITAT //** As adults, female river jewelwings require stream habitats for mating and egg-laying.

**BREEDING //** Upon emergence in the summer, adult river jewelwings commence reproductive activities. Sexually mature males establish and maintain territories along streams and engage in elaborate mating behaviors that often preclude them from leaving streams; territories typically contain one or more oviposition sites.

After mating, females lay eggs underwater on submerged vegetation.

Upon hatching, river jewelwings spend a large portion of their lifespan (up to two or three years) as larvae clinging to vegetation, such as pondweed, in streams and rivers.

**FORAGING //** All life stages of river jewelwings are predacious; adults feed primarily on aerial invertebrates, while larvae feed on aquatic invertebrates.

Adult females are often found foraging in forested areas away from streams, while males typically forage in proximity to stream habitats.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Watershed impacts and/or hydrology disruption.

### OTHER ISSUES //

- Chemical toxins and pollutants.
- Introduction of exotic species.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Riparian zone protection and/or aquatic habitat protection.
- Sedimentation and erosion control.

## RIVER JEWELWING (*Calopteryx aequabilis*)

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**Photo Credit:** Drags Vujnovic, Alberta Natural Heritage Information Centre

# GRIZZLED SKIPPER (*Pyrgus centaureae freija*)

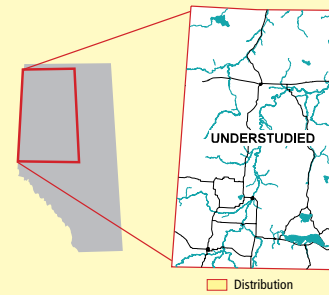


*Pyrgus centaureae* Evans

ALBERTA: 10km W Bragg Creek 12-V1-1994 (D. Lawrie)

U.A. Strickland Museum #UASM33179 (G. Anweiler image)

**THE GRIZZLED SKIPPER** is a rare butterfly occurring in the Boreal Forest Natural Region of Alberta. This species is commonly grouped with the subspecies (*P.c. loki*), which is found in the Rocky Mountain Natural Region of Alberta. Relatively little is known about grizzled skipper life history and ecology within Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Secure (both subspecies combined)	S2S3 G5T4T5	No status	No status

## HABITAT

In the boreal forest, the grizzled skipper occurs in small clearings of black spruce bogs; in other areas, this subspecies is associated with early successional conifer forest stands containing open patches and abundant larval habitats.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** In the boreal forest, grizzled skippers are often found perching on the ground of small clearings and open areas within conifer stands between June and August; they may use open seismic lines and pipelines as movement corridors.

Breeding and larval life stages are currently understudied; preferred larval host-plants are unknown in Alberta, but oviposition has been reported on cinquefoil shrubs in more southern parts of the species range.

Evidence suggests this species functions on a two year life cycle where it only flies every second year, as it is found more often during odd numbered years.

**FORAGING //** Adult skippers are thought to forage on the nectar of species from the rose family including: wild strawberry, cinquefoil, and other low-growing flowers and plants.

Where information is available, larvae have been observed to feed on blueberry, chokecherry, cloudberry, and wild strawberry.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Understudied.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Understudied.

## GRIZZLED SKIPPER (*Pyrgus centaureae freija*)

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- Photo Credit:** G. Anweiler, E.H. Strickland Entomological Museum, Department of Biological Sciences, University of Alberta

# HUDSONIAN OLD WORLD SWALLOWTAIL

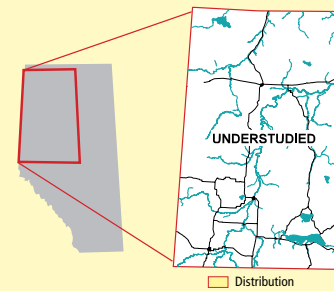
(*Papilio machaon hudsonianus*)



*Papilio machaon hudsonianus* (male)  
MB Thompson 2-VII-1983  
U.A. Strickland Museum #UASM19573  
(G. G. Anweiler image)



*Papilio machaon hudsonianus* (male)  
MB Thompson 2-VII-1983  
U.A. Strickland Museum #UASM19573  
(G. G. Anweiler image)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2S3 G5T4	No status	No status

**HUDSONIAN OLD WORLD SWALLOWTAIL** is a rare subspecies of butterfly that is broadly distributed throughout the Boreal Forest Natural Region of Alberta. Relatively little is known about this butterfly's life history and ecology within Alberta.

## HABITAT

Hudsonian old world swallowtails are associated with conifer forest openings, including roadsides, bogs, open pine woods, and sparsely treed hilltops. Their association with forest age or seral stage has not been studied.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Breeding occurs during flight periods in late June when males typically congregate on hilltops in search of potential mates.

Post-copulation, females deposit fertilized eggs on the larval host plant producing only one brood per year; larval host plants for this subspecies have not been well established.

Eggs hatch the following spring and overwinter as larvae before metamorphosing into the adult butterfly form in the second spring.

**FORAGING //** The diet of Hudsonian old world swallowtails is not well studied; however, there is evidence suggesting coltsfoot may be an important larval host-plant.

Adults consume nectar from Labrador tea, hawkweed, and dogbane blossoms.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Understudied.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Understudied.

# HUDSONIAN OLD WORLD SWALLOWTAIL

## (*Papilio machaon hudsonianus*)

### SELECTED REFERENCES

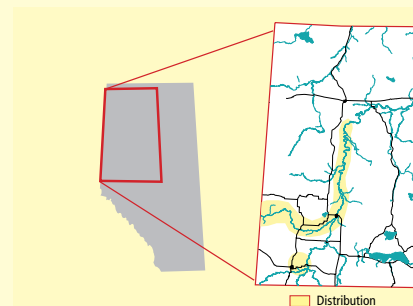
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- Photo Credit:** G. Anweiler, E.H. Strickland Entomological Museum, Department of Biological Sciences, University of Alberta

# PIKE'S OLD WORLD SWALLOWTAIL

(*Papilio machaon pikei*)



**PIKE'S OLD WORLD SWALLOWTAIL**, a rare subspecies of butterfly, has a patchy distribution throughout the Parkland Natural Region; this subspecies is also restricted to dry grassland habitats along the Peace River and in the Kleskun Hills badlands in the Boreal Forest Natural Region. Relatively little is known about Pike's old world swallowtail life history and ecology within Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S1S2 G4T2	No status	No status

## HABITAT

Pike's old world swallowtails are associated with dry grassland habitats along eroding river banks and badlands. Disturbed habitats associated with road construction may also provide suitable habitat for this butterfly provided the larval host-plant is present. This butterfly is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Breeding occurs during flight periods in June. At this time, males congregate on hilltops, patrolling the grassy tops of river valleys in search of potential mates while females typically fly along the draws and valleys.

Post-copulation, females deposit fertilized eggs exclusively on the larval host-plant Dragonwort (*Artemisia dracunculoides*).

One brood is produced per season, with individuals overwintering as larvae. Some individuals may overwinter for two or more years as larvae before emerging as adult butterflies in response to severe drought or other climatic conditions.

Males can often be found feeding early in the morning along eastern slopes and sunning themselves along valley peaks when temperatures warm.

**FORAGING //** The larvae of Pike's old world swallowtails feed exclusively on Dragonwort. Adults consume the nectar of flowers, including: alfalfa, groundsel, and sweet broom.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Understudied.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Understudied.

## PIKE'S OLD WORLD SWALLOWTAIL

(*Papilio machaon pikei*)

### SELECTED REFERENCES

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**Photo Credit:** G. Anweiler, E.H. Strickland Entomological Museum, Department of Biological Sciences, University of Alberta

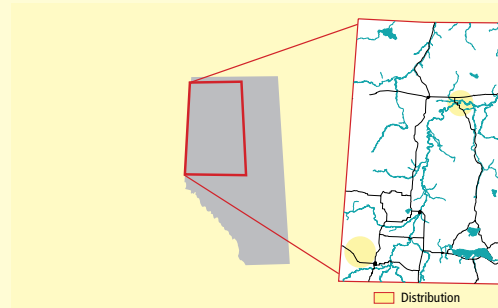
**Larva image:** Wayne Nordstrom



# PALAENO SULPHUR (*Colias palaeno chippewa*)



*Colias chippewa* W. H. Edw. (male dorsal)  
ALBERTA: 20km N Zama City 10-V1-1998 (D. Macaulay)  
U.A. Strickland Museum #UASM24235 (G. Anweiler image)



PROVINCIAL	ANHIC	SARA	COSEWIC
Undetermined	S1S2 G5	No status	No status

**THE PALAENO SULPHUR** is a rare butterfly occasionally observed in the Boreal Forest Natural Region of Alberta. This butterfly has been subject to taxonomic debate, with some references classifying it as *Colias chippewa*. Relatively little is known about palaeno sulphur life history, ecology, and distribution within Alberta.

## HABITAT

The palaeno sulphur is associated with shrubby areas along the edges of spruce tamarack forests, bogs, and low arctic or alpine tundra where bilberry occurs. Their association with forest age or seral stage has not been studied.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** The breeding habits of the palaeno sulphur are presently understudied; however, it is known that breeding occurs during the June to August flight period.

This species produces one brood per year and it is assumed that this subspecies overwinters as larvae.

**FORAGING //** The diet of this subspecies is unknown in Alberta. It is suspected that larvae feed on bilberry and occasionally blueberry leaves.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Understudied.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Understudied.

## PALAENO SULPHUR (*Colias palaeno chippewa*)

### SELECTED REFERENCES

- Acorn J. and I. Sheldon. 2006. Butterflies of British Columbia. Lone Pine Publishing, Edmonton, Alberta. Pp. 360.
- Bird, C.D., G.J. Hilchie, N.G. Kondla, E.M. Pike and F.A.H. Sperling. 1995. Alberta Butterflies. The Provincial Museum of Alberta, Edmonton, Alberta. Pp. 349.
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- Klassen, P., A.K. Westward, W.B. Preston, W.B. Mckillop. 1989. The Butterflies of Manitoba. Manitoba Museum of Man and Nature, Winnipeg, Manitoba. Pp. 290.
- Photo Credit:** G. Anweiler, E.H. Strickland Entomological Museum, Department of Biological Sciences, University of Alberta

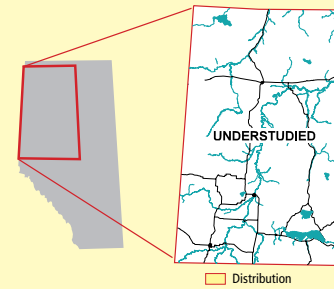
# BRONZE COPPER (*Lycaena (Hyllolycaena) hyllus*)



*Lycaena hyllus* (Cramer) (male dorsal)  
ALBERTA: 3km NW Opal 23-VII-2002 (C. Schmidt)  
U.A. Strickland Museum (G. Anweiler image)



*Lycaena hyllus* (Cramer) (male ventral)  
ALBERTA: 3km NW Opal 23-VII-2002 (C. Schmidt)  
U.A. Strickland Museum (G. Anweiler image)



PROVINCIAL	ANHIC	SARA	COSEWIC
Secure	S2 G5	No status	No status

**THE BRONZE COPPER** is a butterfly commonly found in the southern half of the province in the Grasslands, Parkland, and Foothills Natural Regions; it is occasionally found in the Boreal Forest Natural Region. Relatively little is known about bronze copper life history and ecology within Alberta.

## HABITAT

The bronze copper requires riparian habitats containing the larval host-plant (*Rumex spp.*) to complete their life cycle. While the butterfly's habitat requirements are specific, these habitats are common and include: open wetlands, ditches, prairie sloughs, or wet meadows. This butterfly's association with forest age or seral stage has not been studied.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** Bronze coppers are most active during the breeding season from July to August. At this time, individuals are usually found along the margins of wetlands, streams, and rivers containing host-plant species, or perched among grasses and sedges next to open spaces. They may also occasionally be found near sedge fens in the boreal forest.

Adults, especially females, do not stray far from larval food plants, and rarely fly except when disturbed. Males most frequently take flight when fighting for territories.

Following breeding, females lay single turban shaped pale grey eggs on or near the larval host-plant. Eggs overwinter until spring when the larvae hatch; the larval stage is currently understudied.

**FORAGING //** Preferred nectar plants of bronze copper adults in Alberta are unknown but in other areas, adults occasionally feed on blackberry and red clover.

Bronze copper larvae feed on the leaves of larval host-plant species including: dock (*Rumex spp.*), knotweed, and occasionally water smartweed.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Understudied.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Understudied.

## BRONZE COPPER (*Lycaena (Hyllolycaena) hyllus*)

### SELECTED REFERENCES

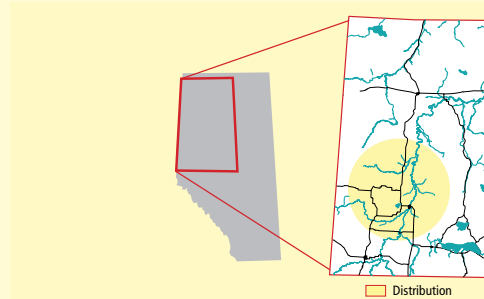
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- Hooper, R.R. 1973. Butterflies of Saskatchewan. Saskatchewan Department of Natural Resources, Regina, Saskatchewan. Pp. 216.
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- Photo Credit:** G. Anweiler, E.H. Strickland Entomological Museum, Department of Biological Sciences, University of Alberta.

# STRIPED (FLETCHER'S) HAIRSTREAK

*(Satyrium liparops fletcheri)*



**THIS STRIPED HAIRSTREAK** subspecies is a rare butterfly found in the Parkland, northern Grasslands, and Peace River area of the Boreal Forest Natural Region. This species is commonly grouped with the subspecies *S. l. aliparops*, which is found in the southern portion of the Grasslands Natural Region. Relatively little is known about striped hairstreak life history and ecology within Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Undetermined	S3S4 G5T4Q (only the Peace River population is currently monitored)	No status	No status

## HABITAT

The striped hairstreak requires abundant shrub habitat to meet their biological requirements for foraging and breeding. Their association with forest age or seral stage has not been studied.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING HABITAT AND SUMMER RANGE //** During the summer (June to August), striped hairstreaks are usually found perched on the leaves of larval host-plants in shrub thickets associated with roadsides, backyards, coulees, valleys sides, shaded wetlands, and forest openings; adults rarely fly unless disturbed.

Females lay single eggs on twigs of host-plants; eggs hatch into larvae the following spring. Their larval stage is currently understudied.

**FORAGING //** Preferred nectar plants of the striped hairstreak in Alberta are unknown, but in other areas, adults forage on chinquapin, common milkweed, dogbane, goldenrod, meadowsweet, New Jersey tea, staghorn sumac, viburnum, and white sweet clover.

A wide variety of plants in the rose and heath family are used as larval hosts in Alberta, including: choke cherry, saskatoon, blueberry, and hawthorn species. Patches of choke cherry may be required to support populations of this species.

Larvae bore into the buds of larval host-plants and eat developing leaves, flowers, and fruits.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Understudied.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Understudied.

# STRIPED (FLETCHER'S) HAIRSTREAK

*(Satyrium liparops fletcheri)*

## SELECTED REFERENCES

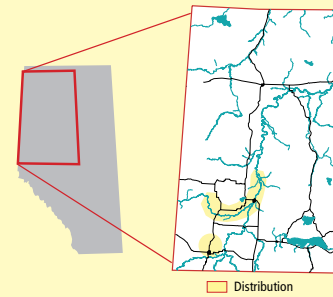
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**Photo Credit:** Jason Dombroskie

# ALBERTA ARCTIC (*Oeneis alberta*)



**THE ALBERTA ARCTIC** is a medium-sized butterfly that occurs in the Parkland and Grassland Natural Regions of Alberta; a disjunct population occurs in the Peace River region. Relatively little is known about Alberta arctic life history and ecology within Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3S4 G4 (only the Peace River population is currently monitored)	No status	No status

## HABITAT

The Alberta arctic butterfly is associated with native short and mixed-grass prairie ecosystems; it is not associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Alberta arctic butterflies breed in May and June during peak flight periods. At this time, males establish and loosely defend territories, perching and patrolling these territories in search of potential mates. Males will also fly to geographical prominences such as dry prairie hilltops to seek females.

Post-copulation, females deposit white, rounded, fertilized eggs on blades of grass, producing only one brood per year.

Eggs hatch approximately 30 days after being laid and overwinter as larvae. In the spring during snow melt, larvae metamorphose into butterflies and reproduce to complete their life cycle.

**FORAGING //** The diet of larval and adult Alberta arctics is unknown in Alberta; however, grasses (*Festuca spp.*) are considered a likely host plant.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Understudied.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Understudied.

## ALBERTA ARCTIC (*Oeneis alberta*)

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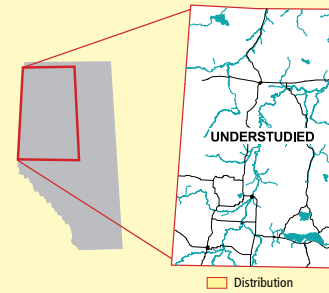
**Photo Credit:** Jason Domroskie



# CARY'S ARCTIC (*Oeneis chryxus caryi*)



**CARY'S ARCTIC** is a rare butterfly found in the Rocky Mountain, Canadian Shield, and Boreal Forest Natural Regions of Alberta. Relatively little is known about Cary's arctic life history and ecology within Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
Secure	S1S2 G5T4	No status	No status

## HABITAT

Cary's arctic butterfly is found in dry grassy areas, open pine forests, and woodland edges. It is not known if this butterfly is associated with forest age or seral stage.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** Breeding occurs during peak flight periods from June to August. During this period, males in search of potential mates perch and wait to detect females flying in grassy areas.

Post-copulation, females deposit cream-coloured fertilized eggs on tree bark and twigs on or near the ground, producing only one brood per year.

Eggs hatch in the spring and then overwinter as larva for one or two winters, before the larvae undergo metamorphoses into adult butterflies.

**FORAGING //** The diet of this species and subspecies is unknown in Alberta. In other parts of their range, it is thought *O. chryxus* larvae feed on sedges and grasses, particularly fescue grass, until they hibernate. Adults often nectar at yellow flowers; females are usually found near nectaring or oviposition sites.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Understudied.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Understudied

## CARY'S ARCTIC (*Oeneis chryxus caryi*)

### SELECTED REFERENCES

- Acorn J. and I. Sheldon. 2006. Butterflies of British Columbia. Lone Pine Publishing, Edmonton, Alberta. Pp. 360.
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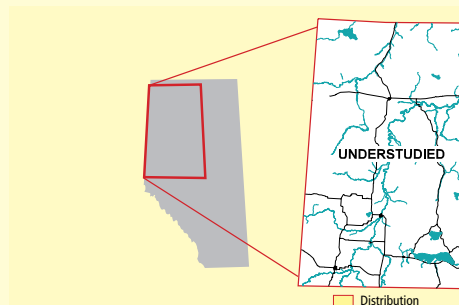
**Photo Credit:** Doug Macaulay

# OCHREOUS RINGLET

*(Coenonympha ochracea mackenziei)*



**THE OCHREOUS RINGLET** is a rare butterfly occurring only in the southern Northwest Territories and northern Alberta, specifically, the Canadian Shield Natural Region of Alberta. This butterfly has been subject to taxonomic debate, with some references referring to it as *Coenonympha tullia mackenziei*. Relatively little is known about Ochreous life history, ecology, and distribution within Alberta.



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S1 G5T5	No status	No status

## HABITAT

The ochreous ringlet is associated with grassy, open areas in northern Alberta; its association with forest age or seral stage has not been studied.

## IMPORTANT HABITATS & HABITAT ELEMENTS

**BREEDING //** The breeding habits of the ochreous ringlet are presently understudied in Alberta; however, it is known that breeding occurs during flight periods in late June. At this time, males most likely patrol grassy areas in search of potential mates, as observed in other ringlet species.

Females lay cream to greenish ribbed eggs on larval host-plants (likely grasses and rushes). One brood is produced per season, and

it is presumed that, similar to other ringlets in the province, ochreous ringlets overwinter as larvae on host grasses before emerging as adults the following spring.

**FORAGING //** The diet of this subspecies is unknown in Alberta. It is suspected that larvae feed on grasses and rushes, while adults feed on the nectar of flowers such as pussytoes and dandelions.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

- Understudied.

### LIMITING FACTORS FOR SPECIES SUCCESS //

- Understudied.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Understudied.

# OCHREOUS RINGLET

*(Coenonympha ochracea mackenziei)*

## SELECTED REFERENCES

Acorn J. and I. Sheldon. 2006. Butterflies of British Columbia. Lone Pine Publishing, Edmonton, Alberta. Pp. 360.

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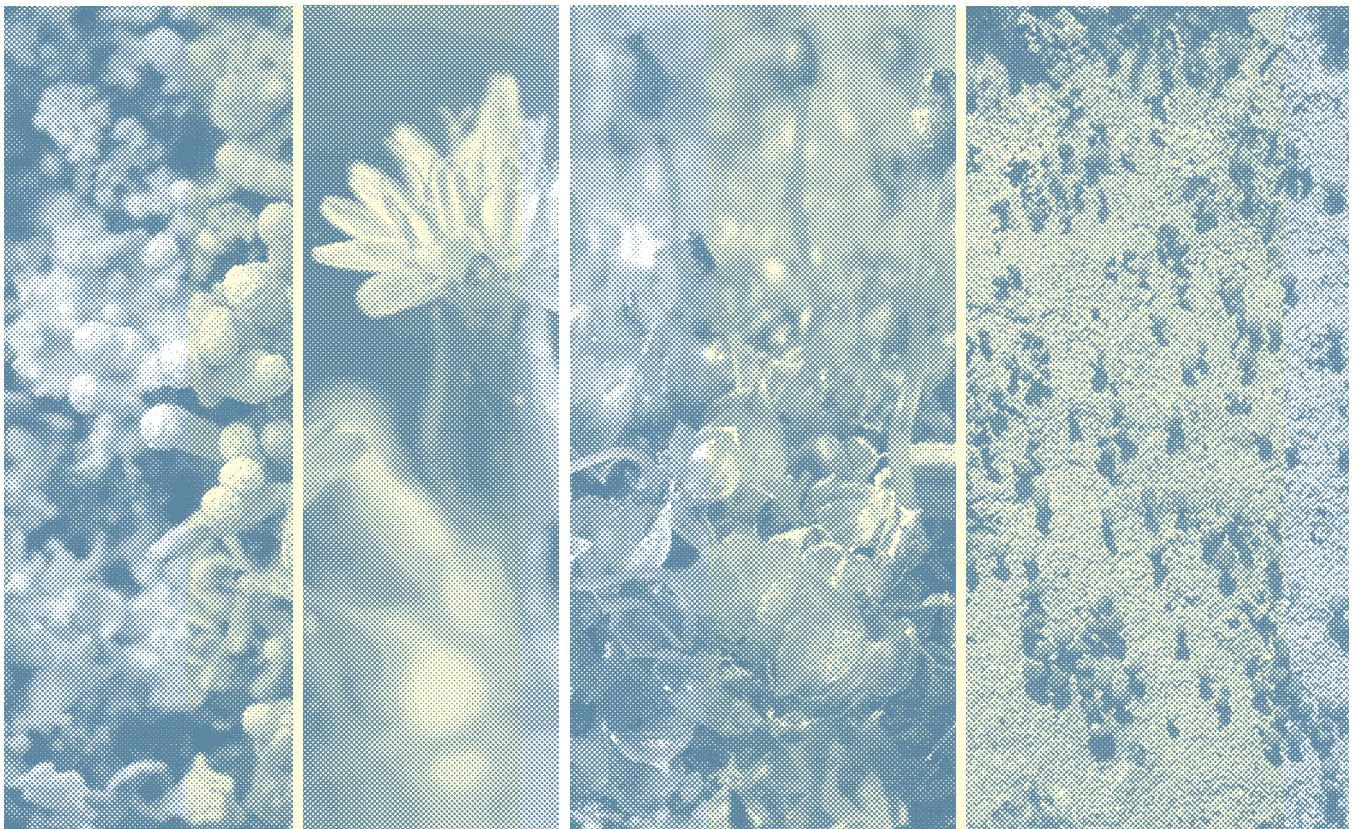
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**Photo Credit:** Doug Macaulay

# PLANTS







# INTRODUCTION

There are approximately 847 plant species that occur in northwestern Alberta.

Approximately 63 of these species are currently listed by the Alberta Natural Heritage Information Centre (ANHIC) as S1 or S2 rarity, including: 29 vascular plants, 22 mosses/liverworts, and 12 lichen species. Provincially, 18 of these species have been listed as "Sensitive" and 15 as "May be at risk". Seven species have been given "priority assessment" status federally.

There are a number of factors that may contribute to the rarity and/or listing of a plant species, including: lack of basic ecological and life-history information; biological limitations; habitat alteration (both natural and human-induced); competition with non-native invasive species; environmental changes caused by pollution, and; human collection of rare plants. One final significant, but unknown threat to rare plants and plant communities in general, is climate change. Of these threats, only one factor may result in the listing of some species (e.g. a species may be naturally rare), whereas for other species a combination of factors may contribute to its rare status (e.g. naturally rare, habitat alteration and competition with invasive species). Each of these threats may be considered "limiting factors" for species success and will be discussed in turn.

## SPECIES STATUS ISSUES & OPPORTUNITIES

### TEMPORAL VULNERABILITY //

Given that plants are sessile and often persist only under specific microhabitat conditions, they are vulnerable to above-ground and soil disturbance at all times of the year.

### LIMITING FACTORS FOR SPECIES SUCCESS //

#### Lack of knowledge

For many rare plant species in Alberta, there are large knowledge gaps with respect to even the most basic ecological, life-history, and habitat dependency information. Many rare species have very specialized environmental requirements, including: specific substrates/soils, nutrient levels, pH levels, and other topographic and/or edaphic conditions (Loehle 2006). A basic understanding of these specialized habitat requirements can help managers create habitat models to predict rare plant species occurrence with greater confidence, and manage for these species appropriately (Imm et al 2001 in Loehle 2006).

A species may be identified as "rare" simply because there is no information on its distribution, or because the species is difficult to identify. Information on the distribution of low profile species, such as lichen, is often lacking and their apparent rarity may often be due to the fact that they are overlooked in the field. When specifically surveyed for, species may in fact be much more common than originally thought and therefore, not of management concern. Forest practitioner or public reporting of sightings is therefore a significant factor in improving knowledge of distribution in northern Alberta. A second problem is the difficulty of identifying some rare species, as there are few individuals who can readily identify rare species and locations where they occur.

As result, small populations of rare plants may be in danger of being overlooked because of the lack of expertise in their identification.

#### Disruption of dispersal

Some plants are naturally rare due to their limited distribution, slow growth, poor ability to propagate, and/or limited dispersal ability (Goward 1994; Lider 2003). In particular, lichens and bryophytes are less dynamic than vascular plants, growing more slowly with slower rates of colonization (Crites and Dale 1998; Ryoma et al 2005; Hart and Chen 2006). These attributes contribute to the rarity of these species, particularly in situations where disturbance has occurred and new species are competing with rare species to colonize areas. In fact, it may be a lack of dispersal ability, rather than habitat quality, that is limiting for some rare plant species (e.g. lichen) (Hilmo and Sastad, 2001). Plants that are unable to disperse to new areas may become geographically and reproductively isolated resulting in a number of potential consequences, including: demographic stochasticity (Dinnetz and Nilsson 2002; Saether et al 2002; Kery et al 2003 in Munzbergova 2006), reduced visitation by pollinators (Aizen and Feinsinger 1994; Agren 1996 in Munzbergova 2006), and an increase in self-fertilization and mating with closely related individuals leading to loss of genetic diversity and a potential increase in harmful alleles (Charlesworth and Charlesworth 1987; Ellstrand and Elam 1993; Munzbergova 2006). Low genetic diversity limits species' ability to adapt to changing environmental conditions, as well as decreasing its resistance to disease and lowering its capacity to colonize new sites, thereby increasing its risk of extirpation or extinction.

#### Habitat loss, alteration, and/or fragmentation

At the stand-level, timber harvesting activities can impact both biotic and abiotic factors with consequent effects on the vegetation community (Romovs and Roberts 2003). Harvesting of mature/old forest creates openings in the canopy which increases the amount of sunlight reaching the forest floor, subsequently increasing ambient air temperature and decreasing soil moisture and relative humidity (Romovs and Roberts 2003). Other impacts of timber harvesting include soil compaction and erosion (Worell and Hampson 1997). Rare plant species adapted to old-forest microclimatic conditions and substrates are threatened by harvesting because of changes to environmental conditions, as well as competition with species adapted to early seral conditions. In particular, rare arboreal lichen species adapted to old-forest conditions are extremely sensitive to microclimatic changes due to their small size, intimate relationships with substrates, and inability to regulate control of water loss and temperature (John 1989), increasing risk to their populations.

At the landscape-scale, habitat fragmentation as a result of forest harvesting results in the direct loss of habitat for some rare plant species and can also isolate populations of rare plants, thereby increasing the probability of extirpation or extinction simply due to demographic stochasticity. Suitable habitat that is fragmented across the landscape combined with the poor dispersal and colonization ability of many rare plants can threaten their populations and limit their chances for recovery.

### Edge effects

Specific microclimatic changes that occur along edges as a result of forest harvesting include changes to: moisture, temperature, light availability, and wind (Smith 1990). Individuals of a species on the edge of the community therefore experience different environmental conditions compared to those located in the forest interior. Rare plants subject to edge effects may not be adapted to altered environmental conditions or may be out-competed by other plant species better adapted to the changed conditions, thereby threatening the persistence of at-risk plants in the newly created environment (Smith 1990).

### Mechanical impacts and site preparation treatments

Heavy machinery used to extract timber can directly impact rare plants by trampling and crushing individuals. Indirect impacts include changes to soil profiles, quality and quantity of organic matter, and water status of a site such that rare plants adapted to early-seral stage conditions may not be able to become established (Worell and Hampson 1997). Other treatments, such as scarification, can result in the removal or significant alteration of decaying woody debris and leaf litter which are valuable substrates for some rare plant species (Romovs and Roberts 2003). Site preparation activities and intensive silviculture practices (e.g. herbicide applications, replanting, and thinning) can negatively impact rare species because herbicide treatments indiscriminately kill plants regardless of abundance, and commercially preferred species that are often replanted and tended for density may out-compete native plant communities.

### Road density

Road networks and other linear features can have a profound impact on vegetative communities; these effects often extend far beyond the width of the feature itself (Foreman and Alexander 1998). The building of roads results in changes to the physical and chemical environment including changes to: soil density, temperature, soil moisture, light availability, surface flow, runoff, sedimentation, and dust (Trombulak and Frissel 2000). These environmental changes allow different plants and plant communities to colonize disturbed sites along the road. Roadside vegetation is generally dominated by herbaceous species due to the increased availability of light and moisture, and while species richness is usually quite high, few rare species are adapted and/or can compete in these areas (Foreman and Alexander 1998). In addition to altering habitats, road networks increase habitat fragmentation and edge effects (Trombulak and Frissel 2000) which further increases risk to rare plants, as discussed previously.

The physical environment created by roadside edges enable the spread of exotic species by creating suitable conditions for non-native species to colonize, and by the same token, making these same areas less suitable for native species, and in particular, rare plants. Further, dispersal of many invasive species is enhanced along roads as vehicles and animals serve as vectors of movement for non-native species. Finally, road development also increases access to previously inaccessible areas for activities such as hunting, fishing, hiking, and off-roading with ATV's and motorbikes. This increases the chance of rare plant species being trampled or collected.

### Wetland loss, alteration, and/or degradation

Rare aquatic and riparian plant species generally exist in small disjunct populations, making them vulnerable to extinction (Möller and Rørdam 1985; Dodd 1990; Sjörgren 1991 in Gibbs 2000). Therefore, changing the abundance and distribution of wetlands on the landscape can affect diversity and persistence of wetland dependant species (Gibbs 2000). Consequently, rare aquatic and riparian plants are threatened by anthropogenic activities that change local and regional hydrological regimes (e.g. road building) or result in wetland loss or alteration (e.g. draining and/or filling) (Gibbs 2000).

### OTHER ISSUES //

- Airborne pollution.
- Introduction of non-native species.
- Collection of rare plants.
- Climate change.
- Range use (grazing).
- Oil and gas exploration and development.

### MANAGEMENT CONSIDERATIONS (BENEFICIAL PRACTICES) //

- Coordinated resource activity planning (footprint reduction).
- Retention of complex forest structure and recruitment of large diameter forest attributes.
- Coarse woody debris recruitment.
- Retention of well-distributed mature/old forest patches.
- Variable retention harvesting practices (e.g. irregular edges, within-block patches).
- Partial retention during wildfire salvage.
- Sedimentation and erosion control.
- Riparian zone protection and/or aquatic habitat protection.
- Minimize soil compaction and rutting on sensitive soils.
- Identify and protect rare plant communities occurring on forest tenures and industrial activity areas through consultation with qualified professionals.
- Train key field staff in recognition of rare-plants and their habitats. Report suspected discoveries of rare plants for further investigation and improving understanding of habitat/distribution.
- Limit treatments such as scarification, herbicide application, and mechanical thinning in areas where rare plants occur.
- Create an invasive species management plan.



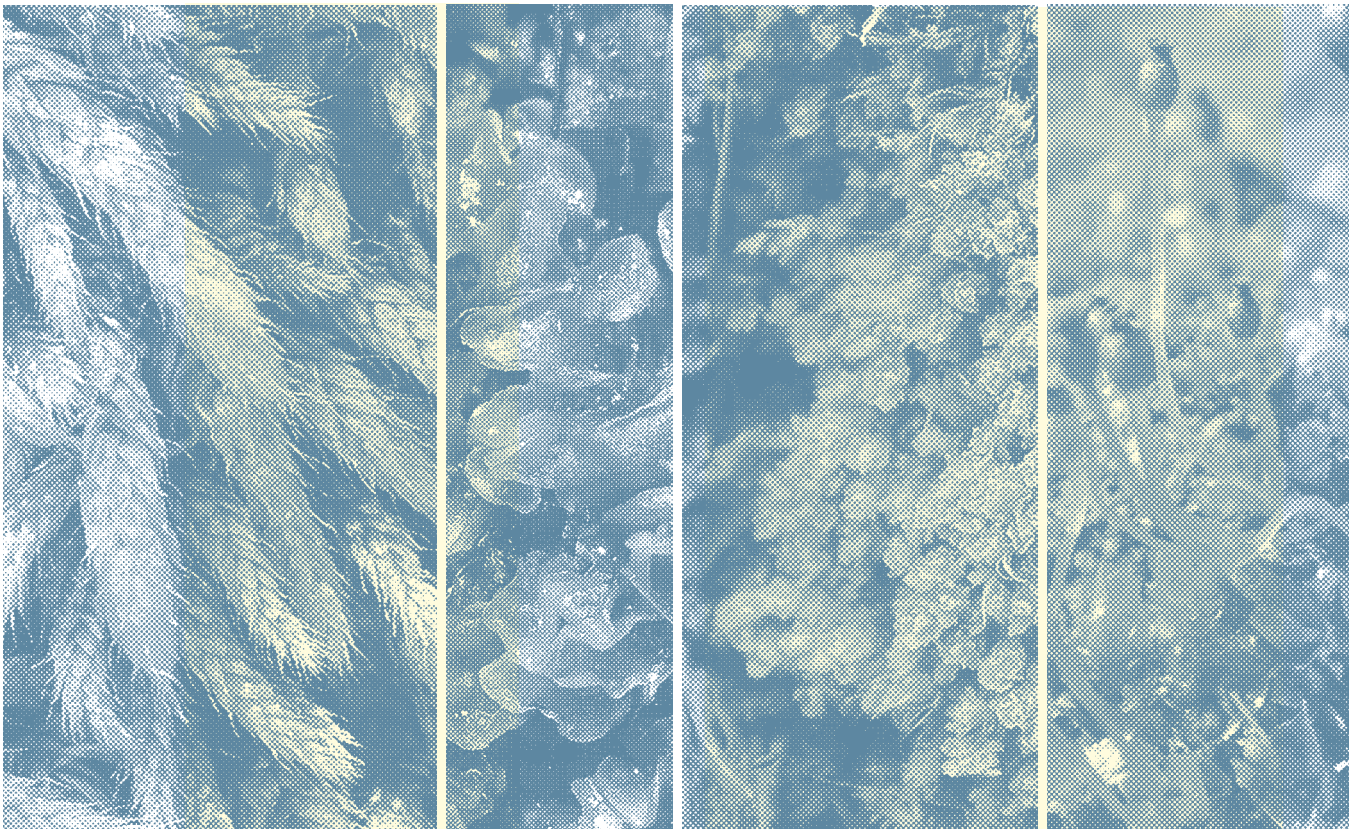
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# NON-VASCULAR PLANTS

## MOSSES & LIVERWORTS





# SNAKE LIVERWORT (*Conocephalum conicum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5	No status	No status

## DISTRIBUTION

- Snake liverwort is widely distributed in temperate regions in the northern hemisphere, particularly near coast; it is less common in continental areas.
- In Alberta, it is found in the Rocky Mountain, Foothills, Boreal Forest, and Parkland Natural Regions.

## HABITAT

- The snake liverwort typically grows in moist, shady, sandy sites, and acidic rocky areas under overhangs at the edges of streams and waterfalls.

## SERAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Dark green, brownish-green, or yellowish-green and irregularly branched; dioicous.
- Largest thalloid liverwort in region; 9 to 10cm long and 1cm wide.
- Easily identified by hexagonal markings on the upper surface of the thalloid, each with a small pore in the centre; these air pores have a bubbly appearance and look similar to alligator skin.
- Antheridia appear as slightly raised purplish cushion on the upper surface of the thallus.

- Conspicuous conical receptacles borne on 3 to 8cm long, light-green stalks bearing sporangia.
- Archegonia borne on underside of conical receptacles.
- Has an aromatic smell when crushed.

### SPOROPHYTE //

- 5 to 8 capsules project downwards from base of cone on short seta when mature.

## NOTES

- Snake Liverwort slightly resembles *Marchantia* spp.; however, the *Marchantia* genus lacks the conical receptacles, aromatic smell, and hexagonal markings with a central pore that is characteristic of the snake liverwort.

## SNAKE LIVERWORT (*Conocephalum conicum*)

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**Photo Credit:** © Michael Lueth 2006



# RING PELLIA / SHINY LIVERWORT (*Pellia neesiana*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5	No status	No status

## DISTRIBUTION

- In Canada, ring pellia has been found in Alberta, Ontario, and Quebec.
- Ring pellia is found in the Boreal Forest, Foothills, Rocky Mountain, and Canadian Shield Natural Regions of Alberta.

## HABITAT

- Ring pellia occurs from low elevations, where it is most common, to the alpine.
- It prefers shaded areas among rushes or sedges on very moist or almost permanently wet, thin, acidic or neutral inorganic soils that form on rocks at the edges of streams, swamps, wet meadows, marshes, and lake-shores.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- This thallose liverwort has a ribbon-like shaped lamina with wavy edges that can be pale green, pale brownish green, or sometimes dark greyish green and shiny in color; rhizoids are usually brown but sometimes are purple.
- *P. neesiana* has no apparent pore structure; therefore, the upper surface is smooth and looks translucent, and is often covered by dead leaves from previous year's growth.
- *P. neesiana* has a well-developed brownish, flattened, central midrib several cells thick, which tapers to one cell thick at the margins.
- Thallus has irregular and extensively branched, overlapping lobes. Lobes frequently curve upward towards the edges in loose or dense turfs with a few branches that lie flat on the ground. Lobes are approximately 12mm wide; lobes on smaller male plants are approximately 10mm wide.

- This species is dioicous; the antheridia are produced in small tubercles (blisters) found near the midrib, while the archegonia are produced beneath a terminal flap of tissue (involucre).

### SPOROPHYTE //

- Capsules are spherical and are produced on hyaline, short-lived stalks that open by four longitudinal valves.

## NOTES

- Complex thallose liverworts such as *Marchantia* spp., *Lunularia* spp., and *Conocephalum* spp. that are similar in size and shape to the *Pellia* spp. may be distinguished by their complex pore structures that cause their surfaces to look opaque green with a snakeskin-type pattern.
- The simple thallose liverwort most similar to *Pellia* spp. is *Aneura* spp., but it has no differentiated midrib and has a darker, greasy green color.

## RING PELLIA / SHINY LIVERWORT (*Pellia neesiana*)

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**Photo Credit:** © Michael Lueth 2006



# *Calypogeia neesiana*



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S3 G5	No status	No status

## DISTRIBUTION

- In Canada, *Calypogeia neesiana* is found in British Columbia, Alberta, Yukon, and Northwest Territories.
- In Alberta, it occurs in the Foothills and Rocky Mountain Natural Regions.

## HABITAT

- *Calypogeia neesiana* grows in shaded areas on decaying wood and moist soil; it is most common in coastal coniferous forests.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Plants pale to bluish-green, growing in thin mats.
- Leaves incubous (overlapping each other like scales or shingles).
- Leaves are entire with a broad, shallow notch in the apex.
- The nearly circular underleaves are undivided or have shallow notches at their apex.
- Oil bodies are absent from the middle of the leaves and underleaves.
- Dull textured leaves, with a distinct border formed by elongated marginal cells.

- Plants can be autoicous and paroicous.
- Abundant pale green or yellowish-green gemmae grow on the underside of shoot tips, both early and late in the growing season.

### SPOROPHYTE //

- Cylindrical capsules are colourless or hyaline, or slightly grayish in colour.
- Nodular thickenings absent from the epidermal cell wall of capsules.
- Root-like white pouch from which the sporophyte emerges.
- Spiral lines in the opening of the elongated black sporangium.

## NOTES

- Similar to *C. intergrispula*; however, *C. neesiana* is differentiated by its ovate-ellipoidal leaves, continuous leaf margin, fewer oil bodies (1 to 3 per cell), small rhizoid area, and absence of nodular thickenings of the capsule and epidermal cells.

## *Calypogeia neesiana*

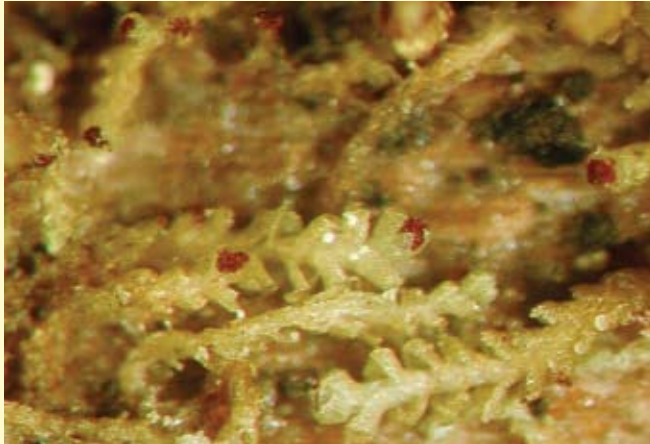
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**Photo Credit:** © Michael Lueth 2006

# HELLER'S ANASTROPHYLLUM

## (*Anastrophyllum hellerianum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5	No status	No status

### DISTRIBUTION

- Heller's Anastrophyllum has a circumpolar distribution; in Canada, it is found in British Columbia, Alberta, Ontario, Quebec, New Brunswick, Yukon, and Northwest Territories.
- In Alberta, this species is found in the Rocky Mountains, Foothills, and Boreal Forest Natural Regions.

### HABITAT

- Heller's Anastrophyllum occurs in shaded areas, specializing on decayed wood substrate.
- This species is an indicator of Coarse Woody Debris in an advanced state of decay (no bark, uneven wood texture, and humid microclimate).
- Associated species include: *Jamesoniella autumnalis*, *Lophozia longidens*, *Ptilidium pulcherrimum*, and *Tritomaria exsectiformis*.

### SERIAL STAGE //

- Boreal old-growth forests.

### DESCRIPTION

#### GAMETOPHYTE //

- Dioicous.
- Small, dull green, less than 6mm long and 0.1mm wide.
- Leaves are transversely attached and have strong longitudinal grooves.
- Wine or dark purplish-red coloured gemmae are abundant and occur at the tips of shoots.
- Gemmae are 1-celled and angular.

#### SPOROPHYTE //

- Perianths (tube of fused leaves surrounding the sporophyte) are 5-plicate (arranged in longitudinal folds back and forth).
- Spinous-ciliate mouth; the cilia 2 to 8 cells long.

### NOTES

- *A. hellerianum* has a similar perianth as *Tritomaria exsecta* and *T. exsectiformis*, but may be differentiated by its 1-celled gemmae, as opposed to the 2-celled gemmae that the *Tritomaria* species have.

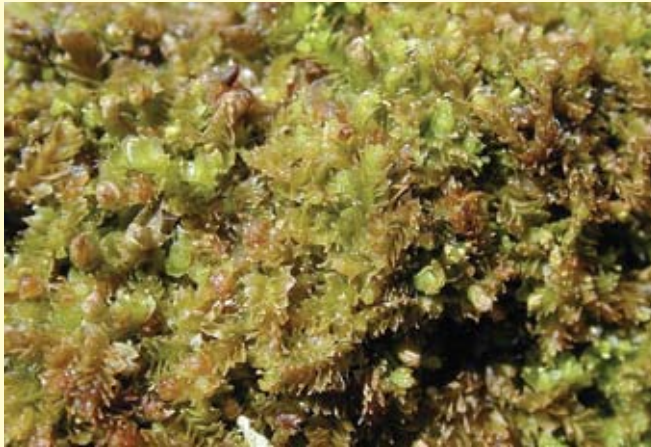
## HELLER'S ANASTROPHYLLUM (*Anastrophyllum hellerianum*)

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**Photo Credit:** © Michael Lueth 2006

# *Lophozia ascendens*



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S1 G4	No status	No status

## DISTRIBUTION

- *Lophozia ascendens* is believed to have a circumboreal distribution; in Canada, it is found in Alberta, Ontario, Quebec, and New Brunswick.
- Distribution within Alberta is understudied.

## HABITAT

- *Lophozia ascendens* is generally associated with highly humid areas, such as spruce-fir forests or alongside running water or lakes. Occurs almost exclusively on moist, decaying logs or stumps (pH of 4.6 to 5.2) but occasionally is found on peaty soil or on humus.
- Occasionally grows in full sun on wet logs, but is usually found at 1/12th to 1/6th of full sun; most sites are at a light intensity 1/50th below full sunlight.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Small compared to other *Lophozia* species; usually 3 to 6mm but sometimes between 8 and 15mm.
- Pale yellowish-green shoots, while older portions of plants have a reddish to purplish-brown colour in direct sunlight.
- Grows in small patches or as isolated plants which are erect or suberect from a prostrate base; stems rigid and stout.
- Leaves obliquely inserted, becoming arched at apex and almost transverse dorsally.
- Upper leaves are suberect; the lower leaves often have squarrous lobes, narrowly rectangular to ovate-rectangular in shape.
- The sinus extends from 1/3 to as much as 1/2 the length of the leaf.
- The 2 (sometimes 3) lobes are narrow and hornlike.
- Gemmae are abundant and occur in spherical masses at the apex of the upper leaf lobes.

- 1 to 2 celled gemmae are yellowish green and angular to stellate.
- Dioicous; often with androceia but rarely with perianths.
- Reddish bracts occur in 2 to 4 pairs that are slightly imbricate and as large as, or slightly larger than, neighboring leaves.
- Bracts are erect and strongly sac-like at the base.
- Female bracts are larger than leaves, longer than wide (subrectangular), and are divided into 2 to 3 triangular entire lobes.
- Bracteoles are usually absent.

### SPOROPHYTE //

- Perianth is rounded in cross section and cylindrical shaped; plicate and contracted to a mouth which is divided into 12 to 15 narrowly triangular small lobes or laciniae.

## *Lophozia ascendens*

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**Photo Credit:** © Michael Lueth 2006

# *Lophozia excisa*

PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S1 G5	No status	No status

No image available

## DISTRIBUTION

- In Canada, *Lophozia excisa* is found in Alberta, Ontario, and Quebec.
- Distribution is understudied in Alberta.

## HABITAT

- *Lophozia excisa* typically occurs on rotting logs in boreal, montane, and subalpine forests.

## SERIAL STAGE //

- Understudied in Alberta.

## DESCRIPTION

### GAMETOPHYTE //

- Small liverwort (stems up to 10mm long), appearing pale green in the shade and reddish in sun.
- Leaves are transversely inserted.
- Lower leaves are squarrose; upper leaves are capitate to crowded, erect to incurved (curved upwards and away).
- Leaves are shallowly bi-lobed and thin walled.
- Gemmae, which are rarely produced, are borne at the tips of upper leaves and are reddish-brown or purplish, 1 to 2 celled, and angular.

- Paroicous archegonia and antheridia in a single gametocium.
- Male bracts lying under the female inflorescence are irregularly 2 to 3 lobed and toothed.

### SPOROPHYTE //

- Perianths are broadly oblong and somewhat tapered to a plicate irregularly toothed mouth.

## NOTES

- *Lophozia* spp. are highly variable and taxonomically difficult to identify.

*Lophozia excisa***SELECTED REFERENCES**

Crum, H. 1991. Liverworts and Hornworts of Southern Michigan. The University of Michigan Herbarium, Ann Arbor, Michigan. Pp. 233.

Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. Mosses, Lichens and Ferns of Northwestern North America. Lone Pine Publishing, Edmonton, Alberta. Pp. 296.



# *Lophozia guttulata*

PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G4G5	No status	No status

No image available

## DISTRIBUTION

- In Canada, *Lophozia guttulata* is found in Alberta and Quebec.
- Distribution within Alberta is understudied.

## HABITAT

- *Lophozia guttulata* occurs in treed fens and is associated with decaying wood.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Green to brownish patches lying prostrate with ascending tips.
- Flexuous, long, and sparsely branched stem (1cm long); pale reddish-brown to almost black in colour.
- Many long and colourless rhizoids to the tip of the stem.
- Leaves spaced apart below and imbricate above.
- Leaves are either squarish, shortly decurrent, ½ to ½ bilobed, acute, or obtuse.
- Leaves slightly obliquely inserted and patent.
- Lacks underleaves.
- Involucral bracts larger than leaves, variable and irregularly 2 to 5 lobed; sinus is swollen and lobes are acute.
- Bracteoles are entire or split in two parts, growing together or fused with one or both bracts.

- Gemmae usually present.
- Dioicous.
- Male bracts in 6 to 8 pairs; terminal, imbricate, transverse.
- Male bracts erecto-patent, round or egg shaped, greatly concave and sac-like at base.
- Sinus rather narrow and obtuse; lobes acute.
- Generally 2 antheridia on pedicels about half their length; oval-globose in shape.

### SPOROPHYTE //

- Perianth is exerted length-wise, almost cylindrical or egg/club shaped; often reddish-purple at the apex.
- Perianth plicate at the top, with shortly lobed mouth, ciliated teeth; cilia 2 to 4 cells long.
- Capsule is oblong-oval shaped, reddish brown in colour.

## NOTES

- *Lophozia porphyroleuca* is very similar but is smaller and with more quadrate leaves which do not narrow at the apex. The leaf lobes are more acute, sinus deeper, gibbose and gemmae are generally absent. Perianth mouth has shorter more obtuse lobes and longer cilia. Capsule is yellowish-brown but separated valves are reddish-brown.

## *Lophozia guttulata*

### SELECTED REFERENCES

- Allen, L., D. Hunter, W. Nordstrom, and D. Vujnovic. 2003. Richardson River Dunes Wildlife Provincial Park – A Synthesis of Biophysical Information. A Report Prepared for Parks and Protected Areas Division, Alberta Community Development, Edmonton, Alberta.
- NatureServe. 2006. NatureServe Explorer: An Online Encyclopedia of Life [Web Application]. Version 6.1. NatureServe, Arlington, Virginia. Available: <http://www.natureserve.org/explorer>. [Accessed June 8, 2007].
- Macvicar, S.M. 1971. The Students Handbook of British Hepatics. Hitchin, Whelden & Wesley, Ltd. New York, New York. Pp. 464.

# *Lophozia incisa*



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5	No status	No status

## DISTRIBUTION

- In Alberta, *Lophozia incisa* is found in the Boreal Forest, Parkland, Canadian Shield, Foothills, and Rocky Mountain Natural Regions.

## HABITAT

- Lophozia incisa* grows on decayed logs and organic peaty turf in montane and boreal forests.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Bright whitish-green, pale, small liverwort with ascending tips; dioicous.
- Leaves are transversely attached to stem and are erect-spreading.
- Upper leaves are crowded in a head and are unequally various (2 to 5) lobed and undulated; lobes are acute and spinose tipped and have crisped irregularly toothed to spinose margins.
- Lower leaves are bilobed (have two lobes).

- Large number of small, round oil bodies in leaf cells; 25 to 30 per cell.
- One to two celled, angular, pale green gemmae are found at the lobes of upper leaves.

### SPOROPHYTE //

- Perianths are broadly obovoid and are obtusely pleated above and abruptly narrowed to a ciliate mouth.
- Spores in May and June.

## NOTES

- Lophozia* spp. are highly variable and taxonomically difficult to identify.
- Lophozia incisa* can be recognized by the clusters of pale, crisped leaves which resemble heads of lettuce; younger plants not yet forming cluster heads can be identified by the unequal 2-lobed leaves, many oil bodies, and white-green colour.
- Tritomaria* spp. is similar but has three-lobed leaves; most in Alberta are asymmetric and the upper lobes are smaller while the lower lobes are larger.

*Lophozia incisa***SELECTED REFERENCES**

Crum, H. 1991. Liverworts and Hornworts of Southern Michigan. The University of Michigan Herbarium, Ann Arbor, Michigan. Pp. 233.

Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. Mosses, Lichens and Ferns of Northwestern North America. Pp. 296.

**Photo Credit:** © Michael Lueth 2006

# *Lophozia longidens*



PROVINCIAL	ANHIC	SARA	COSEWIC
No Status	S1 G5	No status	No status

## DISTRIBUTION

- *Lophozia longidens* is believed to have a circumboreal distribution; in Canada it is known to occur in Alberta, Manitoba, Ontario, and Quebec.
- Distribution within Alberta is understudied.

## HABITAT

- *Lophozia longidens* occurs on sites with dense shade and high humidity; substrates include decaying logs, tree bases, and acidic rocks (pH 5.6 to 4.5) on cliffs.
- When tree bases are selected as substrates, *L. longidens* will typically occur on the north or east side of a birch tree, at least 2 feet up the trunk, rather than at the very base.
- *L. longidens* is usually a pioneer species which disappears once a dense mat of moss forms.

## SERIAL STAGE //

- Understudied; however, this liverwort is associated with *Anastrophyllum hellerianum* and *Scapania glaucocephala* which both appear to be dependant on old-growth forests.

## DESCRIPTION

### GAMETOPHYTE //

- Green to dark green, erect to strongly ascending, slender plant growing in patches or tufts.
- Stems uniform in colour and generally become brownish beneath with age.
- Leaves spreading and imbricate, often with spreading lobes.
- Leaves 2-lobed, squarrose, longer than wide, with straight margins.
- Leaves almost transversely attached to stem.
- 4 to 12 oil bodies per cell.
- Dioicous and rarely with perianths.
- Male plants are more slender and more branched, with denser leaves that are erect and spreading.

- Bracts in 5 to 6 pairs; imbricate, and sac-like at the base.
- Female bracts larger than leaves; 2 to 5 unequal sized lobes.
- Female bracts are triangular to horn-like, and sharply acute, with dentate to serrate margins which are rarely entire; broader than long.
- Bracteole small, lingulate to bilobed or dentate, and united with one bract.
- Gemmae in reddish-yellow to reddish-brown conspicuous masses; polygonal, quadrate, or trapezoidal in shape.
- Differs from other bi-lobed species with red gemmae on leaf.

### SPOROPHYTE //

- Perianth mouth lobulate and dentate with 3 to 6 celled teeth.

## NOTES

- *Lophozia* spp. is highly variable and is taxonomically difficult to identify.
- Associated with *Tritomaria exsectiformis*, *Anastrophyllum hellerianum*, *Blepharotoma trichophyllum*, *Jamesoniella autumnalis* and other *Lophozia* spp.

## *Lophozia longidens*

### SELECTED REFERENCES

Schuster, R.M. 1969. The Hepatica and Anthocerotae of North America East of the Hundredth Meridian – Volume II. Columbia University Press. New York, New York. Pp. 1062.

Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. Mosses, Lichens and Ferns of Northwestern North America. Lone Pine Publishing, Edmonton, Alberta. Pp. 296.

**Photo Credit:** © Michael Lueth 2006

# Scapania cuspiduligera

PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5	No status	No status

No image available

## DISTRIBUTION

- In Canada, *Scapania cuspiduligera* has been found in British Columbia, Alberta, Ontario, Quebec, New Brunswick, and Nova Scotia.
- In Alberta, *Scapania cuspiduligera* is found in the Rocky Mountain and western portion of the Boreal Forest Natural Regions.

## HABITAT

- *Scapania cuspiduligera* is found in calcareous alpine and arctic environments, such as calcareous crevices of the Rockies.

## SERAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- This liverwort is small in size with stems only 1 to 2.5mm across; distinguished by the upper lobes that extend rigidly away from the slightly larger lower lobes.
- The masses of dark brown gemmae are found on the young, terminal leaves; leaf margins are entire.

### SPOROPHYTE //

- No information.

## NOTES

- This species is difficult to identify without a compound microscope and appropriate technical literature.

## *Scapania cuspiduligera*

### SELECTED REFERENCES

- Natureserve. 2004. Natureserve Explorer: An online encyclopedia of life.  
Available: <http://www.natureserve.org/explorer/>. Natureserve, Arlington, Virginia.  
[Accessed: June 11 2007].
- Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. Mosses, Lichens and Ferns of Northwestern North America. Pp. 296.



# *Scapania glaucocephala*



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G4G5	No status	No status

## DISTRIBUTION

- *Scapania glaucocephala* has a boreal distribution; in Canada, it occurs in British Columbia, Alberta, and Manitoba.
- Distribution within Alberta is understudied.

## HABITAT

- *S. glaucocephala* occurs almost exclusively on decaying logs in coniferous forests; it occurs less frequently in deciduous stands, preferring substrates with a pH ranging from 4.6 to 5.2.
- It does not appear to be a pioneer species on recent logs; however, it will occupy logs not colonized by other pioneer species.

## SERIAL STAGE //

- *S. glaucocephala* appears to be associated with mature/old-growth stands.

## DESCRIPTION

### GAMETOPHYTE //

- Dioicous, small, 1 to 2 celled, blue-green liverwort.
- Erect to suberect and usually crowded.
- Not usually branched; leaves are usually subequal in size, except during strong development of gemmae when leaves are reduced, subequally bilobed, and narrow.
- Leaves are well spaced to imbricate and entire except at the apex of gemmiparous lobes.
- Leaves bilobed for 0.5 to 0.62 the length of the ventral lobe.
- Female bracts are larger than leaves, but similar in shape although more subequally bilobed.
- Thick-walled, small, reddish brown, 2-celled gemmae.
- Gemmiparous shoots are stiffly erect.

### SPOROPHYTE //

- Production by sporophytes is rare.
- Perianth strongly flattened dorsoventrally.
- Eplicate or virtually so at mouth, partially plicate when young, parallel sided, truncate at wide mouth.
- Apical region often ventrally deflexed.
- Mouth varies from entire, to sinuous, to sinuate-lobed.
- The lobes are entire to angulate, sometimes ending in short, 2 to 3 celled teeth.

## NOTES

- This species is difficult to identify without a compound microscope and appropriate technical literature.
- This species is associated with: *Jamesoniella* spp., *Lophozia ascendens*, *Anastrophyllum hellerianum*, *Lepidozia reptans*, and *Blepharostoma* spp.

## *Scapania glaucocephala*

### SELECTED REFERENCES

Schuster, R.M. 1974. The Hepaticae and Anthocerotae of North America East of the Hundredth Meridian – Volumae III. Columbia University Press, New York, New York. Pp. 880.

**Photo Credit:** © Michael Lueth 2006

# FLAT-TOP BOG MOSS (*Sphagnum fallax*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5	No status	No status

## DISTRIBUTION

- Flat-top bog moss has a circumboreal distribution; in Canada, it has been found in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, and Newfoundland.
- Distribution within Alberta is understudied.

## HABITAT

- Flat-top bog moss grows in permanently wet or moist acidic habitats including wet fields, bogs, swamps, woods, ditches, or the edges of streams.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Dioicous, slender, medium sized moss.
- Green, yellow, or orange shoots and pale or reddish stems; the base of branches may or may not have red pigment.
- Branches in fascicles of 3 to 5, with 1 or 2 spreading.
- Pendent (hanging) branches more or less equal to divergent (spreading) branches.
- Stem leaves small, triangular or fan shaped, as broad as it is long, and sharply pointed.
- Stem leaves rarely rounded at apex, apices not fringed; acute and in-rolled margins form a distinct cusp.
- Branch leaves are lance to narrowly ovate-lanceolate, irregularly notched, loosely spreading and contorted, with undulating margins and recurved tip when dry.

### SPOROPHYTE //

- Sporophytes not seen.
- Capsules occasional.

## FLAT-TOP BOG MOSS (*Sphagnum fallax*)

### SELECTED REFERENCES

Crum, H. 2004. Mosses of the Great Lakes Forest. The University of Michigan Herbarium, Ann Arbor, Michigan. Pp. 592.

Efloras.org. 2007. Flora of China. Efloras.org. Available: [www.efloras.org/florataxon.aspx?flora\\_id=4&taxon\\_id=240000098](http://www.efloras.org/florataxon.aspx?flora_id=4&taxon_id=240000098). [Accessed May 9th 2007].

Natureserve. 2004. Natureserve Explorer: An Online Encyclopedia of Life. Available: <http://www.natureserve.org/explorer/>. Natureserve, Arlington, Virginia. [Accessed: June 11 2007].

Sims, R.A., and K.A. Baldwin, 1996. Sphagnum Species in Northwest Ontario: a Field Guide to Identification. Natural Resource Canada, Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie, Ontario. NODA/NFP Technical Report TR-30, NWST Technical Report TR-101. Pp. 51.

Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland. Cambridge University Press, New York, New York. Pp. 1012.

**Photo Credit:** © Michael Lueth 2006

# FRINGED BOG MOSS (*Sphagnum fimbriatum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5	No status	No status

## DISTRIBUTION

- Fringed bog moss has a circumpolar distribution; in Canada, it is found in Alberta, British Columbia, Ontario, Quebec, Newfoundland, Nova Scotia, and Prince Edward Island.
- Distribution within Alberta is understudied.

## HABITAT

- The fringed bog moss forms small hummocks or dense mats above water level in open, or occasionally, partially shaded areas.
- It is weakly to moderately minerotrophic and is usually found on the edges of ombrotrophic bogs and poor to medium fens, preferring relatively dry sections of open bogs or wet shrubby transition zones between bog and forested wetlands.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Small to medium sized autoicous moss; slender and flexuous.
- Pale green, green, or sometimes pale yellow, or yellow brown in colour.
- Head is small and has a single, very large cone shaped terminal bud.
- Thin stem with branches of 5 fascicles, 2 or 3 of which are spreading.
- Branch leaves are small, imbricate, and narrowly ovate; margins rolled inwards and have a finely toothed apex.

- Slender branches at the terminal head but flexuous-stringy below.
- Large stem leaves are fan shaped and distinctive, strongly lacerated along side and across broad apex.

### SPOROPHYTE //

- Produces abundant sporophytes that arise on short erect stalks from the head and appear as small dark brown or black globular capsules.
- Capsules in summer.

## NOTES

- Similar to *S. teres* which has a brown or red-brown stem and smaller, less lacerated stem leaves.
- Also similar to *S. girgersohnii*; however, fringed bog moss is more slender and less robust and has a clear terminal head. Additionally, the stem leaves are strongly lacerated at both the sides and at the tip.

## FRINGED BOG MOSS (*Sphagnum fimbriatum*)

### SELECTED REFERENCES

Crum, H. 2004. Mosses of the Great Lakes Forest. The University of Michigan Herbarium, Ann Arbor, Michigan.

Sims, R.A., and K.A. Baldwin, 1996. *Sphagnum* Species in Northwest Ontario: a Field Guide to Identification. Natural Resource Canada, Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie, Ontario. NODA/NFP Technical Report TR-30, NWST Technical Report TR-101. Pp. 51.

Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland. Cambridge University Press, New York, New York. Pp. 1012.

**Photo Credit:** Johnathan Sleath

# LINDBERG'S PEAT (BOG) MOSS (*Sphagnum lindbergii*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5?	No status	No status

## DISTRIBUTION

- Lindberg's peat moss has a circumpolar distribution; in Canada, it is found in British Columbia, Alberta, Manitoba, Ontario, Quebec, and Nova Scotia, as well as the Yukon and Northwest Territories.
- Lindberg's peat moss is found in the Rocky Mountain, Foothills, and Boreal Forest Natural Regions of Alberta.

## HABITAT

- Lindberg's peat moss is associated with alpine and sub-alpine seepage sites and fens with acidic substrates.
- It can be widespread, forming carpets in ombrotrophic to weakly minerotrophic boreal mires.

## SERIAL STAGE //

- This species is not directly associated with forest age or seral stage.

## DESCRIPTION

### GAMETOPHYTE //

- Autoicous, moderate to large plant forming low carpets; moderately densely branched.
- Shoots up to 20cm long, capitulum flat-topped with long terminal buds, brown in colour but sometimes greenish after spring snow melt.
- Stems dark brown in colour; almost black, 0.5 to 0.9mm in diameter.
- Branches in fascicles of 4 or 5, sometimes 6, and not differentiated into spreading or hanging branches.

- Stem leaves are hanging and wedge-shaped or rectangular.
- Branch leaves narrowly ovate and do not recurve when dry.
- Antheridial leaves slightly darker than others.
- Perichaetial leaves are entire and oblong, or retuse and fringed at apex.

### SPOROPHYTE //

- Sporophytes are uncommon.
- Capsules very rare, appear in summer.

## NOTES

- *S. lindbergii* is conspicuous when its colour is bright orange brown. Further, the dark brown wedge shaped stems with fringed stem leaves make it unmistakable.

## LINDBERG'S PEAT (BOG) MOSS (*Sphagnum lindbergii*)

### SELECTED REFERENCES

Flora of North America. (Unknown). *Sphagnum lindbergii* in Flora of North America @ eflora.org. [Web Application] Available: [http://www.efloras.org/florataxon.aspx?flora\\_id=50&taxon\\_id=242443221](http://www.efloras.org/florataxon.aspx?flora_id=50&taxon_id=242443221) (Accessed: June 1, 2007).

Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland, Second Edition. Cambridge University Press, Cambridge United Kingdom and New York, United States of America. Pp.1012.

**Photo Credit:** © Michael Lueth 2006



# URN-LIKE POGONATUM (*Pogonatum urnigerum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2S3 G5	No status	No status

## DISTRIBUTION

- Urn-like pogonatum is a circumpolar species.
- In Alberta, it occurs in the Boreal Forest, Foothills, Rocky Mountain, and Canadian Shield Natural Regions.

## HABITAT

- *Pogonatum urnigerum* is most often found as isolated individuals amongst rocks, along disturbed acidic, gravelly, sandy, or alpine soils, and on humid ledges at sea level.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Small, approximately 1 to 2cm high and 0.5 to 1.0cm wide.
- The lanceolate leaves are broad and coarsely toothed; they stand erect when dry but spread outwards 90 degrees from the stem when wet, making the plant look like miniature grey-green flowers.

### SPOROPHYTE //

- Setae are usually 1 to 3cm long; commonly with capsules in autumn or winter.
- Capsules are erect or inclined, short, and cylindrical; spores are 10 to 14µm.

## NOTES

- *Pogonatum urnigerum* is similar to *P. dentatum* which may be distinguished by the apical cell shape of the lamellae.

## URN-LIKE POGONATUM (*Pogonatum urnigerum*)

### SELECTED REFERENCES

- Crum, H.A. 2004. Mosses of the Great Lakes Forest. University of Michigan Herbarium, Ann Arbor, Michigan. Pp. 592.
- Lawton, E. 1971. Moss Flora of the Pacific Northwest. Hattori Botanical Laboratory, Nichinan, Japan. Pp. 363.
- Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland, Second Edition. Cambridge University Press, Cambridge United Kingdom and New York, United States of America. Pp.1012.
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- Yousafzai, S.A. 2006. Bryophytes of Stanley Park. University of British Columbia, Department of Botany. Available: [www.botany.ubc.ca/bryophyte/stanleypark/pellia\\_neesiana/index.htm](http://www.botany.ubc.ca/bryophyte/stanleypark/pellia_neesiana/index.htm). (Accessed: April 30, 2007).

**Photo Credit:** © Michael Lueth 2006

# **SLENDER HAIRY CAP** (*Polytrichum longisetum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S1 G5	No status	No status

## **DISTRIBUTION**

- Slender hairy cap has a circumpolar distribution.
- Distribution within Alberta is understudied.

## **HABITAT**

- The slender hairy cap grows on well drained acidic soils and humus in deciduous and coniferous forests.

## **SERIAL STAGE //**

- Understudied.

## **DESCRIPTION**

### **GAMETOPHYTE //**

- Dark green plant growing in tufts 1.5 to 10cm high, with erect flexuous leaves when dry and spreading, recurved leaves when moist.
- Leaves narrowly lance-shaped, acuminate, toothed, and margins pointing upward.
- Costa projects beyond the lamina in a toothed brown bristle.

### **SPOROPHYTE //**

- Flexuous setae (1.5 to 6.0cm long) are reddish-brown below and yellowish above.
- When mature, capsules are erect, but incline with age.
- Capsules, which are common in the summer, are obloid in shape and 5 to 6 angled.
- The sterile basal section of the capsule is strongly defined from the rest of capsule.
- Capsule lid has a long beak.

## SLENDER HAIRY CAP (*Polytrichum longisetum*)

### SELECTED REFERENCES

Crum, H. 2004. Mosses of the Great Lakes Forest. The University of Michigan Herbarium, Ann Arbor, Michigan. Pp. 592.

Efloras.org. 2007. Flora of China. Efloras.org. Available: [www.efloras.org/florataxon.aspx?flora\\_id=4&taxon\\_id=240000098](http://www.efloras.org/florataxon.aspx?flora_id=4&taxon_id=240000098). [Accessed May 9th 2007].

Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland. Cambridge University Press, New York, New York. Pp. 1012.

**Photo Credit:** © Michael Lueth 2006

# BROKEN-LEAF MOSS (*Dicranum tauricum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S1S2 G4	No status	No status

## DISTRIBUTION

- *Dicranum tauricum* is found in Canada from British Columbia east to Alberta and Saskatchewan, and north to the Northwest Territories.
- Distribution within Alberta is understudied.

## HABITAT

- *Dicranum tauricum* grows on decaying logs or on the base of trees in shady woods; it is rarely found on soil or rocks.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Dioicous; male plants are as large as female plants.
- Dark green or yellowish-green above and brown to olive coloured below, growing in dense tufts.
- Branched stems grow 0.5 to 2.5cm tall and are usually densely covered in reddish rhizoids.
- Leaves are dense, erect, patent, and straight when dry, but erect-patent, straight, rigid and slightly secund at the tips when moist.
- Most leaf tips are deciduous and lacking, lance-shaped and concave below, tubulose above with an acute tip.
- Leaf margins are entire or serrulate above.

### SPOROPHYTE //

- Yellowish to yellow-brown coloured solitary seta which gets darker with age; 1 to 2cm long.
- Cylindrical capsules (1.4 to 2.5mm) are erect, yellowish-brown, and get darker with age.
- Urn is smooth to minutely longitudinally wrinkled (when dry); neck region is short.
- Operculum is inclined with a long beak; lacks an annulus.
- Operculum teeth are reddish-brown, cleft irregularly to about ½ or more; teeth are usually smooth or irregularly marked with oblique striations below and papillose above.
- Operculum teeth are sometimes nearly smooth throughout.
- Capsules mature in summer.

## NOTES

- *D. auricum* is recognized by its shiny appearance, erect capsules, and broken leaf tips.
- *D. fragilifolium* also has broken leaf tips and a range similar to *D. tauricum*. However, when sporophytes are present *D. tauricum* is differentiated by its straight capsules, while *D. fragilifolium* has curved capsules which are rarely produced. When sterile, the costa cross section of the proximal half of the leaf must be examined under a microscope to distinguish these two species.

## BROKEN-LEAF MOSS (*Dicranum tauricum*)

### SELECTED REFERENCES

Flowers, S. 1973. Mosses: Utah and the West. Brigham Young University Press. Provo, Utah. Pp. 566.

Ireland, R.R. 2002. *Dicranum* in Bryophyte Flora of North America, Provisional Publication. Buffalo Museum of Science. Available: <http://www.mobot.org/plantscience/bfna/v1/DicrDicranum.htm>. [Accessed June 6th 2007].

**Photo Credit:** Richard Caners, PhD Candidate, University of Alberta

# YELLOW COLLAR MOSS (*Splachnum luteum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S3 G3	No status	No status

## DISTRIBUTION

- The yellow collar moss has a circumpolar distribution. It is most abundant in Alaska, Yukon, western Northwest Territories, northern British Columbia, and central and northern Alberta.
- In Alberta, this species occurs in the Rocky Mountain and Boreal Forest Natural Regions.

## HABITAT

- The yellow collar moss is a member of the dung moss family; it is confined to animal dung in muskeg habitats and usually occurs on moose dung, but may be found growing on other animal dung. All members of this genus are associated with peatlands ranging from rich fens to bogs.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Inconspicuous.

### SPOROPHYTE //

- Bright yellow, expanded, skirt-like capsules on long setae. Capsules are up to 1cm across and the setae range from 5 to 10cm in height.
- Spores are dispersed by flies; the colour and odor of the expanded capsules are thought to attract flies, and subsequent to landing on the capsules, flies distribute spores on fresh dung piles.

## YELLOW COLLAR MOSS (*Splachnum luteum*)

### SELECTED REFERENCES

Crum, H.A. 2004. Mosses of the Great Lakes Forest. University of Michigan Herbarium, Ann Arbor, Michigan. Pp. 592.

Marino, P.C. 1988. The North American Distributions of the Circumboreal Species of *Splachnum* and *Tertraplodon*. The Bryologist 91(3):161-166.

Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. Mosses, Lichens and Ferns of Northwest North America. Lone Pine Publishing, Edmonton, Alberta. Pp. 296.

**Photo Credit:** J. Derek Johnson



# RED COLLAR MOSS (*Splachnum rubrum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S3 G3	No status	No status

## DISTRIBUTION

- Red collar moss has a circumpolar distribution; it is evenly distributed across boreal systems throughout Canada.
- In Alberta, it occurs in the Rocky Mountain and Boreal Forest Natural Regions.

## HABITAT

- Red collar moss is a member of the dung moss family; it is confined to animal dung in muskeg habitats and usually occurs on moose dung, but may be found growing on other animal dung. All members of this genus are associated with peatlands ranging from rich fens to bogs.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Leaves are not conspicuous relative to the sporophytes; they are broadly ovate, flaccid, yellow-green and shiny when moist, but form an unrecognizable shriveled mass when desiccated.

### SPOROPHYTE //

- Brilliant red inflated capsules with a red skirt-like hypophysis on long pink setae. Capsules range in size from 0.5 to 1 cm across and the setae range 2 to 15 cm in height.
- Spores are dispersed by flies; the colour and odor of the expanded capsules are thought to attract flies, and subsequent to landing on the capsules, flies distribute spores on fresh dung piles.

## RED COLLAR MOSS (*Splachnum rubrum*)

### SELECTED REFERENCES

Crum, H.A. 2004. Mosses of the Great Lakes Forest. University of Michigan Herbarium, Ann Arbor, Michigan. Pp. 592.

Marino, P.C. 1988. The North American Distributions of the Circumboreal Species of *Splachnum* and *Tertraplodon*. The Bryologist 91(3):161-166.

Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. Mosses, Lichens and Ferns of Northwest North America. Lone Pine Publishing, Edmonton, Alberta. Pp. 296.

**Photo Credit:** J. Derek Johnson

# LARGE-FRUITED SPLACHNUM (*Splachnum vasculosum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G3G5	No status	No status

## DISTRIBUTION

- Large-fruited splachnum has a circumpolar distribution.
- In Alberta, it is restricted to the northern portions of the Boreal Forest and Rocky Mountain Natural Regions.

## HABITAT

- Large-fruited splachnum is a member of the dung moss family which grow on organic substrates, primarily dung. However, large-fruited splachnum does not appear to be restricted to growing on a particular type of animal dung (i.e. carnivore or ungulate). All members of this genus are associated with peatlands ranging from rich fens to bogs.

## SERAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Pale green to dark green growing in patches up to 7cm high; dioicous.
- Broadly ovate blunt-tipped leaves with a narrow base that are shrunken and contorted when dry but extend out from the stem at a 45 degree angle when moist.

### SPOROPHYTE //

- Thin, pale red setae (1 to 3cm) with ovoid capsules (2 to 4cm) frequent in the summer; hypophysis is dark purple, broadly globose, and much wider than the capsule body when moist, but wrinkled and narrower when dry.
- Spores are smooth and 8 to 10µm in size.

## LARGE-FRUITED SPLACHNUM (*Splachnum vasculosum*)

### SELECTED REFERENCES

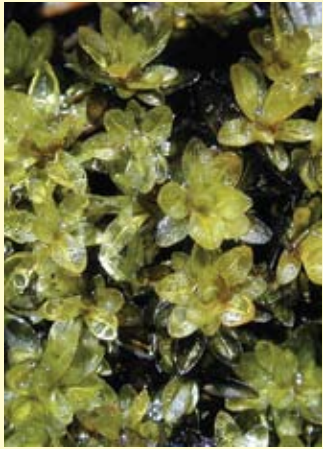
Lawton, E. 1971. Moss Flora of the Pacific Northwest. Hattori Botanical Laboratory, Nichinan, Japan. Pp. 363.

Marino, P.C. 1988. The North American Distributions of the Circumboreal Species of *Splachnum* and *Tertraplodon*. The Bryologist 91(3):161-166.

Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland, Second Edition. Cambridge University Press, Cambridge United Kingdom and New York, United States of America. Pp.1012.

**Photo Credit:** © Michael Lueth 2006

# TONGUE-LEAF SMALL KETTLE MOSS (*Tayloria lingulata*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G3G5	No status	No status

## DISTRIBUTION

- In Canada, tongue-leaf small kettle moss occurs in British Columbia, Alberta, Saskatchewan, Manitoba, Quebec, and Newfoundland.
- This species is found in the Rocky Mountain, Foothills, and Boreal Forest Natural Regions of Alberta.

## HABITAT

- Tongue-leaf small kettle moss is a member of the dung moss family but it is not restricted to animal dung substrate; this moss is commonly found in the margins of dried up pools enriched by the dung of wading birds.
- Tongue-leaf small kettle moss is found in sub-alpine and alpine environments, as well as sub-arctic and arctic environments; in particular, it is associated with alpine and sub-alpine seepages and fens, and specifically, acidic substrates.

## SERIAL STAGE //

- This species is not directly associated with forest structure.

## DESCRIPTION

### GAMETOPHYTE //

- Blunt tongue-shaped leaves that are pale green above, and blackish or brownish below; leaves are somewhat bent or wavy when dry, but become erect when wet.
- Stems are usually 1 to 3cm high and sometimes branched with red to purple rhizoids.
- Synoicous.

### SPOROPHYTE //

- Bright red setae (1.5 to 4cm) on stalks (1 to 3cm) are slender, erect and terminate with the capsules.
- Capsules are erect, elliptic in shape, and green in color; the finely papillose spores are 20 to 30µm.

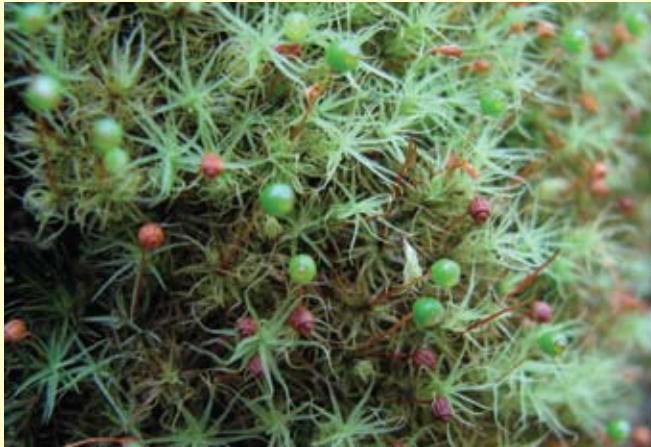
## TONGUE-LEAF SMALL KETTLE MOSS (*Tayloria lingulata*)

### SELECTED REFERENCES

- Crum, H.A. 2004. Mosses of the Great Lakes Forest. University of Michigan Herbarium, Ann Arbor, Michigan. Pp. 592.
- Lawton, E. 1971. Moss Flora of the Pacific Northwest. Hattori Botanical Laboratory, Nichinan, Japan. Pp. 362.
- Natureserve. 2004. Natureserve Explorer: An Online Encyclopedia of Life. Available: <http://www.natureserve.org/explorer/>. Natureserve, Arlington, Virginia. [Accessed: June 11 2007].
- Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland, Second Edition. Cambridge University Press, Cambridge United Kingdom and New York, United States of America. Pp.1012.
- Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. Mosses, Lichens and Ferns of Northwest North America. Lone Pine Publishing, Edmonton, Alberta. Pp. 296.

**Photo Credit:** © Michael Lueth 2006

# APPLE MOSS (*Bartramia pomiformis*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5	No status	No status

## DISTRIBUTION

- Apple moss occurs in Canada from British Columbia east to Newfoundland, and north to the Yukon and Northwest Territories.
- In Alberta, it is found in the Foothills, Rocky Mountain, and Boreal Forest Natural Regions.

## HABITAT

- The apple moss grows in mesic rocky outcrops and moist shady soils in montane forests and is found in acidic rock crevices in coastal forests; it may also be found at the base of trees and on downed logs in moist shady forests.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Dioicous; autoicous or synoicous.
- Pale, bright glaucous green or bluish-green, but sometimes yellowish in colour.
- Grows in dense or loose tufts with stems 2 to 10cm high.
- Loosely erect to erect-spreading when moist, and bent to contorted when dry.
- Unbranched or sometimes branched stems with abundant red hairs.
- Leaves are lance to linear-shaped, slightly and irregularly bent/twisted; 4 to 9mm long.
- Leaves gradually narrow from base to tip; margins are rolled under to the tip.
- Leaves are coarsely toothed at tip and subulate.

- Small papillae on the end of the leaves from projected cells.
- Perigonia lies next to the perichaetium.

### SPOROPHYTE //

- Seta is erect and flexuose; 5 to 25mm long.
- Perfect spherical capsules, reddish-brown in colour, deeply furrowed with 16-ribs.
- Young, green, apple-like capsules.
- Capsules are exserted, inclined, or cernuous.
- Capsules mature between February and November.
- Fragile, reduced double peristome.

## NOTES

- Apple moss is similar to *Plagiopus oederiana*; however, *P. oederiana* can be differentiated from *B. pomiformis* by its smaller capsules and dark green leaves that are spirally ranked with minute bumps, rather than distinct papillae.

## APPLE MOSS (*Bartramia pomiformis*)

### SELECTED REFERENCES

- Boodenberg, E.T. 1954. Mosses: A New Approach to the Identification of Common Species. Burgess Publishing Co. Minneapolis, Minnesota. Pp. 264.
- Lawton, E. 1971. Moss Flora of the Pacific Northwest. The Hattori Botanical Laboratory, Nichinan, Miyazaki, Japan. Pp. 362.
- Natureserve. 2004. Natureserve Explorer: An Online Encyclopedia of Life. Available: <http://www.natureserve.org/explorer/>. Natureserve, Arlington, Virginia. [Accessed: April 27 2007].
- Pojar, J. and A. MacKinnon. 1994. Plants of Coastal British Columbia Including Washington, Oregon and Alaska. Lone Pine Publishing, Edmonton, AB. Pp. 528.
- Vitt, D.H., J.E. Marsh, and R.R. Bovey. 1988. Mosses, Lichens & Ferns of Northwest North America. Lone Pine Publishing, Edmonton, Alberta. Pp. 296.
- Zander, R.H. 2001. Bryophyte Flora of North America. Available: [www.mobot.org/plantscience/BFNA/bfnamenu.htm](http://www.mobot.org/plantscience/BFNA/bfnamenu.htm). Flora of North America Association, Inc. Missouri Botanical Garden. St Louis, MO. [Accessed April 27 2007].

**Photo Credit:** Richard Caners, PhD Candidate, University of Alberta



# COMPACT CONARDIA MOSS (*Conardia compacta*)

PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G3G5	No status	No status

No image available

## DISTRIBUTION

- Compact conardia moss has a circumpolar distribution; in Canada, it is found from British Columbia east to Newfoundland.
- Distribution within Alberta is understudied.

## HABITAT

- The compact conardia moss occurs in heavily shaded areas on basic soil and rocks, particularly under rocky overhangs; it also grows on wood substrates.

## SERAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Plants slender and form shiny dense green or yellowish green patches.
- Stems are spreading, prostrate, and irregularly branched.
- When dry, the leaves are pressed flat against the stem (appressed), and when moist the leaves are secund.
- Leaves are crowded, serrulate, and usually erect or erect-spreading, growing 0.3 to 0.7mm long.
- Leaves are lance-shaped and toothed near the bottom but less so above, tapering to a point.
- Teeth at widest part of leaf are often recurved.

- Leaf margins are plane, not wavy.
- Costa is not strongly defined, reaches the apex, but is often not visible near the middle.
- Branch leaves similar but smaller than stem leaves.
- Gemmae are uniseriate and are on the abaxial surface near the leaf apex.

### SPOROPHYTE //

- Smooth setae are orange-yellow or red, growing 8 to 14mm long.
- Capsules are 1.2 to 1.5mm long and are inclined.

## NOTES

- The genus *Amblystegium* is similar to *C. conar*; however, *C. conar* is softer, the costa is not visible in the acumen at the leaf tip, and it has leaves that are sharply toothed at the base.

## COMPACT CONARDIA MOSS (*Conardia compacta*)

### SELECTED REFERENCES

- Crum, H. 2004. Mosses of the Great Lakes Forest. The University of Michigan Herbarium, Ann Arbor, Michigan. Pp. 592.
- Lawton, E. 1971. Moss Flora of the Pacific Northwest. The Hattori Botanical Laboratory, Nichinan, Miyazaki, Japan. Pp. 362.
- Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland. Cambridge University Press. New York, NY. Pp. 1012.

# REFLEXED FEATHER-MOSS (*Brachythecium reflexum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G4G5	No status	No status

## DISTRIBUTION

- Reflexed feather-moss has a circumpolar distribution; in Canada, it is found from British Columbia east to Labrador.
- Distribution within Alberta understudied.

## HABITAT

- Reflexed feather-moss is a xerophytic moss which grows on oligotrophic and mesotrophic sites, including the following substrates: dry decaying wood, dry soil, silicate-rich stones, moist humus, fine woody debris. It may also occur occasionally on tree bases.

## SERIAL STAGE //

- Mature even-aged stands.

## DESCRIPTION

### GAMETOPHYTE //

- Slender species, growing in thin, loose or dense mats; dark green or yellow green in colour.
- Stems and branches are slender, tapering, and curved at the ends.
- Stems prostrate and pinnately branched; branches round in cross section.
- Leaves are slightly shiny, light green or yellowish, with plain or recurved margins; 0.8 to 1.2mm long and 0.35 to 0.55mm wide.
- Leaves are erect and spreading, imbricate, concave at base with the costa ending at the apex.
- Leaves are long-acuminate from the broad base, and strongly decurrent; the apex is often wide-spreading or sometimes recurved.

- Branch leaves are smaller, oval-lance or lance-shaped, less strongly decurrent; margins saw-toothed.
- Perichaetial bracts are slightly sheathing near the base and the tips are erect to spreading; autoicous.

### SPOROPHYTE //

- Seta rough growing; 0.6 to 1.3cm long.
- Capsules dark brown, horizontal, and zygomorphic.
- The operculum is high-conic (0.5mm long), and the urn is between 0.8 and 1.4mm long.
- Peristome is well developed, typically with long cilia; appendiculate and sometimes short.

## NOTES

- *Brachythecium starkei* var. *pacificum* is a very similar species but may be differentiated from the reflexed feather-moss by its larger, longer leaf cells and the perichaetial bracts which are costate.

## REFLEXED FEATHER-MOSS (*Brachythecium reflexum*)

### SELECTED REFERENCES

- Dunham, E.M. 1916. How to Know the Mosses: A Popular Guide to the Mosses of the Northeastern United States. Houghton Mifflin Company, Boston, Massachusetts. Pp. 287.
- Hokkanen, P.J. 2004. Bryophyte Communities in Herb-Rich Forests in Koli, Eastern Finland: Comparison of Forest Classifications Based on Bryophytes and Vascular Plants. *Annales Botanici Fennici* 41:331-365.
- Lawton, E. 1971. Moss Flora of the Pacific Northwest. The Hattori Botanical Laboratory, Nichinan, Miyazaki, Japan. Pp. 362.
- McGee, G.G. and R.W. Kimmerer. 2002. Forest Age and Management Effects on Epiphytic Bryophyte Communities in Adirondack Northern Hardwood Forests, New York, U.S.A. *Canadian Journal of Forest Science* 32: 1562-1576.
- Thomas, L.P. and J.R. Jackson, 1985. Walk Softly Upon the Earth a Pictorial Field Guide to Missouri Mosses, Liverworts and Lichens. Missouri Department of Conservation, Jefferson City, Missouri. Pp. 129.
- Photo Credit:** © Michael Lueth 2006

# TENDRIL FEATHER-MOSS (*Cirriphyllum cirrosum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5?	No status	No status

## DISTRIBUTION

- Tendril feather-moss has a circumpolar distribution; in Canada, it is found in Alberta, British Columbia, and Manitoba.
- Distribution within Alberta is understudied.

## HABITAT

- The tendril feather-moss is found in soil on calcareous rock ledges and cliffs.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Dioicous moss growing in loose or dense patches.
- Robust and green to yellowish-green in colour.
- Stems spreading and irregularly branched; shoots growing to 10cm long.
- Leaves are erect, concave, loosely imbricate (leaf margins overlapping) when moist, flexuous (irregularly bent) apices when dry.
- Stem leaves are ovate-oblong, margins are recurved near the base and wavy or finely toothed above.
- Stem leaf apices are obtuse or with a rounded, slender, long tapering point.
- Costa extends approximately 1/3 to 1/2 up the leaf.

### SPOROPHYTE //

- Seta rough with many papillae; deep red or brownish-red in colour.
- Capsules with a conical lid and a rostrate beak.
- Capsules in fall and winter.

## TENDRIL FEATHER-MOSS (*Cirriphyllum cirrosum*)

### SELECTED REFERENCES

Lawton, E. 1971. Moss Flora of the Pacific Northwest. The Hattori Botanical Laboratory, Nichinan, Miyazaki, Japan. Pp. 362.

Smith, A.J.E. 2004. The Moss Flora of Britain and Ireland. Cambridge University Press. New York, NY. Pp. 1012.

**Photo Credit:** © Michael Lueth 2006

# *Herzogiella turfacea*



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S3 G4G5	No status	No status

## DISTRIBUTION

- In Canada, *Herzogiella turfacea* is found in British Columbia, Alberta, Manitoba, Ontario, Labrador and Newfoundland.
- Distribution within Alberta is understudied.

## HABITAT

- *Herzogiella turfacea* occurs in dense or open coniferous forests, bogs, marshes, and swamps on a variety of substrates, including: soil, humus, rock, decaying logs and the base of trees.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### GAMETOPHYTE //

- Bright green or yellow-green plant, growing in loose mats.
- Branches and leaves spreading, leaves are secund, often indistinctly compressed and sometimes plicate when dry.
- Leaves are oblong-lanceolate, narrowing to a flexuous acumen.
- Leaves are not decurrent and are 1.2 to 1.5mm long.
- Perichaetial leaves are spreading at the tips or are flexuous.

### SPOROPHYTE //

- Setae are red and 0.8 to 1.8cm long.
- Capsule 1.5 to 2mm long and are strongly inclined and horizontal.
- Exostome teeth are yellowish, endostome cilia are paired.

## *Herzogiella turfacea*

### SELECTED REFERENCES

Crum, H. 2004. Mosses of the Great Lakes Forest. The University of Michigan Herbarium, Ann Arbor, Michigan. Pp. 592.

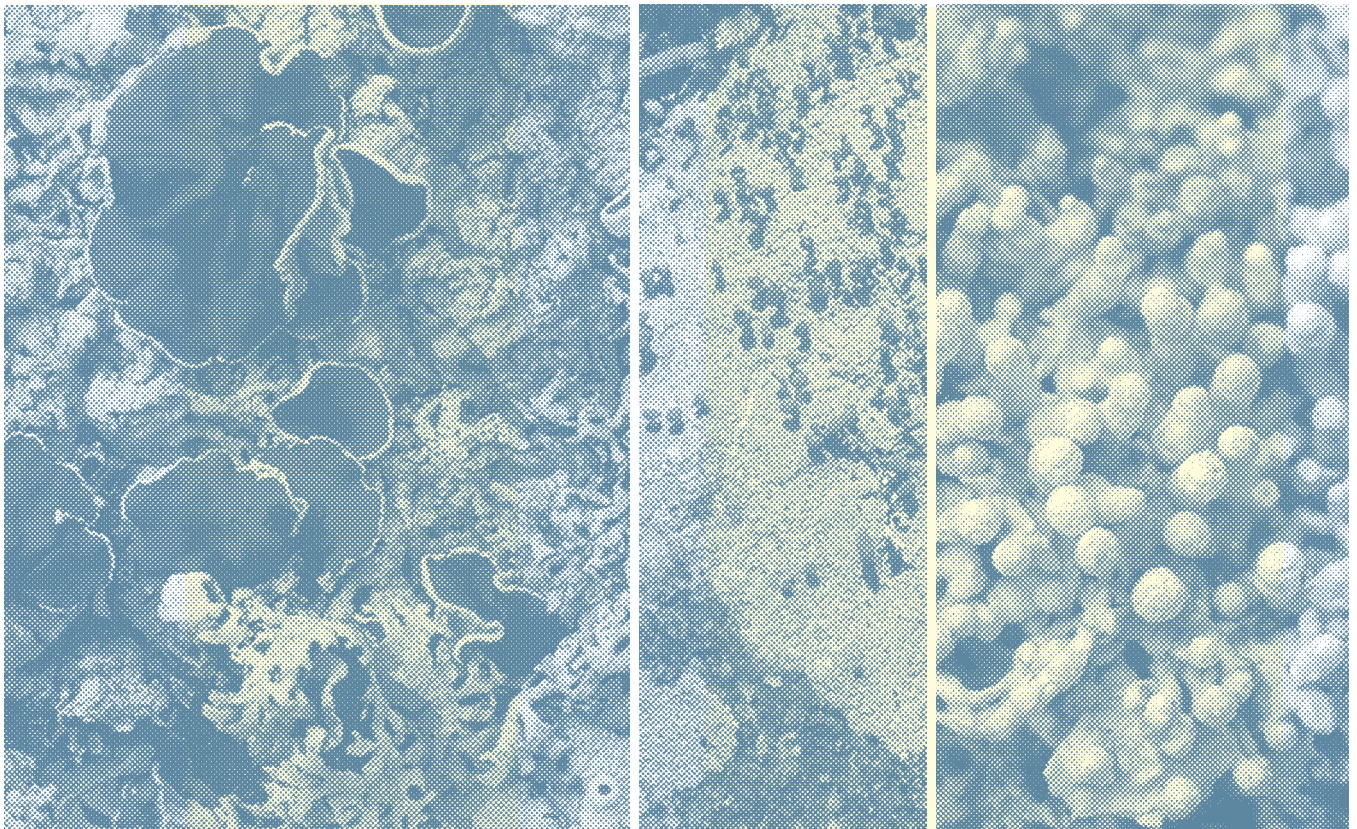
Lawton, E. 1971. Moss Flora of the Pacific Northwest. The Hattori Botanical Laboratory, Nichinan, Miyazaki, Japan. Pp. 362.

**Photo Credit:** © Michael Lueth 2007



# NON-VASCULAR PLANTS

## LICHENS





# RUSTY-ROCK LICHEN (*Tremolecia atrata*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G?	No status	No status

## DISTRIBUTION

- Tremolecia atrata* is most commonly found from sub-alpine to arctic environments within the northern Boreal Forest and a portion of the Rocky Mountain Natural Region of Alberta.

## HABITAT

- Rusty-rock lichen is found on exposed acidic rocks, often with iron content, in arctic, alpine and sub-alpine areas with full sun exposure.

## SERAL STAGE //

- This lichen species is not directly associated with forest structure.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- The crustose lichen body is a bright, rusty red color over a distinctive black hypothallus, which forms a network of thin black lines between thalli.

### ASCOCARP (FRUITING STRUCTURE) //

- T. atrata* has small, black, lecideine apothecia, which have simple hyaline spores.

### MICROCHEMISTRY SPOT TEST //

- No test described.

## RUSTY-ROCK LICHEN (*Tremolecia atrata*)

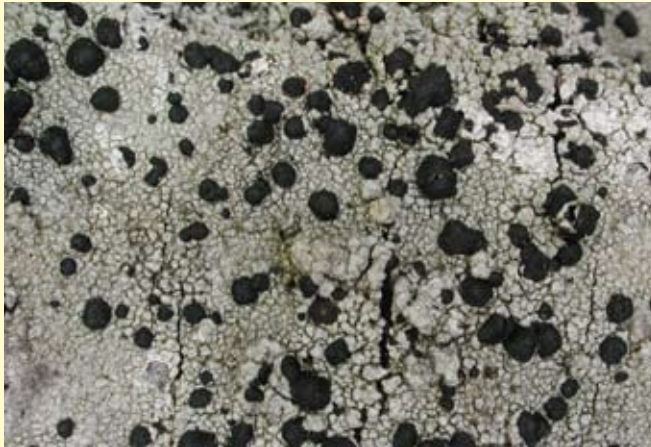
### SELECTED REFERENCES

Geiser, L.H., K.L. Dillman, C.C. Derr, and M.C. Stensvold. 1994. Lichens of Southeastern Alaska: An Inventory. USDA Forest Service, Alaska Region R10-TB-45. Pp. 143.

Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. Mosses, Lichens and Ferns of Northwest North America. Lone Pine Publishing, Edmonton, Alberta. Pp. 296.

**Photo Credit:** Lief & Anita Stridvall ([www.stridvall.se/la.index.php](http://www.stridvall.se/la.index.php))

# BLOODY HEART (*Mycoblastus sanguinarius*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G?	No status	No status

## DISTRIBUTION

- Mycoblastus sanguinarius* is most commonly found from low to sub-alpine elevations of both deciduous and conifer forests in the Parkland, Boreal Forest, and Rocky Mountain Natural Regions of Alberta.

## HABITAT

- Bloody heart is found on the decaying bark of trees and shrubs in moist forests.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- The thallus of *M. sanguinarius* is crustose, warted, and pale grayish-green or whitish in color.

### ASCOCARP (FRUITING STRUCTURE) //

- M. sanguinarius* apothecia are large, lecideine, thick-walled, shiny, and black; unlike most lichens this species only has a single spore per ascus.

### MICROCHEMISTRY SPOT TEST //

- No test described; however, when the apothecium is sliced a clearly visible red hypothecium is exposed.

## NOTES

- M. sanguinarius* is similar to *M. affinis*, which lacks the red hypothecium.

## BLOODY HEART (*Mycoblastus sanguinarius*)

### SELECTED REFERENCES

- Geiser, L.H., K.L. Dillman, C.C. Derr, and M.C. Stensvold. 1994. Lichens of Southeastern Alaska: An Inventory. USDA Forest Service, Alaska Region R10-TB-45. Pp. 143.
- Geiser, L.H., K.L. Dillman, C.C. Derr, and M.C. Stensvold. 1998. Lichens and Allied Fungi of Southeast Alaska. In: M.G. Glenn, R.C. Harris, R. Dirig and M.S. Cole (Eds.) Lichenographia Thomsoniana: North American Lichenology in Honor of John W. Thomson. Mycotaxon Ltd., Ithaca NY. Pp. 42.
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- Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. Mosses, Lichens and Ferns of Northwest North America. Lone Pine Publishing, Edmonton, Alberta. Pp. 296.

**Photo Credit:** Lief & Anita Stridvall ([www.stridvall.se/la.index.php](http://www.stridvall.se/la.index.php))



# *Pertusaria dactylina*



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G?	No status	No status

## DISTRIBUTION

- Pertusaria dactylina* is most commonly found in the Arctic regions of North America but is also occasionally found in alpine elevations of the Rocky Mountain Natural Region of Alberta.

## HABITAT

- Pertusaria dactylina* is often found on exposed rock or soil ridges in alpine or arctic tundra, as well as among mosses such as *Racomitrium* spp. and *Tortula* spp.

## SERAL STAGE //

- This lichen species is not directly associated with forest structure.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- The lichen body of *P. dactylina* is made up of a thin thallus containing distinctive white, finger shaped, erect, thick isidia.

### ASCOCARP (FRUITING STRUCTURE) //

- Apothecia are rare, pruinose, black discs immersed within the tips of the isidia; one large, single hyaline spore is found in each ascus.

### MICROCHEMISTRY SPOT TEST //

- Thallus turns yellow to red-brown when exposed to potassium hydroxide (KOH) or orange-red with paraphenylenediamine (PD).

## *Pertusaria dactylina*

### SELECTED REFERENCES

- Geiser, L.H., K.L. Dillman, C.C. Derr, and M.C. Stensvold. 1994. Lichens of Southeastern Alaska: An Inventory. USDA Forest Service, Alaska Region R10-TB-45. Pp. 143.
- Geiser, L.H., K.L. Dillman, C.C. Derr, and M.C. Stensvold. 1998. Lichens and Allied Fungi of Southeast Alaska. In: M.G. Glenn, R.C. Harris, R. Dirig and M.S. Cole (Eds.) Lichenographia Thomsoniana: North American Lichenology in Honor of John W. Thomson. Mycotaxon Ltd., Ithaca NY. Pp. 42.
- Vitt, D.H., J.E. Marsh, and R.B. Bovey. 1988. Mosses, Lichens and Ferns of Northwest North America. Lone Pine Publishing, Edmonton, Alberta. Pp. 296.

**Photo Credit:** Lief & Anita Stridvall ([www.stridvall.se/la.index.php](http://www.stridvall.se/la.index.php))



# *Baeomyces rufus*



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G5?	No status	No status

## DISTRIBUTION

- In Canada, *Baeomyces rufus* has been found in Alberta, Saskatchewan, Ontario, and Quebec.
- *Baeomyces rufus* is found in the Boreal Forest, Parkland, Foothills, Rocky Mountain, and Canadian Shield Natural Regions of Alberta.

## HABITAT

- *Baeomyces rufus* is typically found growing on acidic soils along road sides, cut banks, and trail sides but may also be found growing on wood or the surface of flat sandstone boulders along shorelines and coast lines.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- The thallus of *B. rufus* is finely granular, thin, and green in color.

### ASCOCARP (FRUITING STRUCTURE) //

- *B. rufus* has light brown apothecia that are found at the end of short (up to 3mm), furrowed stalks; soredia are absent.

### MICROCHEMISTRY SPOT TEST //

- *B. rufus* produces a yellow color when mixed with potassium hydroxide (KOH) and turns orange in color when exposed to paraphenylenediamine (PD).

## NOTES

- In its non-fruiting stage *B. rufus* may be confused with the sorediate *Trapeliopsis granulosa* and the granulate *Lcmadophila ericetorum*.
- The establishment of this species helps to stabilize soils of unstable banks and shorelines.

## *Baeomyces rufus*

### SELECTED REFERENCES

Geiser, L.H., K.L. Dillman, C.C. Derr, and M.C. Stensvold. 1994. Lichens of Southeastern Alaska: An Inventory. USDA Forest Service, Alaska Region R10-TB-45. Pp. 143.

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**Photo Credit:** Lief & Anita Stridvall ([www.stridvall.se/la.index.php](http://www.stridvall.se/la.index.php))

# *Cladonia bellidiflora*



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2S3 G5	No status	No status

## DISTRIBUTION

- In Canada, *Cladonia bellidiflora* has been found in Alberta, Saskatchewan, Manitoba, Ontario, and Quebec.
- *Cladonia bellidiflora* is typically found at all elevations and in most forest types of the Boreal Forest, Rocky Mountain, and Canadian Shield Natural Regions of Alberta.

## HABITAT

- *Cladonia bellidiflora* grows on a variety of substrates including bare acidic soils, humus, rotting stumps, logs, and among mosses in open and forested habitats, but it most often occurs on soils rather than rocks.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- The lichen body of *C. bellidiflora* is made up of a small, pale yellow-green thallus with frilly lobes and small, erect, branch-like stems ending in cup-shaped tips rimmed with bright red apothecia.

### ASCOCARP (FRUITING STRUCTURE) //

- Bright red apothecial discs are found either on the narrow cup edges or at the ends of the tapered squamulose podetia (stems).

### MICROCHEMISTRY SPOT TEST //

- The inner thallus body (medulla) of this species appears white in color under long wave UV light.

## NOTES

- *C. bellidiflora* is sensitive to sulphur dioxide and is often used as an indicator of pollution.
- It is similar to *C. cristatella*, which is smaller, cupless, usually without squamules, and is rare within the western mountains.

## *Cladonia bellidiflora*

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- Geiser, L.H., K.L. Dillman, C.C. Derr, and M.C. Stensvold. 1994. Lichens of Southeastern Alaska: An Inventory. USDA Forest Service, Alaska Region R10-TB-45. Pp.143.
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- Photo:** Einar Timdal, University of Oslo Lichen Herbarium ([www.nhm.uio.no/lichens](http://www.nhm.uio.no/lichens))

# DRAGON FUNNEL (*Cladonia squamosa*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G4G5	No status	No status

## DISTRIBUTION

- In Canada, dragon funnel has been found in Alberta, Saskatchewan, Manitoba, Ontario, and Quebec.
- Dragon funnel is most commonly found from low to sub-alpine elevations in moist conifer forests of the Parkland, Boreal Forest, and less commonly, the Rocky Mountain Natural Regions of Alberta.

## HABITAT

- Dragon funnel usually occurs on the bases and low branches of coniferous trees, as well as on bare soil, rocks, and among mosses.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- The lichen body is made up of a pale greenish, patchy, irregular, discontinuous cortex covered by scaly (squamulate), club-shaped, hollow podetia (stalk); the squamules are usually 2mm long.

### ASCOCARP (FRUITING STRUCTURE) //

- Brown apothecium are found on a single cup formed at the end of the podetia.

### MICROCHEMISTRY SPOT TEST //

- The thallus of this species shows up white in color under long wave UV light, and has no reaction with potassium hydroxide (KOH) or paraphenylenediamine (PD).

## DRAGON FUNNEL (*Cladonia squamosa*)

### SELECTED REFERENCES

- Geiser, L.H., K.L. Dillman, C.C. Derr, and M.C. Stensvold. 1994. Lichens of Southeastern Alaska: An Inventory. USDA Forest Service, Alaska Region R10-TB-45. Pp.143.
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- Photo:** Einar Timdal, University of Oslo Lichen Herbarium ([www.nhm.uio.no/lichens](http://www.nhm.uio.no/lichens))

# RIPPLED ROCKFROG (*Arctoparmelia centrifuga*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G3G5	No status	No status

## DISTRIBUTION

- In Canada, rippled rockfrog has been found in Alberta, Saskatchewan, Ontario, and Quebec.
- The rippled rockfrog is typically an arctic lichen species but may occasionally be found at higher elevations in the Boreal Forest, Rocky Mountain, and Canadian Shield Natural Regions.

## HABITAT

- The rippled rockfrog is typically found growing on the vertical or horizontal sides of acidic rocks found in rock slides, talus slopes, and rocky outcrops.

## SERIAL STAGE //

- This lichen species is not directly associated with seral stage and/or forest structure.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- Rippled rockfrog is a medium to large foliose lichen with a yellow-green colored thallus containing elongated, thin, irregularly branched lobes; it is found closely attached to the substrate growing in a concentric ring pattern.
- The upper cortex of this species is firm, never eroding, and dull greenish yellow in color, while the lower cortex is white or tan colored; a few scattered, short, simple, brownish to black rhizines are usually present on the lower cortex.

### ASCOCARP (FRUITING STRUCTURE) //

- Brown apothecia are rare and located over the upper surface; soredia and isidia are lacking.
- Spores are simple, ellipsoid, colorless, with 8 per ascus.

### MICROCHEMISTRY SPOT TEST //

- The white inner part of the thallus (medulla) shows up as a blue-white color under long wave UV light, it produces a red color when exposed to KC (potassium hydroxide (KOH) followed by calcium hypochlorite(C)), and has no reaction to potassium iodide (I). The cortex turns pale yellow with KOH or yellow with KC.

## NOTES

- The yellow-green color of *Arctoparmelia centrifuga* is similar to that of *A. separata*, but the species differ in that *A. separata* is only loosely attached to substrates, its lower cortex is gray, and it does not form concentric rings. Additionally, the medulla of the *A. separata* is positive (blue) with an iodine test.

## RIPPLED ROCKFROG (*Arctoparmelia centrifuga*)

### SELECTED REFERENCES

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**Photo Credit:** Lief & Anita Stridvall ([www.stridvall.se/la.index.php](http://www.stridvall.se/la.index.php))



# DEFLATED BONE OR TUBE LICHEN

## (*Hypogymnia metaphysodes*)

PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G3G5	No status	No status

No image available

### DISTRIBUTION

- In Canada, deflated bone lichen has only been found in Alberta.
- *Hypogymnia metaphysodes* is most commonly found in moist conifer forests distributed along the western portion of the Parkland, Boreal Forest, Foothills, and Rocky Mountain Natural Regions of Alberta.

### HABITAT

- *Hypogymnia metaphysodes* is usually found growing on the bark of coniferous twigs, branches, and trunks but it occasionally occurs on the bark of birch and poplar trees.

### SERAL STAGE //

- Understudied.

### DESCRIPTION

#### THALLUS (LICHEN BODY) //

- The small to medium lichen body is made up of a corticate, foliose thallus containing flattened, loosely appressed, hollow lobes (0.5 to 5mm wide) that often have black dots near their edges.
- The flat upper surface is pale brownish or more often whitish grey, while the lower surface is blackish, shiny, wrinkled, and lacking rhizines.

#### ASCOCARP (FRUITING STRUCTURE) //

- This lichen species has lecanorine apothecia located over the upper surface in the form of large, stalked/stipitate, concave, brown discs that develop at the lobe tips.

- Spores are simple, spherical to ellipsoid, colorless, with 8 per ascus; soredia may be present while isidia are absent.

#### MICROCHEMISTRY SPOT TEST //

- The cortex produces a yellow color when mixed with potassium hydroxide (KOH) and the upper cortex may also turn yellow when paraphenylenediamine (PD) is added. The white medulla turns red when exposed to KOH followed by calcium hypochlorite (C).

### NOTES

- *H. metaphysodes* is sometimes used as an indicator of acidic, low fertility environments. It is similar to the coastal species *H. entermorpha* which is distinguished by its small lobes, flattened upper surface and absence of marginal lobules.

## DEFLATED BONE OR TUBE LICHEN (*Hypogymnia metaphysodes*)

### SELECTED REFERENCES

- Geiser, L.H. and P.N. Neitlich. 2006. Air Pollution and Climate Gradients in Western Oregon and Washington Indicated by Epiphytic Macrolichens. *Environmental Pollution* 145: 203-218.
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# LEATHER BROWN (*Melanelia stygia*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G4G5	No status	No status

## DISTRIBUTION

- Melanelia stygia* is most commonly found at high elevations in the Rocky Mountain Natural Region of Alberta.

## HABITAT

- Leather brown grows on exposed, acidic, sandstone rocks and boulders.

## SERIAL STAGE //

- This lichen species is not directly associated with forest structure.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- M. stygia* has a dark foliose thallus made up of scattered and laminal pseudocyphellae and sunken pycnidia over the upper surface.
- The corticate thallus has short to elongate (0.4 to 7mm), closely or loosely appressed, narrow, convex lobes.
- M. stygia* has a brown or black upper surface that is dull near the centre and shiny near the tips; the lower surface of the lobes is either pale brown or black with short, simple rhizines that may be restricted to the margins of the lower surface.

### ASCOCARP (FRUITING STRUCTURE) //

- The disc apothecia have crenate margins and are located over the upper surface; they are usually the same color as the upper cortex.
- Spores are simple, ellipsoid, colorless, with 8 to 32 per ascus; soredia and isidia are usually absent.

### MICROCHEMISTRY SPOT TEST //

- The medulla will either have no reaction or will turn red or orange when exposed to paraphenylenediamine (PD) and it will turn red when mixed with calcium hypochlorite (C).

## NOTES

- M. stygia* is similar to *Cetraria hepatizon* and *C. commixta*, which are both dark brown, with channeled lobes and marginal pseudocyphellae.

## LEATHER BROWN (*Melanelia stygia*)

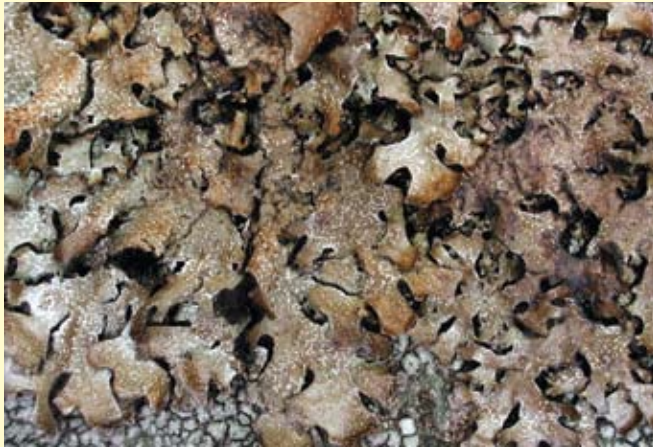
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**Photo Credit:** Lief & Anita Stridvall ([www.stridvall.se/la.index.php](http://www.stridvall.se/la.index.php))

# UNSALTED SHIELD (*Parmelia omphalodes*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G2G4	No status	No status

## DISTRIBUTION

- Parmelia omphalodes* is most commonly found in sub-alpine, alpine, and arctic environments of the Rocky Mountain, Canadian Shield, and northern Boreal Forest Natural Regions of Alberta.

## HABITAT

- Unsalted shield occurs on exposed boulders of open acidic rock slides and rock cliff faces.

## SERIAL STAGE //

- This lichen species is not directly associated with forest structure.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- The lichen body is foliose, displaying a weakly reticulate pattern of ridges on the upper surface of the thallus; simple or branched black rhizines are present on the lower surface and sometimes project beyond the thallus lobe margins.
- The thallus is corticate above and below with loosely attached or appressed, elongate lobes averaging to 1.5 to 10mm wide; the upper surface is somewhat shiny and whitish or pale greyish blue in color, while the medulla is white.

### ASCOCARP (FRUITING STRUCTURE) //

- Soredia and isidia are absent.

### MICROCHEMISTRY SPOT TEST //

- Medulla of this species turns from yellow to red in color when exposed to potassium hydroxide (KOH). The cortex turns orange when exposed to paraphenylenediamine (PD) and yellow with potassium hydroxide (KOH).

## NOTES

- P. omphalodes* is similar to the sorediate species *P. sulcata*.

## UNSALTED SHIELD (*Parmelia omphalodes*)

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- Photo Credit:** Lief & Anita Stridvall ([www.stridvall.se/la.index.php](http://www.stridvall.se/la.index.php))

# APPRESSED VINYL (*Leptogium subtile*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S1 G	No status	No status

## DISTRIBUTION

- Appressed vinyl is found in western North America and western Eurasia.
- In Canada it has been found in British Columbia, Alberta, and Quebec.
- Distribution within Alberta is understudied.

## HABITAT

- Appressed vinyl is found on decaying or burnt wood, plant debris, and mossy rock in humid forests of lower elevations; it is rarely found on standing trees.

## SERIAL STAGE //

- Understudied.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- A small to medium foliose (occasionally fruticose) lichen with a flattened thallus that has elongate, closely appressed lobes averaging less than 1mm wide; isidia and medulla are absent.
- Upper surface is corticate and bluish grey, greyish brown, or dark brown in color and often somewhat angular and shiny; lower surface usually corticate, dark, lacking rhizines, although sometimes it may be white-tomentose.

### ASCOCARP (FRUITING STRUCTURE) //

- Apothecia are reddish-brown to black discs, located over upper surface or at thalline margins; spores are ellipsoid to spindle-shaped or acicular, colourless, with 4 to 8 per ascus.

### MICROCHEMISTRY SPOT TEST //

- No test described.

## NOTES

- *Leptogium subtile* is possibly overlooked and under collected due to its extremely small size.

## APPRESSED VINYL (*Leptogium subtile*)

### SELECTED REFERENCES

Hutchinson, J.L. and B.P. McCune. 2001. Riparian Lichens of Northern Idaho. Idaho Bureau of Land Management, Technical Bulletin No. 01-12. Pp.145.

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**Photo:** Einar Timdal, University of Oslo Lichen Herbarium ([www.nhm.uio.no/lichens](http://www.nhm.uio.no/lichens))



# PUNCHED GRISTLE (*Ramalina dilacerata*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S2 G3G5	No status	No status

## DISTRIBUTION

- Ramalina dilacerata* is most commonly found from low to sub-alpine elevations in moist deciduous and conifer forests of the Parkland, Boreal Forest, and Rocky Mountain Natural Regions of Alberta.

## HABITAT

- Punched gristle is nitrophilous and often found growing on the stumps, trunks, and branches of deciduous and coniferous trees and shrubs.

## SERAL STAGE //

- Understudied.

## DESCRIPTION

### THALLUS (LICHEN BODY) //

- The lichen body is made up of a short (< 2cm), tufted, greenish yellow thallus with hollow, inflated, perforated branches that are flattened at the end and up to 3mm wide.

### ASCOCARP (FRUITING STRUCTURE) //

- Apothecia are often present at the ends of the branches; soredia and isidia are lacking.

### MICROCHEMISTRY SPOT TEST //

- No test described.

## NOTES

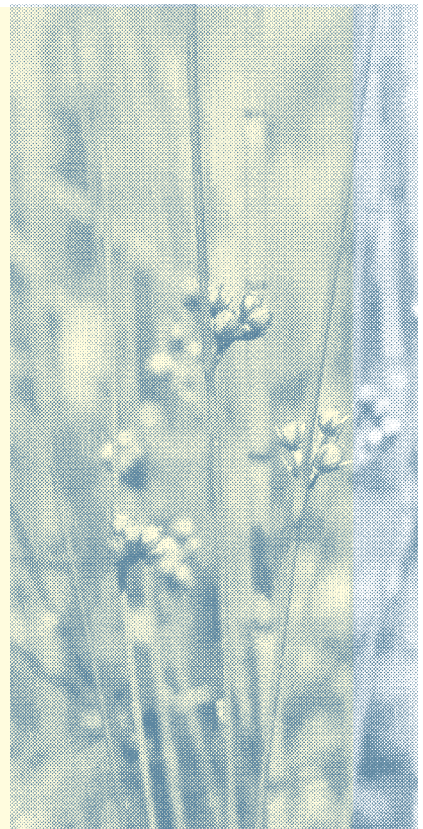
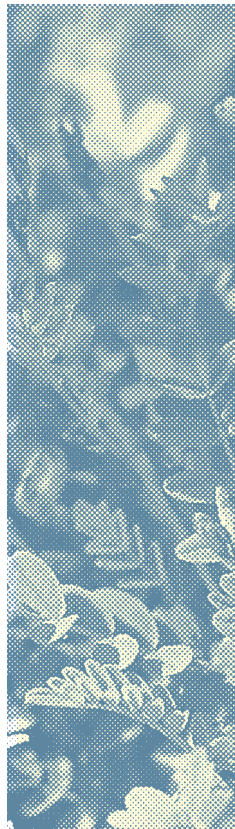
- R. dilacerata* is sometimes used as an indicator of acidic, moderately fertile environments, and sulphur dioxide pollution. It is similar to some species of *Usnea* spp. and *Evernia* spp., except it does not have the central cord of *Usnea* spp. and is not sorediate like *Evernia* spp.

## PUNCHERED GRISTLE (*Ramalina dilacerata*)

### SELECTED REFERENCES

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- Photo:** Einar Timdal, University of Oslo Lichen Herbarium ([www.nhm.uio.no/lichens](http://www.nhm.uio.no/lichens))

# VASCULAR PLANTS





# LANCE-LEAVED GRAPE FERN/MOONWORT

*(Botrychium lanceolatum)*



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S2 G5	No status	No status

## DISTRIBUTION

- Lance-leaved grape fern has a circumpolar distribution.
- It occurs in the Rocky Mountains and Parkland Natural Regions of Alberta; known sites include Elk Island National Park, South Drywood Creek, Forestry Trunk Road, Banff National Park, Jasper National Park, and Cypress Hills Provincial Park.

## HABITAT

- The lance-leaved grape fern is shade tolerant and is typically found on mountain slopes; elsewhere it is found in open woods, peaty slopes, sandy clearings, and moist or wet meadows in the montane and alpine zones.

## SERIAL STAGE //

- Prefers early successional stages and does well in recently (within 50 years) disturbed sites such as: slope failures, avalanches, flood plain, old road beds, and burnt-over areas.

## SOILS //

- Adapted to growing in moist to mesic soils, but has been found to grow in xeric to sub-hydric soils.
- Grows in medium or fine textured soils, specifically sandy, but not clay soils.
- Populations near the Rocky Mountains have been found to grow on coarse textured soils such as regosols and brunisols.
- Prefers slightly acidic soils (pH range 4.4 to 6.0).

## DESCRIPTION

### PLANTS //

- Deciduous, fleshy perennial, approximately 5 to 25cm tall.
- Green or green-yellowish, small, shiny, stalkless triangular sterile blade.
- Sterile blade below a single fertile spike.

### LEAVES //

- Small leaves, less than 6cm long and 10cm wide.
- Once or twice pinnately divided into 5 pairs of ascending segments which do not overlap.

- Fertile leaves are pinnately divided once or three times.
- In the spring and early summer, leaves start to appear and wither by midsummer.

### REPRODUCTIVE STRUCTURES //

- Spore clusters sit on a fertile spike which is heavily branched and sits above the sterile blade.

## NOTES

- *Botrychium* spp. are not true ferns because their spores are attached in clusters to a bare stalk instead of the undersides of leaves as in true ferns.
- Care should be taken when identifying species within this genus as several species are very similar. Technical manuals and keys should be used to identify this genus to species.



## LANCE-LEAVED GRAPE FERN/MOONWORT (*Botrychium lanceolatum*)

### SELECTED REFERENCES

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**Photo Credit:** Joyce Gould, Alberta Natural Heritage Information Centre

# **SLENDER LIP FERN** (*Cheilanthes feei*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Secure	S3 G5	No status	No status

## **DISTRIBUTION**

- In Canada, the slender lip fern is found from British Columbia to Saskatchewan.
- In Alberta, it is found in the Rocky Mountain Natural Region with known locations in Banff National Park.

## **HABITAT**

- The slender lip fern grows on dry, calcareous rocks and other basic rocks in steppe and montane zones.

## **SERIAL STAGE //**

- Understudied.

## **SOILS //**

- Primarily rocky areas.

## **DESCRIPTION**

### **PLANTS //**

- Slender lip fern is an evergreen perennial which grows 8 to 25cm tall.
- Grows in clumps from a short rhizome.
- Fern is short and quite branched.

### **LEAVES //**

- Delicate leaves 0.5 to 3mm long.
- Leaves are divided 2 or 3 times pinnately into rounded segments.
- Leaf blades are covered in dense brown hair on the bottom surface.

- Upper surface of leaves is green and sparsely hairy.
- Leaves are 5 to 20cm long.

### **SPORES //**

- Spore clusters are on lower surface along rolled edges.
- Purplish to brown stalks are soft and hairy.

## **NOTES**

- Resembles the lace fern (*Cheilanthes gracillima*), but the lace fern has wider (1 to 3.5cm) leaves.

## SLENDER LIP FERN (*Cheilanthes feei*)

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**Photo Credit:** © 2002 Gary A. Monroe



# MOUNTAIN BLADDER FERN (*Cystopteris montana*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S2 G5	No status	No status

## DISTRIBUTION

- Circumpolar species found in Canada from British Columbia east to Labrador (except Manitoba), and north to the Yukon and Northwest Territories.
- Rare in Alberta, Saskatchewan, and Ontario; extirpated from Newfoundland.
- In Alberta, this species occurs in the Rocky Mountain and Foothill Natural Regions with known locations around Waterton Lakes National Park.

## HABITAT

- Mountain bladder fern is found along springs and streams in mixed or coniferous stands.
- This species prefers moist to wet calcareous sites such as scree slopes, rocky outcrops, and damp woods in the montane and sub-alpine zones.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Nutrient rich or calcareous soils.

## DESCRIPTION

### PLANTS //

- Delicate, deciduous perennial growing 4 to 35cm tall.
- Grows from a dark, thin, long rhizome.

### LEAVES //

- Annual leaves.
- Single, along rhizomes on long stipes.
- Thin and broadly triangular; 5 to 15cm long and 5 to 15cm wide.
- Three times pinnately divided into irregularly divided segments.

- Appears to have 3 main leaflets with the lower two leaflets asymmetric and smaller than the upper leaflet.
- Stalks, which are longer than the blade, are green or straw-coloured at the top and darker below.
- Stalks, 6 to 20cm long, have glands and scales.

### SPORES //

- Sori attached to veins on the lower side of the leaves.
- Whitish coloured membranes (indusium) partially cover sori until they disintegrate in the summer/fall when the spore clusters mature.

## NOTES

- The mountain bladder fern may be confused with the more widespread common oak fern (*Gymnocarpium dryopteris*); however, the common oak fern lacks the membranes which partially cover the sori, and its 3 equal main leaflets are less finely divided.

## MOUNTAIN BLADDER FERN (*Cystopteris montana*)

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- Kershaw, L., J. Gould, D. Johnson, and J. Lancaster. 2001. Rare Vascular Plants of Alberta. The University of Alberta Press, Edmonton, Alberta. Pp. 484.
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- Photo Credit:** USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. Illustrated flora of the northern states and Canada. Vol. 1: 15.

# SPREADING WOOD FERN (*Dryopteris expansa*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	No status	No status	No status

## DISTRIBUTION

- Spreading wood fern has a circumpolar distribution; in Canada, its range extends from British Columbia east to Newfoundland, and north to the Yukon and Northwest Territories.
- Found in Foothills, Rocky Mountain, and Boreal Forest Natural Regions of Alberta.

## HABITAT

- Spreading wood fern habitats include: moist shady sites in mesic to wet forests, forest margins, and scree slopes in the foothills and sub-alpine.
- A shade tolerant species found in boreal, cool temperate, and cool meso-thermal climates; occurrence is strongly correlated with an increase in precipitation.

## SERIAL STAGE //

- Common and occasionally dominant in early seral coniferous forests yet persists in late successional stands, in both water-receiving and water-shedding sites.

## SOILS //

- Fresh to very moist nitrogen-medium soils.
- Associated with Mor and acidic Moder humus forms.

## DESCRIPTION

### PLANTS //

- Perennial fern, growing singly or in clusters.
- Fronds are erect and spreading, growing to 1m tall.
- Rhizomes ascending to erect and covered in chaffy, brown scales.

### LEAVES //

- Stipes have scales near the base.
- Blades are longer than stipes.
- Fronds are broadly triangular in shape, 2 to 70cm long and 10 to 60cm wide.

- Blades are 3 times pinnate, with 5 to 20 pairs of leaflets.
- Most basal pair of leaflets (pinnae) are triangular and asymmetrical; upper pinnae are symmetrical and lanceolate.
- Ultimate segments (pinnules) are toothed and the two most basal are larger than others.

### SPORES //

- Clustered sporangia occur under leaves covered by rounded indusium.

## NOTES

- This species has also been called *D. asimilis*, *D. austriaca*, and *D. dilatata*.
- Lady fern (*Athyrium filis-femina*) usually found at the same sites.
- In British Columbia, spreading wood fern is associated with deer fern, (*Blechnum spicant*), lanky moss (*Rhytidiadelphus loreus*), and Alaskan blueberry (*Vaccinium alaskaense*).

## SPREADING WOOD FERN (*Dryopteris expansa*)

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- Photo Credit:** USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. Illustrated flora of the northern states and Canada. Vol. 1: 21.

# FRAGRANT CLIFF WOOD FERN (*Dryopteris fragrans*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G5	No status	No status

## DISTRIBUTION

- The fragrant cliff wood fern is a circumpolar species; in Canada, its range extends from British Columbia east to Newfoundland and north to the Yukon and Northwest Territories.
- Disjunct distribution throughout the Rocky Mountain, Foothills, and Canadian Shield Natural Regions of Alberta; known locations occur around Lake Athabasca.

## HABITAT

- Fragrant cliff wood fern occurs at elevations ranging from lowlands to subalpine; it is found in open areas, rock crevices, and on talus slopes. This species is also associated with shaded or exposed cliffs.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Neutral to basic rocky areas with low organic content.
- Dry to moderately well-drained soils including: rock, gravel, till.
- Non-calcareous rocks.

## DESCRIPTION

### PLANTS //

- Dark green, perennial evergreen.
- Grows in persistent clumps.
- Grows from short rhizomes between 12 and 25cm.

### LEAVES //

- Dark green leather-like leaves, rust coloured below; 5 to 35cm long, 3 to 7cm wide.
- Mostly basal; alternate.
- Young leaves coiled in a spiral, and become linear or lanceolate when older.
- Older fronds are grey and noticeably curled.

- Aromatic with a spicy or sickly sweet smell.
- Stipes are short, glandular and covered in reddish or brownish scales (scales and indusia on the rachis can make the leaves appear fuzzy underneath).
- Narrow fronds are pinnate and pinnatifid.

### SPORES //

- Large, white sori are densely clustered around the centre of the pinnae.
- Sori with distinct indusium; 1 to 2mm wide.
- Margin of sori often toothed.

## FRAGRANT CLIFF WOOD FERN (*Dryopteris fragrans*)

### SELECTED REFERENCES

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- Photo Credit:** USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. Illustrated flora of the northern states and Canada. Vol. 1: 19.

# OSTRICH FERN (*Matteuccia struthiopteris*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G5	No status	No status

## DISTRIBUTION

- The ostrich fern has a circumpolar distribution; in Canada, its distribution extends from British Columbia east to Newfoundland, and north in to the Yukon and Northwest Territories.
- In Alberta, this species is found in Boreal Forest Natural Region.

## HABITAT

- The ostrich fern prefers moist to wet sites on stream banks, riverbanks, and floodplains with sandy or silty soils.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Sandy or silty, nutrient rich soils.

## DESCRIPTION

### PLANTS //

- Large (0.5 to 1.5m tall), perennial fern growing in vase shaped clumps.
- Erect and spreading, growing from a black stolon and creeping, branched rhizomes.
- Rhizomes covered in brown scales.
- Old leaf stalks remain on base of plant.

### LEAVES //

- Two types of leaves: fertile and sterile.
- Green sterile leaves are lance-shaped, and taper at both ends.
- Sterile leaves are once-pinnately divided.

- Leaves are divided into 20 to 30, alternate, leaflet pairs.
- Leaflets are dark green to black, with short stalks, and deeply cut into blunt lobes.
- Fertile leaves are stiff, olive-green, and last through the winter turning dark brown.
- Fertile leaves are shorter than sterile leaves, reaching lengths of 20 to 60cm.
- Fertile leaves pinnately divided into pod-like leaflets.

### SPORANGIA //

- Sporangia borne on large, erect, fertile leaves.
- Sporangia are covered by the rolled under margins of the leaflets.
- Hood-like indusium is not apparent.

## NOTES

- In British Columbia, the ostrich fern is an indicator of nutrient rich alluvial forests and bottomlands.

## OSTRICH FERN (*Matteuccia struthiopteris*)

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- Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre, Alberta Natural Heritage Information Centre



# NORTHERN QUILWORT (*Isoetes echinospora*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1 G5?	No status	No status

## DISTRIBUTION

- The northern quilwort has a circumpolar distribution; in Canada, it extends from British Columbia east to Newfoundland, and north in to the Yukon and Northwest Territories.
- In Alberta, this species occurs in the Boreal Forest and Canadian Shield Natural Regions, and more specifically, the Central Mixedwood, Sub-Arctic, Boreal Highlands, Athabasca Plain, and Kazan Upland Natural Subregions.
- Known locations in northern and northeastern Alberta include: Andrew Lake, Colin-Cornwall Wildland Provincial Park, Lake Athabasca, and Maqua Lake Provincial Recreation Area.

## HABITAT

- The northern quilwort grows in oligotrophic permanent lakes and ponds at water depths of up to 1m.

## SERIAL STAGE //

- Understudied but unlikely to be associated with forest age or seral stage.

## SOILS //

- Often grows in sand or gravel.

## DESCRIPTION

### PLANTS //

- Aquatic perennial herb with fibrous roots.
- Grows in tufts from a 2-lobed fleshy bulb-like corm.

### LEAVES //

- Onion-like leaves are green to yellowish green.
- Leaves are basal and are spoon shaped near the base.
- Few leaves or many (10 to more than 30).
- Ligule (thin membrane) up to 2.5mm long on the inside of the leaf just above the sporangia.

- Leaves may be erect or spreading, straight or downward curved.
- Leaves contain 4 longitudinal air-cavities (in a cross-section a circle containing a cross).

### SPORANGIA //

- Sporangia found on the inside at the base of the leaf.
- Oblong to oval shaped, 10mm long, 3mm wide.
- Covered by a velum (thin membrane).
- Female spores (megaspores) are larger than male spores (microspores) and borne in separate sporangia.
- Flowers in late August.

## NOTES

- Quillworts can be confused with spike rushes (*Eleocharis* spp.); however, the spoon-shaped swollen leaf base and a short thick stem (corm) of the quillwort distinguishes it from the spike rushes.

## NORTHERN QUILWORT (*Isoetes echinospora*)

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- Photo Credit:** W. Carl Taylor @ USDA-NRCS PLANTS Database / USDA NRCS. 1992. Western wetland flora: Field office guide to plant species. West Region, Sacramento, CA.

# **SLENDER NAIAD** (*Najas flexilis*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1S2 G5	No status	No status

## **DISTRIBUTION**

- The slender naiad has a circumpolar distribution; in Canada, its range extends from British Columbia east to Newfoundland.
- In Alberta, this species is found in the Parkland and Boreal Forest Natural Regions.

## **HABITAT**

- Turbid, mesotrophic water bodies.
- Ponds, marshes, and streams; also in shallow to deep lakes with fresh or slightly brackish water.

## **SERIAL STAGE //**

- Understudied.

## **SOILS //**

- Sheltered areas where silty, organic, flocculent sediment develops.

## **DESCRIPTION**

### **PLANTS //**

- Delicate submerged aquatic plant reaching lengths of 30 to 150cm long.
- Annual plant which grows in dense tufts from a fibrous root.
- Leaves bunched near the tips of the stems, lacking near the base.
- Stems heavily branched; approximately 1mm thick.

### **LEAVES //**

- Nearly opposite leaves.
- Flaccid, pale green leaves (1 to 3cm long) are broader at base and tapering to a long slender point at tip.
- Leaves minutely toothed with sharp forward pointing teeth, barely discernable with the naked eye.

### **FLOWERS //**

- Monoecious (i.e. separate male and female flowers on same plant).
- Imperfect flowers.
- Male flowers (staminate) have single stamen enveloped in a membranous sheath; anthers 1-chambered.
- Female (pistillate) flowers have single pistil which is not enclosed.
- Flowers solitary, although sometimes male and female paired near the base of plant.
- Blooms July to August.

### **FRUITS //**

- Spindle shaped achene; 2 to 3mm long.
- Pale brown, smooth, shiny seed.

## **NOTES**

- Threats to this species include acidification and eutrophication of water bodies.
- This plant is an annual; however, occasionally the plant base survives the winter and sprouts new shoots the following spring.

## SLENDER NAIAD (*Najas flexilis*)

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- Hitchcock, C.L., and A. Cronquist. 1998. Flora of the Pacific Northwest. University of Washington Press. Seattle, Washington. Pp. 730.
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# FLOATING-LEAF PONDWEED (*Potamogeton natans*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Secure	S3 G5	No status	No status

## DISTRIBUTION

- The floating-leaf pondweed has a circumpolar distribution and its range extends across Canada.
- This species is found throughout Alberta, with the exception of the Grasslands Natural Region.

## HABITAT

- The floating-leaf pondweed occurs in still or slow-moving shallow water.

## SERIAL STAGE //

Understudied.

## SOILS //

Understudied.

## DESCRIPTION

### PLANTS //

- Aquatic perennial herb from strong rhizomes.
- Stems are unbranched and submerged; typically grow 1.5 to 2m long.
- Underground rhizomes are extensive, and often form overwintering tubers.

### LEAVES //

- There are two leaf types exhibited by this species: submerged leaves and floating leaves
- Submerged leaves are firm, dark green, and linear in shape; they grow from the main stem, and are 10 to 20cm long and 0.8 to 2mm wide.
- Appendages at the base of the submerged leaf stalks are fibrous and extend 4 to 9cm.

- Floating leaves are flat, leathery, veined (13 to 37), and egg-shaped, with stalks longer than the leaf blades.
- Floating leaf dimensions range from 3 to 10cm long and 2.5 to 6cm wide.

### FLOWERS //

- Spike-like inflorescences contain numerous greenish flowers in dense whorls of 10 to 12, growing approximately 2 to 5cm long and 1cm thick.
- Flowering spikes are held above water on long stalks.
- Flowering typically occurs in June and July.

### FRUITS //

- Achenes are greenish, shiny, and 3 to 5mm long.

## FLOATING-LEAF PONDWEED (*Potamogeton natans*)

### SELECTED REFERENCES

Kershaw, L., J. Gould, D. Johnson, and J. Lancaster. 2001. Rare Vascular Plants of Alberta. The University of Alberta Press, Edmonton, Alberta. Pp 484.

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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre, Alberta Natural Heritage Information Centre

# WHITE-STEMMED PONDWEED

*(Potamogeton praelongus)*



PROVINCIAL	ANHIC	SARA	COSEWIC
Secure	S3 G5	No status	No status

## DISTRIBUTION

- The white-stemmed pondweed is circumpolar and is distributed throughout Canada.
- In Alberta, this species is found in the Foothills, Boreal Forest, and Parkland Natural Regions.

## HABITAT

- The white-stemmed pondweed inhabits deep, clear water in lakes and ponds.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Submerged aquatic perennial herb from strong rhizomes.
- Stems zigzag or curve alternately in opposite directions, and are mostly unbranched, except near the top where they are freely branched.
- Stems are whitish to olive-green in colour, nearly circular in cross-section, and are about 2 or 3m tall.

### LEAVES //

- Leaves are typically submersed, thin, flat, and tapering to a rounded or hood-shape tip.
- Shiny light green leaves are 10 to 20cm long and 2 to 4cm wide, with 3 to 5 main nerves and several less distinct veins.
- The bases of the leaf stalks, or stipules, are fibrous, whitish, conspicuous, and persistent; stipules are 2 to 8cm long.

### FLOWERS //

- Spike-like inflorescences contain numerous greenish flowers in dense whorls of 6 to 12, and are approximately 3 to 4cm long.
- Flowering spikes are held above water on stout, long stalks.
- Flowering typically occurs in July and August.

### FRUITS //

- Fruits are achenes, dry seed-like structures that are egg-shaped, 4 to 5mm long, and tipped with a thick, short beak.

## WHITE-STEMMED PONDWEED (*Potamogeton praelongus*)

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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre, Alberta Natural Heritage Information Centre



# PALE BULRUSH (*Scirpus pallidus*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1 G5	No status	No status

## DISTRIBUTION

- The distribution of the pale bulrush in Canada extends from British Columbia east to Ontario.
- In Alberta, this species is found in the Boreal Forest Natural Region.

## HABITAT

- Pale bulrush habitat includes marshes and wet meadows.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Perennial tufted herb growing 30 to 100cm tall.
- Loosely clustered stems arising from short, tough, fibrous rhizomes.
- Pale green stems, three-sided (triangular), and blunt-edged.

### LEAVES //

- Several leaves are usually on the lower half of the stem.
- Leaves are flat and grass-like; 5 to 15mm wide.
- Sheaths are green or pale brown when dry; not red-tinged.

### FLOWERS //

- Flowers in June and July.
- Flower clusters are irregular and flat-topped (umbels or occasionally compound cymes), with 4 to 8 dense heads of spikelets on unequal stalks above 3 or 4 short leaf-like bracts; spikelets are greenish brown and 2 to 8mm long.

- Pale brown scales are 2 to 3mm long, with a pale mid-vein extending from the tip as an awn approximately 0.5mm in length.
- Each floret has 3 stigmas.

### FRUITS //

- Fruits are achenes, light brown, dry, seed-like structures growing 1mm in length.
- Achenes are three-sided in cross-section, pointed at the tip, and covered by 6 fine, whitish perianth bristles that extend from the base to the middle, beyond which they are finely downward-barbed.

## NOTES

- Pale bulrush is similar in appearance to a more common species, the small-fruited bulrush (*Scirpus rubrotinctus*). The difference in appearance lies in the colour of the leaf sheaths and the number of stigmas associated with the achenes; the small-fruited bulrush has reddish leaf sheaths and 2 stigmas.

## PALE BULRUSH (*Scirpus pallidus*)

### SELECTED REFERENCES

Kershaw, L., J. Gould, D. Johnson, and J. Lancaster. 2001. Rare vascular plants of Alberta. The University of Alberta Press, Edmonton, Alberta. Pp. 484.

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**Photo Credit:** Robert H. Mohlenbrock @ USDA-NRCS PLANTS Database / USDA NRCS. 1992. Western wetland flora: Field office guide to plant species. West Region, Sacramento, CA

# POLAR GRASS (*Arctagrostis arundinacea*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S1 G5T5	No status	No status

## DISTRIBUTION

- Polar Grass occurs on both sides of the Bering Strait, with scattered occurrences north of 57°; it is considered rare in Alberta, Manitoba, and Ontario.
- Found in the Boreal Forest Natural Region, and specifically, in the Sub-Arctic Natural Subregion of Alberta.

## HABITAT

- Polar grass grows in marshy ground, mesic to wet meadows, damp turfy tundra, gravel bars along rivers, and open forests from montane to sub-alpine zones.

## SERIAL STAGE //

- Polar grass is a co-dominant in grassland tundra communities. It appears to occur in early seral stages following fires. In riparian floodplains, polar grass is abundant in late-seral mixed white and black spruce stands.

## SOILS //

- Polar grass is best suited to cold boggy soils and mesic upland soils.
- Grows on hummocks rather than depressions in marshes.
- On inland embankments, it grows on well-drained, sandy, neutral pH soils.

## DESCRIPTION

### PLANTS //

- Perennial grass grows 21 to 145cm tall from rhizomes.
- Stems are solitary or form tufts.

### LEAVES //

- Alternate, mostly along stem.
- Sheaths are open, blades are flat or in-rolled and rough; 5 to 20cm long, 2 to 15mm wide.
- Ligules (3.5 to 6.5mm long) are prominent, jagged, and often suffused with red or purple at the base.

### FLOWERS //

- Inflorescence is an open pyramidal panicle.
- Panicle 5 to 30cm long, commonly purple but sometimes yellowish or green.
- Glumes unequal, shorter than lemmas, lower ones are 1.7 to 4.7mm long.
- Lemmas (3 to 6mm) awnless, three nerved and densely covered in tiny bristly hairs.
- Paleas nearly equal to the lemmas.
- Rachilla joints to about 1mm long.
- Anthers mostly 1.5 to 3mm long.

## NOTES

- Also been called *Arctagrostis latifolia* var. *arundinacea*.
- Five subspecies have been proposed for this highly variable species; however, morphological and chromosomal evidence do not support these separations.
- During spring runoff this species can tolerate being submerged.

## POLAR GRASS (*Arctagrostis arundinacea*)

### SELECTED REFERENCES

- Cope, A.B. 1992. *Arctagrostis arundinacea*. In: Fire Effects Information System. Available: <http://www.fs.fed.us/database/feis/plants/graminoid/arclat/all.html#INTRODUCTORY>. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Services Laboratory. [Accessed: March 29th 2007].
- Kershaw, L., J. Gould, D. Johnson, and J. Lancaster. 2001. *Rare Vascular Plants of Alberta*. The University of Alberta Press, Edmonton, Alberta. Pp. 484.
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- Mackinnon, A., J. Pojar, and R. Coupe. 1992. *Plants of Northern British Columbia*. Lone Pine Publishing, Edmonton, Alberta. Pp. 345.
- Moss, E.H. 1977. *Flora of Alberta*. University of Toronto Press, Toronto, Ontario. Pp. 546.
- Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre, Alberta Natural Heritage Information Centre

# POVERTY OAT GRASS (*Danthonia spicata*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1S2 G5	No status	No status

## DISTRIBUTION

- The poverty oat grass has a trans-continental distribution; it is common in much of Canada, but rare in Alberta and Northwest Territories.
- There are 9 known locations of this species in central Alberta, including the following Natural Subregions: Central Mixedwood, Dry Mixedwood, Montane, Athabasca Plain, and Central Parkland.

## HABITAT

- This species grows in sandy and rocky sites, shorelines, open-canopy young-forests, dry woods, and non-forested communities such as dry prairies and meadows.
- Characteristic of sites where moisture is lacking, such as well-drained water shedding sites; abundance often decreases with increasing elevation and precipitation.

## SERIAL STAGE //

- Associated with young, open canopy forests originating from fire or harvest.

## SOILS //

- Grows in very dry or moderately-dry nitrogen poor soils.
- Found in Mor humus forms.

## DESCRIPTION

### PLANTS //

- Perennial grass growing in tufts from fibrous roots.
- Grows from 10 to 70cm tall.
- Stems are slender.

### LEAVES //

- Threadlike, basal leaves grow between 0.8 to 3mm wide and 6 to 15cm long.
- Blades are smooth to soft-hairy and are straight when young but curled with age.
- Ligules reduced, less than 1mm long and are fringed with short hairs.
- Sheaths are soft hairy to smooth with a tuft of hairs at the throat.

### FLOWERS //

- Flowers grow in a narrow panicle from 2 to 5cm long.
- Branches are short and erect and have 1 or 2 spikelets each.
- Lemmas (3 to 4mm long) are soft-hairy across the back but sometimes smooth.
- Lemma with a twisted awn (bristle) at the tip between two apical teeth; 5 to 8mm long.
- Glumes are longer than the lower lemmas; 9 to 12mm long.
- Flowers in July.

### FRUITS //

- Fruit is a grain in late July to September.

## NOTES

- In British Columbia, poverty oat grass is an indicator in coastal ecosystems.
- Poverty oat grass resembles another rare species in Alberta: the one-spike oat grass (*Danthonia unispicata*). However, the one-spike oat grass only has one spikelet in its panicle and hairless lemmas. It also has a more southerly distribution in Alberta, growing on rocky open ground in the Grassland Natural Region.

## POVERTY OAT GRASS (*Danthonia spicata*)

### SELECTED REFERENCES

- Covington, D. 2000. *Danthonia spicata*. In: Fire Effects Information System, [<http://www.fs.fed.us/database/feis/plants/graminoid/danspi/all.html>]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Services Laboratory. [Accessed: April 17th 2007].
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**Photo Credit:** © 2006 Louis-M. Landry

# CANADIAN RICE GRASS (*Oryzopsis canadensis*)



PROVINCIAL	ANHIC	SARA	COSEWIC
No status	S1 G5	No status	No status

## DISTRIBUTION

Primarily found in the eastern boreal forest, from Newfoundland to Alberta.

In Alberta, found in the Parkland and Boreal Forest Natural Regions.

## HABITAT

- Canadian rice grass prefers sandy, dry, or rocky woods and hillsides; it often occurs on dry open sites in association with jack pine and white spruce.

## SERIAL STAGE //

- This species does well on disturbed sites such as road margins and logged areas, as well as along wetland ecotones that remain open as a result of fluctuating water levels.

## SOILS //

- Dry, sandy, or rocky soils.

## DESCRIPTION

### PLANTS //

- Loosely tufted, stiffly erect grass; 30 to 70cm tall.

### LEAVES //

- Leaves are rough to the touch.
- Leaf blades are flat to slightly in-rolled.
- Ligules approximately 2mm long.

### FLOWERS //

- Flowers in an open panicle; 5 to 10cm long.
- Branches in panicle zig-zag; ascending and spreading.
- Thin glumes (4 to 5mm) slightly longer than the dark hairy lemmas.
- Lemma has a twisted awn, 6 to 12mm long, which is bent weakly like a knee.

## NOTES

- Little rice grass (*Oryzopsis exigua*) resembles Canadian rice grass but has smaller leaves, denser flower clusters, and lighter coloured lemmas with a shorter awn (4 to 6mm).
- Also similar is the northern rice grass (*Oryzopsis pungens*), but northern rice grass is taller (up to 50cm), and has tiny inconspicuous bristles from the blunt tips of the lemmas.

## CANADIAN RICE GRASS (*Oryzopsis canadensis*)

### SELECTED REFERENCES

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Canada Rice-Grass. Minnesota Department of Natural Resources. [Accessed April 25 2007].

Kershaw, L., J. Gould, D. Johnson, and J. Lancaster. 2001. Rare Vascular Plants of Alberta.  
The University of Alberta Press, Edmonton, Alberta. Pp. 484.

Moss, E.H. 1977. Flora of Alberta. University of Toronto Press, Toronto, Ontario. Pp. 546.

**Photo Credit:** USDA-NRCS PLANTS Database / Hitchcock, A.S. (rev. A. Chase). 1950. Manual  
of the grasses of the United States. USDA Misc. Publ. No. 200. Washington, DC.



# LITTLE-SEED RICE GRASS (*Oryzopsis micrantha*)

PROVINCIAL	ANHIC	SARA	COSEWIC
No Status	S2 G5	No status	No status

No image available

## DISTRIBUTION

- In Canada, found from British Columbia to Manitoba.
- In Alberta, found in the Grassland and Parkland Natural Regions.

## HABITAT

- Found on dry open slopes and open woods, usually on rocky ground.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Densely tufted, erect perennial growing to between 30 and 80cm tall.
- Grows from fibrous roots.
- Stems are smooth, hollow and numerous.

### LEAVES //

- Alternate leaves.
- Leaf blades are thread-like and flat or with margins slightly in-rolled; 1 to 2mm wide.
- Ligules fringed with hairs; 0.5 to 1mm long.
- Ligules are squared or have sides which are longer than the middle.
- Sheaths are usually open and smooth, but may sometimes have fine hairs.

### FLOWERS //

- Flowers erect or nodding in a somewhat open panicle; 5 to 15cm long.

- Branches are spreading.
- Spikelets are single flowered and attached near the branch tips.
- Glumes are papery, have five nerves, and are glabrous or slightly rough.
- Glumes similar to lemmas or sometimes slightly longer; 2 to 3mm long.
- Lemmas smooth (rare with short hairs); 1.8 to 2.8mm long.
- Lemma is tipped with a straight or twisted awn; 4 to 11mm long.
- Anthers barely 1.5mm long.
- Blooms in June and July.

### FRUITS //

- Grains.
- Florets break away above the glumes and between the florets when they mature.

## NOTES

- Little-seed rice grass resembles other rice grass species but is differentiated by its hairless lemmas. Also known as *Piptatherum micranthum*.

## LITTLE-SEED RICE GRASS (*Oryzopsis micrantha*)

### SELECTED REFERENCES

- Kershaw, L., J. Gould, D. Johnson, and J. Lancaster. 2001. Rare Vascular Plants of Alberta. The University of Alberta Press, Edmonton, Alberta. Pp. 484.
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# **SLENDER SALT-MEADOW GRASS** (*Puccinellia distans*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1 G5T3T4 (subspecies: <i>Puccinellia distans hauptiana</i> )	No status	No status

## **DISTRIBUTION**

- The slender salt-meadow grass has a global distribution.
- In Alberta, it occurs in the Canadian Shield Natural Region; specifically Wood Buffalo National Park.

## **HABITAT**

- The slender salt-meadow grass inhabits saline or alkaline flats, lakeshores, and disturbed sites.

## **SERIAL STAGE //**

- Understudied.

## **SOILS //**

- Understudied.

## **DESCRIPTION**

### **PLANTS //**

- Perennial, tufted grass growing 10 to 40cm tall.

### **LEAVES //**

- Leaf sheaths are open.
- Grass blades are flat to slightly in-rolled and range from 1.5 to 3.5mm in width.
- Ligules are rounded, smooth-margined, and about 1mm long.

### **FLOWERS //**

- Flower clusters are open and branched (5 to 15cm long), with the lower branches longest and flowering first.
- Branches are rough and lower branches are usually descending.
- Spikelets usually contain 5 or 6 flowers, and glumes are egg-shaped and fringed with fine hairs.
- Lemmas are broadly egg-shaped with smooth margins below and sharply toothed margins near the tips; they are 1.6 to 1.8mm long, broadly rounded to blunt, but jagged at the tips.
- The size of the palea are equal to, or slightly larger than, the lemmas.

## **NOTES**

- There is some dispute as to whether this species is native to North American or if it was introduced; some sources claim it is now naturalized and may intergrade with *Puccinellia nuttalliana*.
- In Alberta, slender salt-meadow grass habitat may be at risk due to desiccation as a result of climate change.

## SLENDER SALT-MEADOW GRASS (*Puccinellia distans*)

### SELECTED REFERENCES

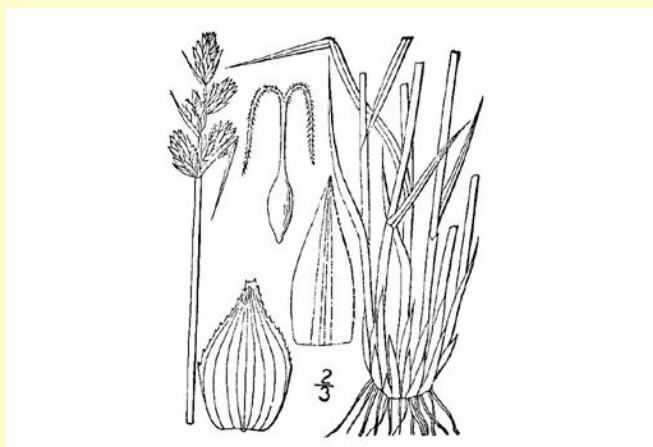
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**Photo Credit:** Robert H. Mohlenbrock @ USDA-NRCS PLANTS Database / USDA NRCS. 1992. Western wetland flora: Field office guide to plant species. West Region, Sacramento, CA.

# BROWNEDED SEDGE (*Carex adusta*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1 G5	No status	No status

## DISTRIBUTION

- Occurs in the Foothills and Boreal Forest Natural Regions of Alberta.

## HABITAT

- Browned sedge occurs in open boreal forests, generally under pine trees; also found in sandy, dry disturbed sites.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Dry acidic sandy soils.

## DESCRIPTION

### PLANTS //

- Perennial herb between 30 and 100cm tall.
- Grows in tufts from fibrous roots.
- Stems are stiffly erect and smooth but rough near top.

### LEAVES //

- Leaves are firm and shorter than stems.
- Four to seven leaves per stem.
- Flat blades are 2 to 5mm wide.

### FLOWERS //

- Flowers are stiff, erect, and form egg to cylindrical-shaped heads.
- Each head contains 4 to 5 olive-coloured spikes.
- Male and female flowers together on same head (gynaecandrous); 1 to 4cm long.

- Male flowers are on the bottom and female flowers are at the top.
- Bracts of the lowest spikes longer than the inflorescence; broadest at the base.
- Scales covering the perigynia are egg-shaped, and reddish-brown with translucent margins.
- Flowers bloom in July.

### FRUITS //

- Achenes (2 to 3mm wide) nested within light green to brownish, shiny egg-shaped perigynia (4 to 5mm long).
- Perigynia is winged, almost to the base, and is toothed above the middle.
- Light nerves below the middle on the back of the perigynia.
- Fruits appear in July to early August.

## NOTES

- Browned sedge has also been called *Carex pinguis*.
- A similar species, white-scaled sedge (*Carex xerantica*), is found in grasslands and plains. The white-scaled sedge has narrower, more egg-shaped spikes that are slightly tapered at the base and lie above an inconspicuous bract. In addition, the white-scaled sedge perigynia is not shiny and is lighter in colour as compared to the browned sedge.

## BROWNE SEDGE (*Carex adusta*)

### SELECTED REFERENCES

- Johnson, D., L. Kershaw, A. MacKinnon, and J. Pojar. 1995. Plants of the Western Boreal Forest and Aspen Parkland. Lone Pine Publishing, Edmonton, Alberta. Pp. 392.
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- Photo Credit:** USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. Illustrated flora of the northern states and Canada. Vol. 1: 386.

# NARROW SEDGE (*Carex arcta*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1 G5	No status	No status

## DISTRIBUTION

- In Canada, the narrow sedge is found from British Columbia, east to Labrador and New Brunswick, and north into the Yukon and Northwest Territories.
- Occurs in northern Alberta in the Rocky Mountain and Foothill Natural Regions.

## HABITAT

- Found in moist woods in Alberta; elsewhere it grows in moist to wet meadows, wet clearings, fens, marshes, streambanks, and ditches.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Perennial, slightly tufted herb from rhizomes.
- Stems (25 to 60cm) as long as leaves.

### LEAVES //

- Leaves (1.5 to 4mm wide) occur near the base of the stem and are numerous and flat.
- Sheaths are tight.

### FLOWERS //

- Five to fifteen spikes (5 to 8mm long) are found in a compact cylindrical or narrowly egg-shaped head.
- Heads are gynaeandrous with inconspicuous male flowers near the bottom and female flowers near the tips.

- Bracts at the base of the head are awn-like.
- Flowers bloom in July.

### FRUITS //

- The egg shaped perigynia is green, dark green or brownish, and has very small white dots.
- Perigynia is 2.2 to 3.5mm long and 0.8 to 1mm wide with a 1mm long minutely sharp-toothed beak.
- The unstalked perigynia is widest at the base and smooth with obscure ribs near the top.

## NOTES

- Narrow sedge is similar to Lachenal's sedge (*Carex lachenalii*) and they were once considered the same species. However, the two species may be differentiated because the narrow sedge has more compact, larger flower heads, and its perigynia is widest at the base versus the middle with a more prominent, sharply-toothed beak.

## NARROW SEDGE (*Carex arcta*)

### SELECTED REFERENCES

- Kershaw, L., J. Gould, D. Johnson, and J. Lancaster. 2001. Rare Vascular Plants of Alberta. The University of Alberta Press, Edmonton, Alberta. Pp. 484.
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**Photo Credit:** Steve Matson



# BROWNISH SEDGE (*Carex brunnescens*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Secure	S4 G5	No status	Assessment Priority 2

## DISTRIBUTION

- Brownish Sedge has a circumpolar distribution; its distribution within Alberta is not well known.

## HABITAT

- Brownish sedge is found in wet sites within forests, bogs, and fens.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Perennial, slightly tufted herb.
- Grows from short rhizomes; 15 to 70cm tall.
- Stems longer than leaves.

### LEAVES //

- Numerous flat leaves (1 to 2.5mm wide) occur near the bottom of stems.
- Sheaths are tight.
- Basal leaves are often smaller.

### FLOWERS //

- Inflorescence made up of 4 to 9 spikes in an interrupted head, with the uppermost spikes forming an egg-shaped, ascending, gynaeandrous cluster.

- Female flowers are located near the tips; inconspicuous male flowers occur near the bottom of the spike.
- Lowermost bract is reduced, 0.5cm long and rarely awn-like.

### FRUITS //

- Fruit is a dark green or brownish egg-shaped perigynia, 2 to 3.5mm long and 0.5 to 0.8mm wide.
- Perigynia is smooth with minute white dots and fine nerves on both sides.
- The unstalked perigynia has a 0.5mm long beak, and a smooth cleft on the upper surface.

## NOTES

- Brownish sedge is similar to grey sedge (*Carex canscens*), but has a more strongly beaked perigynia and fewer, smaller spikes.

## BROWNISH SEDGE (*Carex brunnescens*)

### SELECTED REFERENCES

- Gignac, L.D., R. Gauthier, L. Rochefort, and J. Bubier. 2004. Distribution and Habitat Niches of 37 Peatland Cyperaceae Species Across a Broad Geographic Range in Canada. *Canadian Journal of Botany* 82: 1292-1313.
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- Photo Credit:** USDA-NRCS PLANTS Database / Hurd, E.G., N.L. Shaw, J. Mastrogiuseppe, L.C. Smithman, & S. Goodrich. 1998. *Field guide to Intermountain sedges*. Gen. Tech. Rep. RMS-GTR-10. USDA FS RMRS, Ogden, UT.

# CAPITATE SEDGE (*Carex capitata*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2 G5	No status	No status

## DISTRIBUTION

- Capitate sedge has a circumpolar distribution and is found in the Boreal Forest, Foothills, Rocky Mountain, and Canadian Shield Natural Regions.

## HABITAT

- Found in wet areas, especially calcareous fens, just slightly above the water table. Also found in bogs, stream bank seepage sites, forests with organic or sandy ground, and moist to dry rocky slopes above the tree-line; generally found in small rock crevices.
- This species dominates some sites and may be a climax species in some areas.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Capitate sedge grows on acidic rocky, gravelly, sandy, or peaty soils.
- This sedge can dominate areas with coarse textured, acidic (pH 4.0 to 5.4) soil, where loamy sand predominates; however, they can also be very successful in areas where the pH is greater than 6.0.

## DESCRIPTION

### PLANTS //

- Perennial tufted herb growing from short, ascending rhizomes.
- Stems grow between 10 and 30cm and are either much longer, or equal to, the length of the leaves.

### LEAVES //

- Two to four threadlike leaves found basally on each stem, with slightly rough edges.
- Sheaths are chestnut brown to purplish-brown in colour, are blunt at the tip, and have short ligules.

### FLOWERS //

- Both male and female flowers are found on the same spike; male flowers occur near the tips while 6 to 25 female flowers grow at the bottom of the spike.

- Solitary spikes (5 to 10mm long), lack bracts, and are egg-shaped to round; flowers have two stigmas.
- Blooms June to August.

### FRUITS //

- Lens shaped achenes; 1.5mm long and 1mm wide.
- Perigynia is pale green or yellowish brown, globular to egg-shaped, stalkless and nerveless.
- Perigynia is sharply margined and tapers to a slender 0.3 to 0.7mm long beak.

## NOTES

- This distinctive sedge does not closely resemble other *Carex* species.
- Capitate sedge is valued for erosion control, as well as for stabilizing and restoring disturbed sites.

## CAPITATE SEDGE (*Carex capitata*)

### SELECTED REFERENCES

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**Photo Credit:** Steve Matson

# BEAKED SEDGE (*Carex rostrata*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G5	No status	No status

## DISTRIBUTION

- Beaked sedge has a circumpolar distribution; in Alberta, it occurs throughout the Boreal Forest, Foothills, and Canadian Shield Natural Regions.

## HABITAT

- Beaked sedge occurs in floating fens, willow thickets, peat bogs, and on the edges of lakes and ponds with sandy bottoms in montane and sub-alpine zones.
- Beaked sedge is generally the dominant species in floating mats and is often associated with *Carex lasiocarpa*.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Beaked sedge grows on a variety of mineral and organic soils but many soils have large amounts of peat; pH tolerance is between 3.0 and 7.9.

## DESCRIPTION

### PLANTS //

- Clumped perennial herb growing from creeping rhizomes with a light brown, thick, spongy base.
- Stems are tall (50 to 100cm), smooth but slightly rough at the top.

### LEAVES //

- Leaves have parallel veins with thick cross walls that appear as silica papillae (warts) under the microscope.
- Four to eight leaves per stem, growing from the lower half; 1.5 to 4mm wide.
- Whitish or bluish in colour; waxy powder on the upper surface.
- Sheaths are tight and ligules are as long as they are wide.

### FLOWERS //

- Flower clusters are elongated and cylindrical with 4 to 8 spikes.

- The upper 2 to 4 stalked spikes are male only; the lower 2 to 4 stalkless or short stalked spikes are female only.
- The bracts beneath the lowermost spikes are leaf-like and sheathless; lowermost bract longer than the inflorescence.
- Flowers bloom in August.

### FRUITS //

- Three-sided, yellowish-green to straw coloured achene enclosed in perigynia.
- Egg shaped perigynia (4 to 8mm long) is shiny, smooth, strongly nerved with 3 stigmas.
- The perigynia narrowly contracts to a 1.5 to 2mm long beak with two sharp points.
- Scales are reddish-brown, narrow, and as long as perigynia.

## NOTES

- Bottle sedge (*Carex utriculata*) is similar in appearance to the beaked sedge but is very common throughout Alberta. The bottled sedge is distinguished by its wider (4 to 10mm) leaves which lack the waxy powder found on beaked sedge; in addition, the cross walls on the leaves of the bottle sedge do not appear wart-like.

## BEAKED SEDGE (*Carex rostrata*)

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- Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre, Alberta Natural Heritage Information Centre

# FOX SEDGE (*Carex vulpinoidea*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S2 G5	No status	No status

## DISTRIBUTION

- In Canada, the fox sedge ranges from British Columbia to Newfoundland; however, it is rare in western Canada and Newfoundland.
- In Alberta, known locations include: the Boreal Forest, Parkland, and Foothills Natural Regions.

## HABITAT

- Fox sedge grows in wet meadows, marshes, swamps, and stream banks in lowland steppe and montane zones, requiring full sun to partial shade.

## SERIAL STAGE //

- Fox sedge is a pioneer species which colonizes wet, open, disturbed areas.

## SOILS //

- This sedge is abundant in clay soils, but grows well in sand and loam.
- Requires permanently wet, non-saline, non-acidic soils that have some drainage.

## DESCRIPTION

### PLANTS //

- Perennial, densely clumped herb, from short rhizomes.
- Stems grow about 20 to 100cm tall, are shorter than leaves, and are rough on the angles near the top.

### LEAVES //

- Four to five flat leaves, 2 to 5mm wide, borne on the lower half of each stem.
- Longer than stems, but lowest leaves usually smallest.
- Sheaths are dotted red and cross wrinkled.

### FLOWERS //

- Numerous, stalkless, compound spikes form green to yellowish or dull brown, cylindrical heads (3 to 12cm long and 5 to 20mm wide).
- Spikes are androgynous with inconspicuous male flowers at tips, female flowers below.

- Scales are yellowish brown with a green vein in the middle.
- Bracts are hair-like with the lower-most bract bristle-shaped and up to 5cm long.
- Blooms between May and July.

### FRUITS //

- Achenes enclosed within the perigynia.
- Egg-shaped, smooth perigynia is straw to greenish colour, 2 to 2.5mm long, and 1 to 1.8mm wide.
- Perigynia is rounded on one side and flat on the other with tiny sharp teeth on the edges.
- Perigynia has thick edges that taper into a flattened beak that is one half to three quarters as long as the body, with two teeth at the tip.

## NOTES

- Fox sedge has also been called *Carex multiflora* and *Carex setacea*.
- Awl-fruited sedge (*Carex stipata*) resembles fox sedge, but its beak is longer than the perigynia body.

## FOX SEDGE (*Carex vulpinoidea*)

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**Photo Credit:** Steve Matson



# THREAD RUSH (*Juncus filiformis*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G5	No status	No status

## DISTRIBUTION

- The thread rush has a circumpolar distribution; in Canada, its range extends from British Columbia east to Newfoundland and north to the Yukon and Northwest Territories.
- In Alberta, the thread rush occurs in the Canadian Shield, Boreal Forest, and Foothills Natural Regions.

## HABITAT

- The thread rush occurs in a variety of wet habitats including: fens, marshes, bogs, moist meadows, and sandy lakeshores and stream banks.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Perennial herb growing 10 to 50cm tall.
- Round, slender stems (1mm wide), arising from a slender rhizome.
- Stems not clustered, but grow singly in rows from rhizome.
- Stems are finely grooved.

### LEAVES //

- Basal leaves are reduced to small sheaths.
- Sheaths are a dull light brown colour.

### FLOWERS //

- Flower clusters (5 to 10 flowers) appear to grow from side of stem; 2 to 4cm long.
- Cylindrical bract underneath the flower cluster appears to be part of stem; bract (7 to 20cm long) is as long as, or longer than the stem.

- Perianth segments lance-shaped, green, with thin and translucent margins; 2.5 to 3.5mm long.
- Six stamens and anthers; shorter than the filaments.
- Flowers in June and July.

### FRUITS //

- Fruit is a capsule, slightly egg-shaped, with the broadest part near the apex.
- Capsule is tipped with a short, sharp point.
- Capsule is slightly shorter than the perianth segments.
- Seeds are egg-shaped.

## NOTES

- The *Juncus filiformis*/*Sphagnum* spp. community occurs in depression sites where water is near the surface. This community also occurs in small patches in black spruce peatlands. The thread rush dominates this community but associated graminoids include: *Carex aquatilis* and *Carex deweyana*; bryophytes are dominated by *Sphagnum* spp. but occasionally yellow star moss (*Campylium stellatum*) is present. There is generally low shrub cover in this community, but if present, shrub cover usually includes: Labrador tea (*Ledum groenlandicum*) and common blueberry (*Vaccinium myrtilloides*).

## THREAD RUSH (*Juncus filiformis*)

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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre

# REDDISH WOOD-RUSH (*Luzula rufescens*)

PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S1 G5	No status	No status

No image available

## DISTRIBUTION

- The reddish wood-rush has an amphiberigian distribution; in Canada, its range includes British Columbia, Alberta, and the Yukon.
- In Alberta, the reddish wood-rush is found in the Boreal and Foothills Natural Regions.

## HABITAT

- Grows in open forests and forest edges, moist sand and gravel bars, riverbanks, grassy slopes, and wetland edges such as bogs and marshes.

## SERAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Perennial herb growing from elongated rhizomes.
- Grows between 10 to 35cm tall in loose tufts.

### LEAVES //

- Sharp-tipped leaves are flat and mostly at the base of the plant (basal).
- Leaves are trimmed with fine hairs on the edges.

### FLOWERS //

- Flowers single on long spreading branches forming a loose umbel inflorescence.

- Perianth is brown and the margins are translucent; 2 to 3mm long.
- Perianth is lance-shaped and pointed.
- Flowers have 6 stamens; anthers are 0.4 to 0.6mm long and are shorter than the filaments (stalk of stamen which bears the anther).

### FRUITS //

- Egg-shaped capsules contain spindle-shaped seeds.
- Perianth is shorter than the capsules.
- Seeds have a short, thin, yellow tail.

## NOTES

- Similar to sharp-pointed wood-rush (*Luzula acuminata*) but the sharp-pointed wood-rush has basal leaves that are narrower, and its seeds and flowers are smaller and borne on shorter stalks.

## REDDISH WOOD-RUSH (*Luzula rufescens*)

### SELECTED REFERENCES

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# SPOTTED CORALROOT (*Corallorhiza maculata*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3	No status	No status

## DISTRIBUTION

- A widely distributed but uncommon species, the distribution of the spotted coralroot extends from British Columbia east to Newfoundland, with the northern extent of its range reaching latitudes of 55°, and rarely above.
- The spotted coralroot is typically found in southern Alberta, but it does occur sporadically in the Boreal Forest Natural Region, and in particular the aspen stands of Lakeland country.

## HABITAT

- The spotted coralroot is a shade-tolerant species which grows in moist to dry forests from the plains to montane zones, preferring boreal, temperate, and cool mesothermal climates.

## SERIAL STAGE //

- Mature/old growth coniferous and deciduous forests.

## SOILS //

- This species grows on moist to moderately dry soils.
- Spotted coralroot is associated with Mor humus forms.

## DESCRIPTION

### PLANTS //

- Red to yellow-brown perennial, often growing in clumps.
- Saprophytic herb with coral-like rhizomes.
- Smooth stems, growing 20 to 55cm tall.

### LEAVES //

- Leaves reduced to thin bract-like, semi-transparent sheaths.

### FLOWERS //

- Irregular flowers.
- Reddish-purple and pink with wine-red spots on lip.

- Lowest petal forms a white 3-lobed lip spotted with purple; 5 to 8mm long and 5mm wide.
- Narrow sepals are about 8mm long, while petals are broader and slightly shorter.
- Column is curved, yellow, and spotted purple.
- 10 to 30 flowers per stem in an elongated raceme.
- Blooms May to August.

### FRUITS //

- Nodding, oval capsules; 1.5 to 2cm long, with many seeds.

## NOTES

- The spotted coralroot lacks chlorophyll, and so it derives its nutrients from decaying organic matter; it forms a symbiotic relationship with soil fungi in order to derive these nutrients.
- The pale coralroot (*Corallorhiza trifida*) is a smaller species with pale yellowish or greenish flowers (non-spotted) in groups of 3 to 12.
- The striped coralroot (*Corallorhiza striata*) is a species with large (2cm wide) pink or yellowish-pink flowers, with broad petals, and three distinct red or purple stripes; its lower lip lacks basal lobes.

## SPOTTED CORALROOT (*Corallorhiza maculata*)

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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre

# WHITE ADDER'S MOUTH (*Malaxis monophylla*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2 G5	No status	No status

## DISTRIBUTION

- In Canada, the white adder's mouth is found from British Columbia east to Newfoundland.
- In Alberta, this species occurs in the Parkland, Boreal Forest, and Foothills Natural Regions, with sporadic occurrences in central Alberta.

## HABITAT

- A shade-tolerant herb, the white adder's mouth is found in damp woods, wet meadows, thickets, mudflats, banks, drier bogs, and fens.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Neutral or slightly acidic soils.

## DESCRIPTION

### PLANTS //

- Perennial herb, growing 10 to 25cm tall.
- Grows from a corm (8mm wide) with fibrous roots.
- Pale green coloured; smooth and glossy.

### LEAVES //

- Single, light green basal leaf is egg-shaped to elliptical, 2 to 10cm long and 2 to 5cm wide; the back of the leaf forms a keel.
- The stalk is sheathed and grows 2 to 3cm long.

### FLOWERS //

- Small, greenish-white flowers form a slender racemose inflorescence.
- Flower stalks approximately 2.5mm long; lanceolate bracts approximately 1.5mm long.

- Sepals are narrowly egg-shaped; lateral sepals (1 to 2mm long) are lanceolate.
- Sepals are slightly curved behind the lip; margins are rolled under.
- Petals (1 to 2mm long) are linear and bend backwards against the capsule.
- Petals are shorter and narrower than the sepals.
- Broadly triangular lip droops downward, with a beaked tip and heart-shaped base 2mm long and wide.
- Column less than 1mm wide; no spur.
- Blooms June to August.

### FRUITS //

- Ellipsoid capsule are erect; 5mm long.

## NOTES

- Also known as *Malaxis brachypoda* and *Malaxis monophylla* var. *brachypoda*.

## WHITE ADDER'S MOUTH (*Malaxis monophylla*)

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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre



# POWELL'S SALTBRUSH (*Atriplex powellii*)

PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S1 G4	No status	No status

No image available

## DISTRIBUTION

- In North America, Powell's saltbrush occurs in Alberta and Saskatchewan, south to Arizona and New Mexico, with a disjunct population in Oregon.
- This species is rare in Alberta and is typically found in the Grassland Natural Region, specifically the Northern Fescue, Mixedgrass, and Dry Mixedgrass Natural Sub-regions.
- Known locations for this species include Dinosaur Provincial Park.

## HABITAT

- Powell's saltbrush is drought tolerant and occurs on saline or alkaline soils in areas with full sun and little to moderate amounts of moisture.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Prefers saline soils.
- Fine textured clay or silty substrates.
- pH ranging from acidic to alkaline.

## DESCRIPTION

### PLANTS //

- Herbaceous annual that grows between 10 and 50cm tall.
- Stems either stout or slender but branching throughout.
- Dioecious or sometimes monoecious.

### LEAVES //

- Leaves alternate and grayish mealy on lower surface.
- Prominently three-veined.

### FLOWERS //

- Flowers of both sexes intermixed in clustered heads or borne on separate plants.
- Staminate flowers are 5-merous.
- Flowers May to June.

### FRUITS //

- Seeds greenish, yellowish or brown.

## NOTES

- Similar to four-wing saltbrush (*Atriplex argentea*) except the more common four-wing saltbrush has larger toothed leaves and its flower and fruit bracts are also toothed.

## POWELL'S SALTBRUSH (*Atriplex powellii*)

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# WAVY-LEAVED CHICKWEED (*Stellaria crispa*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S2 G5	No status	No status

## DISTRIBUTION

- Wavy-leaved chickweed has a circumpolar distribution extending from Alaska and the Yukon, east to Alberta, and south through Wyoming and Nevada to California, including British Columbia and the western coastal states.
- In Alberta, wavy-leaved chickweed is found in the Rocky Mountain, Foothills, and Boreal Forest Natural Regions.

## HABITAT

- The wavy-leaved chickweed occurs in moist seepage sites, meadows, streambanks, fields, and forests ranging in elevation from 0 to 2300m.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Very moist to wet, nitrogen-rich soils (BC).

## DESCRIPTION

### PLANTS //

- Perennial herb from a slender rhizome forming small to large mats; stems weak and reclining with tips ascending, numerous, glabrous, matted, 5 to 60cm tall / long.

### LEAVES //

- Opposite; lanceolate to egg-shaped .
- Unstalked or barely stalked; 5 to 30mm long, 2 to 15mm wide.
- Margins irregularly curly.

### FLOWERS //

- Flowers bloom in June and July.
- Solitary in leaf axils, petals minute or absent.
- Sepals usually 5, prominently 3-veined, lanceolate, pointed with dry translucent edges; 3 to 4mm long.
- Stamens 10 or fewer; styles 3, spreading to ascending, curved but not curled.

### FRUITS //

- Capsules 6-valved, egg-shaped, and straw-coloured or brownish; 3.5 to 6mm long.
- Seeds brown and minutely wrinkled-warty; 0.7 to 1.1mm long.

## NOTES

- Meadow chickweed (*Stellaria obtuse*) is similar to wavy-leaved chickweed, but is distinguished by its shorter blunt-tipped sepals (2 to 3mm long) and shorter fringed leaves (4 to 8mm long).

## WAVY-LEAVED CHICKWEED (*Stellaria crispa*)

### SELECTED REFERENCES

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Moss, E.H. 1977. Flora of Alberta. University of Toronto Press, Toronto, ON. Pp. 546.

**Photo Credit:** © 2006 Doreen L. Smith

# BODIN'S MILK VETCH (*Astragalus bodinii*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1 G4	No status	No status

## DISTRIBUTION

- Found in the Foothills and Boreal Forest Natural Regions of Alberta.

## HABITAT

- Moist meadows and gravel banks; also found in thickets, and on disturbed ground such as along roads.

## SERIAL STAGE //

Understudied.

## SOILS //

Understudied.

## DESCRIPTION

### PLANTS //

- Perennial herb; mat-forming from a central taproot.
- Numerous slender stems growing 10 to 30cm long.

### LEAVES //

- Alternate leaves divided pinnately into 7 to 15 leaflets.
- Leaflets are 4 to 12mm long and are lance-shaped to oblong.
- Leaflets are hairless above, and have stiff, flat-lying hairs underneath.

### FLOWERS //

- Pea-like, pink to bluish purple flowers blooming in July.
- Few occur on slender stalks, up to 25cm long in loose racemes.

- Corolla is 7 to 10mm long.
- Calyxes are black-hairy, tube is 2 to 2.4mm long with 5 awl-shaped lobes at the tip.

### FRUITS //

- Black-hairy erect pods; 5 to 7mm long.
- Obliquely egg-shaped to oblong-ellipsoid.
- Sit erect on short stalks within the calyx; less than 2mm.
- Sharp pointed and only one cavity.

## NOTES

- This species has also been called *Astragalus yukonis*.
- A similar species (*Astragalus alpinus*) has larger calyxes (3 to 4mm long), and fruits hang on slender 3 to 4mm long stalks within calyxes.

## BODIN'S MILK VETCH (*Astragalus bodinii*)

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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre

# LARGE CANADA ST. JOHN'S WORT (*Hypericum majus*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2 G5	No status	No status

## DISTRIBUTION

- In Canada, found from British Columbia east to Newfoundland.
- In Alberta, found in the Canadian Shield, Boreal Forest, and Foothills Natural Regions.

## HABITAT

- Found in wet sites near lakes and ponds, and in low-lying areas.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Annual herb growing from short leafy rhizomes, with fibrous roots.
- Stems erect but branched above and glabrous; reaches heights of between 10 and 50cm.

### LEAVES //

- Opposite, unstalked, and glabrous; 5 to 7 parallel veins.
- Lanceolate to oblong in shape, with a blunt tip; 1 to 3.5cm long.

### FLOWERS //

- Small and inconspicuous; between 5 and 50 in the inflorescence.
- Petals are orangey-yellow and equal or only slightly longer than the sepals; 4 to 5mm long
- Flowers with 3 styles and less than 30 stamens.
- Flowers from late June to September.

### FRUITS //

- Membranous, one-celled capsule; 5.5 to 7.5mm long with longitudinal grooves.
- Yellow seeds; 0.5mm long.

## NOTES

- *Hypericum majus* is easily distinguished from other species of the same genus because of the small flowers, erect stem, and lack of black spots on the petals.

## LARGE CANADA ST. JOHN'S WORT (*Hypericum majus*)

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- Hitchcock, C.L., and A. Cronquist. 1998. Flora of the Pacific Northwest. University of Washington Press. Seattle, Washington. Pp. 730.
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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre



# SMALL BITTER CRESS (*Cardamine parviflora*)

PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1 G5	No status	No status

No image available

## DISTRIBUTION

- The small bitter cress has a circumpolar distribution; in Canada, its range extends from British Columbia east to Newfoundland, and north to the Northwest Territories. It is rare in western portions of its range (i.e. British Columbia to Saskatchewan).
- In Alberta, the small bitter cress is found in the Boreal Forest Natural Region.

## HABITAT

- The small bitter cress occurs in dry sandy and rocky areas and in dry open mixed forests, as well as near seepage sites and rocky outcrops.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Annual or biennial herb that grows 10 to 30cm tall.
- Stem are solitary and either simple or branched, coming from a taproot.
- Stem is glabrous.

### LEAVES //

- Leaves are alternate and sometimes clustered at the base.
- Basal leaves are pinnate.
- Stem leaves have 3 to 6 pairs of leaflets; linear to narrowly oblanceolate shaped and not over 2mm wide.
- Stem leaves are tipped with a larger linear-oblong lance-shaped leaflet that is widest above the middle.

- Terminal leaves are linear-oblong to oblanceolate.
- Leaflet bases do not extend along the central stalk.

### FLOWERS //

- White flowers in an elongated raceme bloom in July.
- Flowers are 4mm wide.
- Flowers have 4 petals (1.5 to 3mm long), 4 sepals, and 6 stamens of which the outer 2 are attached below the other 4.

### FRUITS //

- Ascending fruit in a pod-like silique; 1 to 3cm long.

## NOTES

- Small bitter cress may be confused with Pennsylvanian bitter cress (*Cardamine pennsylvanica*). Pennsylvanian bitter cress is generally taller (10 to 50cm) and has less-branched stems. Stems are also hairy at the base and leaflets extend to the central stalk. Uppermost leaflets also are broader and elliptic to kidney-shaped.

## SMALL BITTER CRESS (*Cardamine parviflora*)

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# IOWA GOLDEN SAXIFRAGE (*Chrysosplenium iowense*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G3	No status	No status

## DISTRIBUTION

- Found in northeast British Columbia (Dawson Creek area) east to Manitoba, and north into the Northwest Territories.
- Distribution within Alberta is understudied.

## HABITAT

- This species grows in cool, wet to moist, nitrogen rich stream banks and marshy ground in the montane zone.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Nitrogen rich soils.

## DESCRIPTION

### PLANTS //

- Iowa golden saxifrage is a succulent perennial herb.
- Grows to 3 to 15cm tall from slender rhizomes.
- Generally branched above and simple below.

### LEAVES //

- Basal leaves are round-toothed, hairy white, and round to kidney-shaped with conspicuous veins above; 5 to 20mm wide.
- Stem leaves are alternate, smooth, kidney to fan-shaped, and shallowly lobed; usually 2, but sometimes 1 or 3.

### FLOWERS //

- Inflorescence is a terminal cluster of 5 to 12 flowers.
- Flowers are bell shaped, short and 2.5 to 5mm wide.
- Five to eight inner flowers larger than the 2 to 4 outer flowers.
- No petals, but 4 golden yellow, spreading, three-veined sepals.
- Outer pair of sepals slightly wider than long, the tips are rounded and often curved back.
- Inner pair of sepals slightly longer than wide, making them narrower.
- Hypanthium is saucer shaped and ovary partly inferior.
- Bracts are yellow and fan- to egg-shaped.
- Two to eight stamens.

### FRUITS //

- Fruit are 2-valved, light brown with numerous smooth brownish-red seeds.

## NOTES

- Green saxifrage (*Chrysosplenium tetrandrum*) is similar to Iowa golden saxifrage, but green saxifrage has smaller flowers, only 4 stamens, and equal sized sepals; grows in similar habitat but more common southwards.

## IOWA GOLDEN SAXIFRAGE (*Chrysosplenium iowense*)

### SELECTED REFERENCES

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**Photo Credit:** USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. Illustrated flora of the northern states and Canada. Vol. 2: 230

# PURPLE RATTLE (*Pedicularis sudetica*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1 G5	No status	No status

## DISTRIBUTION

- The purple rattle has a circumpolar distribution; in Canada, its range extends from British Columbia and the Yukon, east to Labrador.
- In Alberta, few records for this species exist; currently, its known range is restricted to the northern portion of the Boreal Forest Natural Region in the Caribou Mountains.

## HABITAT

- The purple rattle inhabits fens, calcareous tundra, and lakeshores.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Imperfectly drained moist areas or seepage slopes; calcareous, gravel, sand, silt.

## DESCRIPTION

### PLANTS //

- Perennial herb growing 5 to 50cm tall from a stout branched rhizome.
- One to several clustered, purplish, mostly leafless, unbranched stems.
- Stems are hairless to sparsely covered in soft hairs.

### LEAVES //

- Leaves are predominantly basal, stalked, and lanceolate.
- Leaves are pinnately lobed to deeply cleft, growing 4 to 7cm long.
- Lobes are toothed or cleft, with divisions once again toothed.

### FLOWERS //

- Flower clusters from a terminal, wooly, or soft-hairy spike of multiple, spiraling, pink to purple flowers.
- The spike is compact early in the season and elongates as it fruits; it is subtended by 1 or 2 bracts that resemble small leaves.

- The flowers are 15 to 25mm long and 2-lipped, with the upper lip forming an arched, hood-like structure approximately 6 to 3mm long, with a pair of slender teeth near the tip. The lower lip is spotted and 3-lobed and is generally shorter than the upper lip.
- Calyxes are 8 to 12mm long and wooly to smooth, with five lanceolate teeth 3 to 5mm long
- Four stamens with smooth filaments are present in each flower.
- Flowers in July.

### FRUITS //

- Slightly flattened oblong capsules with abruptly short beaks; 9 to 14mm in length.
- Capsule contains many rough textured seeds.

## NOTES

- There are two similar rare species: the arctic lousewort (*P. arctica*) and wooly lousewort (*P. lanata*), both of which have taproots rather than rhizomes.

## PURPLE RATTLE (*Pedicularis sudetica*)

### SELECTED REFERENCES

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Moss, E.H. 1977. Flora of Alberta. University of Toronto Press, Toronto, Ontario. Pp 546.

**Photo Credit:** J. Derek Johnson

# RUSSIAN GROUND CONE (*Boschniakia rossica*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1 G5	No status	No status

## DISTRIBUTION

- The Russian ground cone is distributed on both sides of the Bering Strait, with its range extending from northwestern Alberta and northern British Columbia, north into the Northwest Territories, Yukon, and Alaska into Asia.
- In Alberta, the Russian ground cone occurs in the Boreal Forest Natural Region, specifically, the Sub-Arctic Sub-Region.

## HABITAT

- Occurs on moist sites in open, shrubby, or wooded areas at middle elevations in the montane zone.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Parasitic herb; fleshy and cone-like.
- Brown, single or clustered stem growing 10 to 40cm tall, 4 to 15mm thick, from tuber-like underground stem (rhizome).

### LEAVES //

- Yellowish to purplish overlapping scale-like leaves similar to a conifer cone.
- Alternate leaves are triangular to egg-shaped.
- Leaves (3 to 10mm long) are smooth to fringed at edges (fringed on upper leaves).

### FLOWERS //

- Inflorescence a dense raceme, 25cm long blooming in late June and July.
- Flowers are 8 to 13mm long and are brownish-red to purplish in colour.
- Petals 5-lobed and forming 2 unequal lips; lower lip shorter than the upper lip.
- Calyxes are fringed with hairs, irregularly lobed (2 or 3 lobes) and 3 to 6mm long.
- Bracts under each flower fringed with hairs.

### FRUITS //

- Capsules are 6 to 7mm long but can be up to 1.5cm long.
- Capsules split apart irregularly with numerous minute seeds inside.

## NOTES

- Russian ground cones cannot photosynthesize due to the absence of chlorophyll; it therefore parasitizes alders (*Alnus* spp.) but it can also parasitize birch (*Betula* spp.), willow (*Salix* spp.), huckleberry (*Vaccinium* spp.), spruce (*Picea* spp.), and leatherleaf (*Chamaedaphne* spp.).
- Grizzly bears often feed on the plant's thick tubers.

## RUSSIAN GROUND CONE (*Boschniakia rossica*)

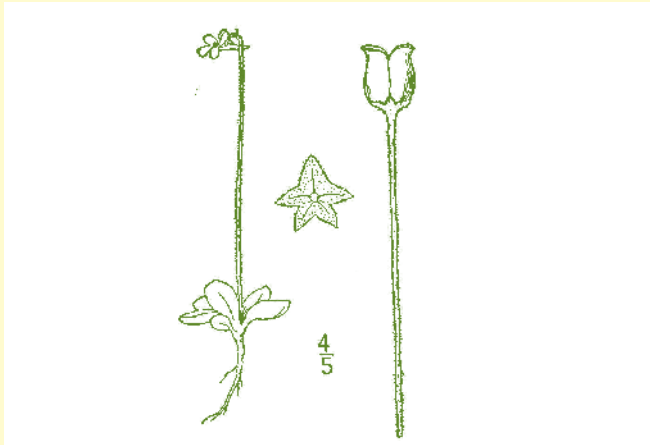
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**Photo Credit:** Dr. Robert Thomas and Margaret Orr © California Academy of Sciences



# HAIRY BUTTERWORT (*Pinguicula villosa*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S1 G4	No status	No status

## DISTRIBUTION

- The hairy butterwort has a circumboreal distribution; in Canada, it occurs in British Columbia and the Yukon, east to Nunavut and Labrador.
- In Alberta, this species is found primarily in the far north of the province in the northern portion of the Canadian Shield and Boreal Forest Natural Regions.

## HABITAT

- The hairy butterwort is found on sphagnum hummocks in peatland areas.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Insectivorous perennial herb growing 2 to 5cm tall from a fibrous root.
- Stems are erect and typically solitary, with long soft hairs near the base and glandular, club-shaped hairs above.

### LEAVES //

- Leaves form basal clusters, and are egg-shaped to elliptic; 0.4 to 1.5 cm long, and 2 to 7mm wide.
- Leaves are yellowish-green and fleshy with the upper surface covered in greasy, slimy glands; leaf margins are untoothed and slightly rolled upwards along the edges.

### FLOWERS //

- There is single purple to blue funnel-like flower 6 to 10mm long, which is 2-lobed on the upper lip, and 3-lobed on the lower lip; a spur extends back from the base.
- Flowers from mid-June to July.

### FRUITS //

- Fruits are erect capsules; 3 to 5mm long.

## NOTES

- There are few occurrences of hairy butterwort in Alberta; range appears to be restricted to the Caribou Mountains area. The habitat of this species may be threatened by potential wetland dessication and loss as a result of climate change.

## HAIRY BUTTERWORT (*Pinguicula villosa*)

### SELECTED REFERENCES

Kershaw, L., J. Gould, D. Johnson, and J. Lancaster. 2001. Rare Vascular Plants of Alberta. The University of Alberta Press, Edmonton, Alberta. Pp. 484.

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**Photo Credit:** USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. Illustrated flora of the northern states and Canada. Vol. 3: 225.

# WESTERN RIBGRASS (*Plantago canescens*)

PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2 G4G5	No status	No status

No image available

## DISTRIBUTION

- The western ribgrass has an amphiberian distribution. In Canada, it occurs in British Columbia and the Yukon, east to Nunavut; disjunct populations exist in Alberta and Manitoba.
- In Alberta, western ribgrass occurs in the Rocky Mountain, Grassland, and Boreal Forest Natural Regions; this species is found primarily in the southwestern corner of the province with a few scattered records elsewhere.

## HABITAT

- The western ribgrass inhabits grassy or gravelly slopes in association with non-alkaline soils, but also may occur on steep open slopes, riverbanks, and scree slopes.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Perennial tufted herb growing 10 to 15cm tall from a stout taproot.
- Flowering stems are leafless and woolly-hairy; they extend above the leaves.

### LEAVES //

- Leaves form basal clusters, and are lance-shaped (sometimes oblong to linear).
- Leaf dimensions range from 5 to 15cm long and 0.3 to 2.5cm wide; leaves contain 3 to 5 veins and lack stalks.
- Leaf margins are toothless or irregularly toothed.

### FLOWERS //

- Flower clusters are numerous and form 3 to 12cm long spikes.
- Flowers are white or greenish, with four spreading, fringed lobes. They are stalkless and originate in the axils of egg-shaped, scale-like bracts (2mm long) with translucent edges.
- Stamens may be conspicuous.

### FRUITS //

- Fruits are oblong capsules 3 to 3.5 long.
- Each capsule has 2 to 4 black/brown, egg-shaped seeds.

## NOTES

- This species may be confused with a more common species, the saline plantain (*Plantago eriopoda*). However, key vegetative differences evident in the saline plantain are as follows: leaves are wider, yellowish brown or reddish wool occurs on its root crowns, and it also has sparingly hairy stems and leaves.

## WESTERN RIBGRASS (*Plantago canescens*)

### SELECTED REFERENCES

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# HERRIOT'S SAGEWORT (*Artemisia tilesii*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S2 G5	No status	No status

## DISTRIBUTION

- Herriot's sagewort has a circumpolar distribution.
- In Alberta, known locations include the Boreal Forest and Parkland Natural Regions.

## HABITAT

- Moist to mesic meadows, open forests in montane to subalpine zones, river flats, stream banks, gravel bars, and rocky slopes.

## SERIAL STAGE //

- This species has been observed to colonize recently disturbed riparian sites, while being notably absent from nearby undisturbed older stands.

## SOILS //

- Found to colonize disturbed areas with silty substrates.
- Requires dry to moist soil.
- Prefers sandy and loamy well drained soils.
- pH amphotolerant but prefers slightly acidic soils.

## DESCRIPTION

### PLANTS //

- Perennial, erect, and aromatic herb from rhizomes.
- Stems 0.3 to 1.5m tall and usually finely woolly.

### LEAVES //

- Alternate, highly variable leaves.
- Elliptic to lance-shaped, sometimes widest above middle; 5 to 15cm long.
- Toothless, few-toothed, or lobed to sharply-toothed.
- Deeply pinnate or subpalmately divided.
- Green above, white woolly below, green and almost hairless above.

### FLOWERS //

- Disciform heads with 8 to 12 female flowers, and 20 to 40 disk flowers.
- Yellowish, sometimes with a red tinge; erect or nodding.
- Elongated branched inflorescence (panicle).
- Involucres woolly, blunt tipped and bell or top shaped; 3 to 5mm tall.
- Purplish or sometimes green involucral bracts, broadly lanceolate to egg-shaped.
- Receptacle glabrous.
- Blooms July to October.

### FRUITS //

- Small, smooth achene without bristles at tip.

## NOTES

- This species has also been called *Artemisia herriotti*.

## HERRIOT'S SAGEWORT (*Artemisia tilesii*)

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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre

# SPOTTED JOE-PYE WEED (*Eupatorium maculatum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S1S2 G5	No status	No status

## DISTRIBUTION

- In Canada, the spotted Joe-pye weed is a commonly occurring species across its range from British Columbia east to Newfoundland; however, it is rare in Alberta.
- In Alberta, it occurs in the Boreal Forest Natural Region.

## HABITAT

- Wet to moist meadows, swamps, open woods, and pond margins.

## SERIAL STAGE //

- Understudied.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Perennial herb that grows from fibrous roots that are between 60 and 150cm long.
- Purple or purple-spotted stems are stout and tall.
- Stems are solitary but branched in the inflorescence.

### LEAVES //

- Leaves are in whorls, mostly in 3's and 4's but can be up to 6.
- Leaves are lance to egg-shaped and sharply toothed; 6 to 20cm long, 2 to 7cm wide.
- Leaves narrow at the base where they are stalked.
- Lower surface of the leaves are covered in short, curly, and spreading hairs.

### FLOWERS //

- Pink to purple corymb (flat topped inflorescence).
- Disc flowers only, purple, tubular and perfect (male and female).
- Involucres (6 to 9mm high) purple or pinkish, in overlapping rows of bracts.
- Blooms in August.

### FRUITS //

- Achenes covered in glands.
- Achenes have a tuft of white bristles (pappus).
- Achenes are 5-angled.

## NOTES

- This species has also been called *Eupatorium bruneri* and has been included with *Eupatorium purpureum*.
- Sweet Joe-pye weed (*Eupatorium purpureum*) is similar but the stem is green and glaucous (covered in a white, waxy powder). Flowers are also duller and inflorescence is more dome-shaped.

## SPOTTED JOE-PYE WEED (*Eupatorium maculatum*)

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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre



# TALL BLUE LETTUCE (*Lactuca biennis*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S2 G5	No status	No status

## DISTRIBUTION

- In Canada, the range of the tall blue lettuce extends from British Columbia east to Newfoundland and north to the Yukon.
- In Alberta, it is found in the Boreal, Foothills, and Parkland Natural Regions.

## HABITAT

- The tall blue lettuce grows in moist disturbed sites, moist meadows, and forest openings; it may also be found in swampy areas near hot springs.

## SERIAL STAGE //

- Early successional; grows in disturbed sites.

## SOILS //

- Understudied.

## DESCRIPTION

### PLANTS //

- Robust, leafy-stemmed, annual or biennial herb with milky sap.
- Grows from a taproot; reaches heights of between 0.6 and 2.5m.
- Hairless stem is erect and branched near top.

### LEAVES //

- Leaves are alternate and deeply pinnatifid (lobes are cut or toothed).
- Stems lack leaves basally.
- Leaves sometimes have hair along the lower side of main veins.
- Leaves approximately 10 to 40cm long and 4 to 20cm wide.
- Stalks are winged and clasp to the stem.

### FLOWERS //

- Inflorescence a narrow and elongated panicle.
- Flower heads (5mm) numerous with strap-shaped flowers.
- Thirteen to 34 ray flowers that are blue or white, but sometimes yellow.
- Ray flowers have both male and female parts.
- Involucre bracts tall (9 to 14mm), and purplish; lance-shaped and hairless.
- Blooms in July and August.

### FRUITS //

- Thin, flat achene (4 to 5.5mm long) with prominent nerves.
- Achene with short beak, less than half as long as body; or beakless.
- Light brown pappus.

## NOTES

- Tall blue lettuce has also been called *Lactuca spicata*.
- Milky sap is poisonous and may cause skin irritation.

## TALL BLUE LETTUCE (*Lactuca biennis*)

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**Photo Credit:** © 2006 Louis-M. Landry

# LOW TOWNSENDIA (*Townsendia exscapa*)



PROVINCIAL	ANHIC	SARA	COSEWIC
May be at risk	S2 G5	No status	No status

## DISTRIBUTION

- Low townsendia is distributed throughout central North America, ranging from Alberta to Manitoba and south to Arizona and Texas.
- In Alberta, low townsendia is associated with the Grasslands Natural Region; however, prior to the 1950s, its range extended into the southern portion of the Parkland Natural Region.

## HABITAT

- Low townsendia is found on dry hillsides, native prairie grasslands, meadows, and gravelly hills.

## SERIAL STAGE //

- Open areas, grasslands.

## SOILS //

- Sandy soils.

## DESCRIPTION

### PLANTS //

- Low growing perennial herb growing 1 to 3cm in height.
- Stemless plant growing from a deep woody taproot.

### LEAVES //

- Basal and cauline; linear to lance-shaped leaves, which are sharply pointed and covered with fine silvery hairs.

### FLOWERS //

- Small, stalkless flowering heads are partially hidden among leaves.
- Involucral bracts have a green midrib and most have white margin hairs.
- Eleven to 40 white to pink ray flowers (12 to 18mm long) surround the 100 to 150+ yellow disk flowers which are 6.5 to 9mm long.
- Flowers in the early spring (May).

## NOTES

- Alpine townsendia (*Townsendia condensata*), another rare townsendia species, is distinguished from low townsendia by its densely wooly involucral bracts and its spatula-shaped leaves. Additionally, alpine townsendia occurs in alpine ridge habitats rather than native prairie grasslands.

## LOW TOWNSENDIA (*Townsendia exscapa*)

### SELECTED REFERENCES

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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre

# BOG BILBERRY (*Vaccinium uliginosum*)



PROVINCIAL	ANHIC	SARA	COSEWIC
Sensitive	S3 G5	No status	No status

## DISTRIBUTION

- Bog bilberry has a circumpolar distribution, and occurs uncommonly throughout northern Alberta.
- Found in the Boreal Forest, Rocky Mountain, and Canadian Shield Natural Regions.

## HABITAT

- The bog bilberry is a shade-intolerant species found in bogs and boggy coniferous forests, meadows, thickets, and dry to wet rocky tundra.
- Associated species include: Labrador tea, bog cranberry, jack pine, and paper birch.

## SERIAL STAGE //

- Occurs in all seral stages provided appropriate soil conditions are present.

## SOILS //

- Moist to wet, nitrogen-poor, acidic soils.

## DESCRIPTION

### PLANTS //

- Low growing (10 to 30cm tall) deciduous shrub.
- Younger branches are minutely hairy and yellowish-green; older branches are grayish-red.

### LEAVES //

- Alternate; egg-shaped to oval.
- Glabrous or minutely haired; green above, pale and strongly net-veined below.
- Margins toothless and somewhat rolled under.

### FLOWERS //

- Pink flowers bloom from May to July.
- Clusters of 1 to 4; egg- to urn-shaped.
- Flowers 4-lobed with 8 stamens.

### FRUITS //

- Pale, globe-shaped blue berries; 5 to 8mm in diameter.

## NOTES

- Bog bilberry is similar in appearance to the dwarf bilberry (*V. caespitosum*) but is less common in Alberta. The bog bilberry can be distinguished from dwarf bilberry by its prominently veined leaves and rounded (rather than pointed) tip.

## BOG BILBERRY (*Vaccinium uliginosum*)

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**Photo Credit:** Lorna Allen, Alberta Natural Heritage Information Centre

# GLOSSARY

**ABAXIAL** // The lower (dorsal) underside of a leaf; the side away from the stem.

**ACHENE** // A small, dry, hard, 1-seeded fruit resembling a nut.

**ACUMEN** // A slender tapering point.

**ACUMINATE** // Gradually tapering to a slender point, the sides slightly concave.

**ALTERNATE** // Leaves arranged on either side of stem, which are not opposite each other.

**AMPHIBERIGIAN** // Distribution on both sides of the Bering Strait.

**AMPHIBIAN** // A vertebrate of the class Amphibia characterized by typically aquatic larvae and a semi terrestrial adult form with moist glandular skin. In Alberta, this group includes frogs, toads, and salamanders.

**ANDROGYNOUS** // A spike in *Carex* spp. that has both male and female flowers. Male flowers sit above the female flowers.

**ANHIC** // Alberta Natural Heritage Information Center. Provides biodiversity information necessary for conservation, natural resource management and development planning. Among other things, this center provides global and sub national ranking status of species. For more information visit: <http://tprc.alberta.ca/parks/heritageinfocentre/default.aspx>

**ANNUAL** // A plant that completes its life cycle (germinates, flowers, and seeds) in one season.

**ANTHER** // The portion of the stamen that carries pollen.

**ANTHERIDIA** // The male sex organ (gametangium); a globose to broadly cylindrical, stalked structure that produces sperm.

**ANTHROPOGENIC** // Of, relating to, or resulting from the influence of human beings (e.g. anthropogenic sources of pollution).

**APOTHECIUM [APOTHECIA]** // Disc shaped or elongate ascocarp found in most lichens.

**APPENDICULATE** // Short, thin, transverse projections or bars.

**APPRESSED** // Leaves which are lying closely together, pressed against the stem.

**ARACHNID** // Various arthropods of the class Arachnida characterized by simple eyes, fang-like pincers (chelicerae), four pairs of segmented legs, two body regions (cephalothorax and abdomen), and a lack of antennae. This group includes spiders, scorpions, mites, and ticks.

**ARBOREAL** // Pertaining to trees, or an organism adapted to living and moving about in trees.

**ARCHEGONIA** // Female sex organ (gametangium); flask shaped structure, producing an egg cell.

**ARTHROPOD** // A group of invertebrate animals belonging to the phylum Arthropoda, characterized by hard exoskeletons made of chitin, segmented bodies, and jointed limbs. This group includes: spiders, insects, crustaceans, scorpions, and horseshoe crabs.

**ASCOCARP** // The fruiting body of an ascomycete; the specialized structure in which asci are produced.

**ASCOMYCETES** // A class of fungi with septate hyphae and spores formed in asci.

**ASCOSPORE** // A spore produced in the ascus.

**ASCUS [ASCI]** // Club-shaped structure in the ascomycetes in which ascospores are formed.

**AUTOICOUS** // Where the antheridia and archegonia are borne together on the same plant but on different branches.

**AWL** // A slender bristle-like appendage.

**BASAL** // Located at, or near, the base of the plant.

**BENTHIC** // Relating to the bottom of a body of water or to the organisms that live on the bottom substrate of an aquatic environment.

**BILOBED** // Divided into two segments.

**BRACKISH** // Slightly salty.

**BRACT** // A modified leaf that is associated with the flower or inflorescence. Associated with gametangium in mosses.

**BRACTEOLE** // A modified leaf associated with a gametangium in liverworts.

**BROOD** // The offspring of animals, usually a number of young that are produced or hatched at one time, especially birds. Or refers to the process by which a parent bird maintains the temperature for eggs or young in a nest by sitting on or over them.

**CACHE** // A hidden storage space, especially for storing provisions.

**CALCAREOUS** // Containing lime or calcium.

**CALCIUM HYPOCHLORITE (C)** // Used in microchemistry spot test for lichens; also known as household bleach.

**CALYX** // All of the sepals of the flower.

**CANOPY CLOSURE** // The degree to which the ground area is shaded by overhead foliage, usually given as a percentage.

**CAPITATE** // Compact and rounded; head-like.

**CAPITULUM** // Crowded branches at the stem in *Sphagnum* spp., creating a "head"

**CAPSULE** // The part of the diploid generation that bears the spores; spore-case made up of the urn, operculum, and neck.

**CARNIVORE** // An organism that feeds on animal tissue.

**CARRION** // The carcass of a dead animal, which provides an important food source for large carnivores, omnivores, and scavengers in most ecosystems.

**CAULINE** // Associated with the stem.

**CERNUOUS** // Drooping or nodding at an angle more than horizontal, but less than vertically downwards.

**CHINQUAPIN** // Any small tree or deciduous shrub related and similar to the chestnut, or a large evergreen tree of the Pacific Coast.

**CHIRONOMID** // A small, two winged fly from the family Chironomidae that may emerge in large numbers. Larvae are found in almost any aquatic or semi aquatic habitat, and are important food items for fish and other aquatic organisms.

**CILIA** // Hair-like appendages.

**CILIATE** // With cilia.

**CIRCUMBOREAL** // Distribution occurring in boreal regions from North America to Eurasia.

**CIRCUMPOLAR** // Where the distribution circles the North Pole.

**COARSE WOODY DEBRIS (CWD)** // Dead woody material larger than 7.5cm diameter at the crossing point, in various stages of decomposition located above the soil (may be suspended), and is not self-supporting (as a stump). Utilized by forest resources for long-term nutrient capital.

**COARSE WOODY DEBRIS RECRUITMENT** // the addition of coarse woody debris (CWD) into the forest ecosystem through the natural process of decline and decay as standing trees become downed woody debris, thereby creating habitat, substrates for colonization, food resources and nutrients for soils.

**COBBLE** // A rock fragment (especially rounded) classified as smaller than a boulder, but larger than a pebble, with a diameter between 6.4cm and 25.67cm.

**COLUMN** // The main part of an orchid flower where the stamen, style, and stigma are fused.

**COMMUNAL(LY)** // Used or shared in common, or marked by collective ownership.

**COMPLEX FOREST STRUCTURE/ STRUCTURAL COMPLEXITY** // Forest structure that is highly variable in arrangement and is comprised of the three dimensional components of the forest including but not limited to: vertical stratification of various layers, size and density of vegetation (overstory and understory), amount of standing or downed woody debris, amount of canopy cover, and the size, shape, and distribution of forest openings. Forest structure, as well as age and function are all interdependent and all are a product of and driver of ecosystem processes and biological diversity, thereby contributing to the stands integrity and resistance and resilience to disturbance.

**COMPOUND** // Divided into smaller parts; leaf made up of two or more leaflets.

**CONNECTIVITY** // The degree to which a landscape facilitates or impedes movement. Thus, the degree of "connectedness" will vary by species and its inherent ability to move.

**CONTIGUOUS** // Very close or connected in space or time. For example, it may refer to territories having a common boundary, or events that occur one after the other.

**CORE INTERIOR FOREST** // Forest area that is not influenced by edge effects. Some species require large patches of core interior forest to meet their life requisites.

**CORM** // A short, bulb-like, underground, thickened stem, which acts as a storage organ.

**COROLLA** // All of the petals of the flower.

**CORRIDOR** // Generally defined as a linear patch of vegetation that is unlike the surrounding habitat, connecting two habitat patches that were historically connected (Hobbs 1992). A fencerow of trees bordered by agricultural fields may connect two tree stands and would be considered a corridor.

**CORTEX** // The outer layer of the thallus or stem, consisting of fungal hyphae in lichens; or the outermost row or rows of cells in the stem in mosses and liverworts.

**CORTICATE** // Having a distinct cortex.

**CORVID** // A bird belonging to the Family Corvidae, including crows, ravens, rooks, jackdaws, choughs, magpies, nutcrackers and jays.

**CORYMB** // A flat topped, racemose inflorescence; the outside flowers being progressively larger than the inner flowers.

**COSEWIC** // Committee on the Status of Endangered Wildlife in Canada is an independent advisory organization that assesses and designates which wild species are in some danger of disappearing from Canada. Members of the private sector, provincial, territorial and federal government, scientific community, and conservation representatives sit on the Committee. For more information visit: [www.cosewic.gc.ca](http://www.cosewic.gc.ca)

**COSTA** // The leaf nerve forming a midrib.

**COSTATE** // Possessing a costa.

**CRENATE** // With rounded teeth along the margin.

**CREPUSCULAR** // Active or primarily active at the time around dawn or dusk.

**CRISPED** // Twisted and contorted.

**CRUSTACEAN** // A chiefly aquatic invertebrate animal of the class Crustacea (phylum Arthropoda), typically having a segmented body covered with a chitinous shell, 5-7 pairs of jointed legs, and simple eyes. This group includes lobsters, shrimp, crabs, barnacles, and wood lice.

**CRUSTOSE** // A lichen growth form with thalli growing in intimate contact with the substrate and lacking a lower cortex.

**CRYPTIC** // Concealed, hidden, or inconspicuous. Often refers to protective colouration which camouflages an animal in its environment.

**CUSP** // A sharp or tapered end.

**CYME** // An inflorescence where the inner terminal flowers bloom first.

**CYPRINID** // A fish belonging to the family Cyprinidae, or minnow family, which are typically found in freshwater and characterized by toothless jaws, soft fins, and cycloid scales. This group includes minnows, carps, and shiners.

**DAMSELFLY** // An insect of the suborder Zygoptera in the order Odonata. Smaller and more slender than dragonflies, they hold their wings together over the back when at rest. Larvae are important aquatic macroinvertebrates with three pairs of legs, one pair of antennae and wing pads with feathery gills.

**DECURRENT** // Narrow wings formed below the leaf base; formed when the leaf margins extend below the leaf insertion.

**DENTATE** // Having sharp teeth pointing outwards.

**DESICCATION** // Dryness resulting from the removal of water or the process of extracting moisture.

**DETritus** // Disintegrated material. May be the particles of plants, animals or inorganic matter that is often an important source of nutrients.

**DIAMETER AT BREAST HEIGHT (DBH)** // The diameter of a tree at 1.3m above the ground, on the uphill side of the tree.

**DIOECIOUS** // Male and female flowers occurring on separate plants. Or antheridia and archegonia occur on different plants (in mosses).

**DISCIFORM** // In the form of a disc.

**DISJUNCT** // A population that is separated from other populations of the same species by a distance or a barrier. Exchange of genetic material with other populations is not possible due to the distance or barrier.

**DISK FLOWERS** // A type of flower in the Aster family with a tubular corolla.

**DISPERSAL** // Those processes by which a species maintains or expands the distribution of its population through the movement of individuals.

**DISTAL(LY)** // Away from the point of attachment or origin (e.g. branches far from the trunk of a tree).

**DIVERGENT** // Spreading away from.

**DOCK SPECIES** // Plants of the genus Rumex in the family Polygonaceae. Some of the species in this group are considered invasive weeds in North America.



**EDGE EFFECT** // Habitat conditions created at or near the boundary between ecosystems or habitats, such as between a forest and an adjacent open area. Habitat edges can be natural or result from human activities (e.g. forestry, road building); edges resulting from human activities can often have negative impacts on flora and fauna.

**EMERGENT VEGETATION** // Aquatic plants whose roots are buried in the substrate of a water body, with the upperparts extending above the surface of the water (e.g. cat-tails).

**ENDOSTOME** // The inner teeth of a double peristome around the mouth of a capsule.

**ENTIRE** // Not toothed.

**ERECT** // With leaves directed to the stem tip; with leaf margins curved upwards; with capsules straight, not curved.

**EUTROPHIC** // Describes a body of water with high nutrient content and high productivity.

**EUTROPHICATION** // Where a water body becomes over-rich with nutrients and organisms causing oxygen depletion to occur.

**EXCIPIE** // The portion of the apothecium that surrounds the hymenium and forms the proper margin of the apothecium.

**EXOSTOME** // The outer teeth of a double peristome around the mouth of a capsule.

**EXOTIC** // A species from or characteristic of another place introduced into a new environment. Populations of exotics often grow rapidly in their new habitats because they do not have natural predators there and native species are strained to compete with them for limited food and space.

**EXsertED** // Exposed and projected; when the capsule is projected from the perichaetal leaves.

**FARINOSE** // Very fine, powdery soredia.

**FASCICLES** // Bundle of branches from a single point on the stem.

**FIDELITY** // The quality of being faithful. Species may show fidelity to home ranges or specific sites or locations within their home ranges, such as calving areas, nest sites, breeding ponds, or hibernacula.

**FILAMENTOUS** // Composed of or containing thread-like filaments.

**FLEXUOSE** // Irregularly bent, wavy, or twisted.

**FLYCATCHING** // A bird foraging technique, where a bird leaves a perch, catches an insect on the wing and returns to a perch, usually the same one.

**FOLIOSE** // A lichen growth form bilaterally symmetric, leaflike with an upper and usually lower cortex.

**FOOTPRINT** // Impact of an entity on local, regional, and global ecosystems; a measure of direct and indirect consumption of resources and production of wastes.

**FORAGING** // The act of searching for and consuming food or provisions, especially when referring to browsing or grazing.

**FORB** // A broad-leaved, non-woody plant where the above ground stem does not survive the winter. Their flowers are often large, colourful, and showy.

**FRAGMENTATION** // Forest fragmentation is a landscape-scale process by which continuous forest is broken up into smaller, more isolated patches (Wilcove et al. 1986). The effects of fragmentation, which are changes in the shape and continuity of the habitat, are not the same as the effects of habitat loss alone.

**FROND** // The compound leaf of a fern.

**GAMETOECIUM** // Gametangia and surrounding bracts.

**GAMETOPHYTE** // The dominant green, leafy, haploid stage of the moss which is sexual and produces antheridia and archegonia.

**GAMMAE REPRODUCTION** // Small, roundish bodies which serve in vegetative reproduction.

**GLABROUS** // Smooth, hairless, and glandless.

**GLAUCOUS** // Covered in white or bluish bloom.

**GLEAN** // A foraging style used by many small birds, in which the individual picks up small, widely spaced food items from surfaces such as leaves, tree branches, tree trunks, or the ground.

**GLOBOSE** // Spherical.

**GLUME** // One of two bracts at the base of a spikelet in a grass inflorescence.

**GRAMINOIDS** // Grass-like plants with long, narrow, parallel-veined leaves and inconspicuous flowers. This group includes grasses, sedges, and rushes.

**GRANULOSE** // Pertaining to soredia; granules or particles seen under a dissecting microscope – not powdery as farinose.

**GRAVID** // The condition of an individual carrying developing young or eggs.

**GREGARIOUS** // Tending to form a group with others of the same species.

**GYNAECANDROUS** // A spike in *Carex* spp. with both male and female flowers; the male flowers lying below the female flowers.

**HABITAT EFFECTIVENESS** // The ability of a habitat to provide the life requirements and preferences of a species. Habitat effectiveness may decrease due to a variety of factors, including human disturbance.

**HAWKING** // See flycatching.

**HEMI-MARSHES** // A wetland with equal amounts of open water interspersed with dense clumps of emergent vegetation.

**HERBACEOUS** // A plant with a non-woody stem.

**HERBIVOROUS** // An organism that feeds on plant matter.

**HERPETILES** // A term used to refer collectively to both amphibians and reptiles.

**hibERNACULA** // The winter residence of a hibernating animal. In the case of herpetiles, many individuals may gather to hibernate as a group.

**hibERNATION** // A state of dormancy characterized by low body temperature, slowed heartbeat and breathing. Animals and plants often hibernate to survive the winter months or periods of low food and moisture availability.

**HYALINE** // Colorless, transparent, or clear.

**HYDROLOGY** // The study of the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere

**HYPANTHIUM** // A ring or cup around the ovary where the petals, sepals, and stamens are fused.

**HYPHA (HYPHAE)** // Microscopic multicellular fungal thread that gives shape to lichen thallus.

**HYPOPHYSIS** // When the sterile neck section of the capsule is swollen and clearly differentiated from the rest of the capsule body.

**HYPOTHALLUS (HYPOTHALLI)** // A layer of fungal tissue (usually black) next to the substrate and below the thallus proper often appearing between areoles of a crustose lichen or forming a marginal zone around the thallus.

**HYPOTHECIUM (HYPOTHECIA)** // The tissue layer immediately below the hymenium, usually expanded into a cone between the exciple and hymenium.

**IMBRICATE** // Closely overlapping.

**INCLINED** // Capsules that are less than vertical but between erect and horizontal.

**INCUBOUS** // Leaves overlapping like shingles on a roof; the upper part of each leaf covers the bottom of the next higher leaf.

**INDUSIUM** // A growth that covers and protects spore clusters in ferns.

**INFERIOR** // When the petals, sepals, and stamens are attached above the ovary.

**INFLORESCENCE** // A cluster of flowers. See also gametoeceum.

**INSECTIVORE** // An organism that feeds primarily on insects.

**INVERTEBRATE** // An animal lacking a developed spine. Commonly refers to insects (phylum Arthropoda), though it describes many other groups.

**INVOLUCRE** // A set of bracts lying beneath the inflorescence; especially in Aster and Carrot families. Or, a sheath of tissue covering an antheridium, archegonium, or sporophyte.

**ISIDIUM [ISIDIA]** // Minute thalline outgrowth that is corticated, contains algae, and functions as a vegetative propagule.

**LACINIA** // Appendages that are coarser than cilia and wider than one cell.

**LACUSTRINE** // Of, relating to, or associated with lakes.

**LAMELLAE** // The parallel ridges or plates along a leaf blade, costa or thallus.

**LAMINA** // The expanded section of a leaf or petal excluding the costa. Or, the blade of a leaf.

**LANCEOLATE** // Lance-shaped.

**LECIDEINE** // Apothecium with a proper margin; in which no algal cells are present.

**LEKS** // The location of a gathering of males for the purpose of competitive mating displays.

**LEMMA** // The lower of two bracts, which enclose a grass flower.

**LICHEN** // An organism consisting of a fungal body enclosing photosynthetic algae in a symbiotic association.

**LICHENIZATION** // The process of the fungus and algae joining together to form a lichen.

**LIFE REQUISITE** // An indispensable necessity required for survival.

**LIGULATE** // Strap or tongue shaped.

**LIGULE** // In the grass family, a flat, membranous projection at the top and inner side of a leaf, where the blade and sheath meet. Or, the flat part of a ray flower in the Aster family.

**LIP** // The lower petal of an orchid flower that is expanded. Or, in an irregular flower where two or more petals have fused.

**LOBE** // A rounded or strap-shaped division of the thallus of lichens; or a division of a leaf in liverworts.

**LONGITUDINAL GROOVES** // Grooves parallel to the long axis.

**MACRO-INVERTEBRATE** // An invertebrate animal (see invertebrate) large enough to be seen without magnification.

**MEDULLA [MEDULLAE]** // The inner part of the thallus that lacks algae, usually of loosely packed fungal hyphae.

**MESIC** // Sites characterized by intermediate moisture conditions; neither decidedly wet (hydric), nor decidedly dry (xeric).

**MESOTROPHIC** // Clear water bodies with a mid-range of nutrients; between eutrophic (high nutrients) and oligotrophic (low nutrients) water bodies. Or, refers to a plant that found in moderately moist areas.

**METAMORPHOSIS** // A profound and rapid transformation from a larva into an adult that occurs in some species (e.g. butterfly or frog).

**MICROCHEMISTRY SPOT TEST** // A tool for identifying lichens where certain chemicals are applied causing a reaction that results in the production of distinctive colors that can be used to identify lichens to genus or species.

**MICROHABITAT** // A small, localized area occupied by certain organisms because of small differences in moisture, light, and other conditions as compared to its immediate surrounding area.

**MICROSITE** // See microhabitat.

**MIDRIB** // Single costa.

**MIGRATION** // Regular, extensive, seasonal movements between a breeding region and a wintering region.

**MIGRATORY** // Refers to a species that migrates (see migration).

**MINEROTROPHIC** // Plant communities that are influenced by, and derive nutrients from ground water, often highly ionic water.

**MODOR HUMUS FORM** // A humus form characteristic of deciduous forests where there is some intermixing between the mineral and organic layers. Soil fauna presence is high and leads to partly decomposed vegetation matter that is loose and not matted as in Mor humus forms.

**MOLLUSCS** // Any invertebrate of the phylum Mollusca, typically having a calcareous shell, a soft, unsegmented body, and complex eyes. This group includes chitons, snails, bivalves, squids, and octopuses, most of which are aquatic.

**MONOEIOUS** // Separate male and female flowers borne on the same plant.

**MONOTYPIC COMMUNITY** // A community generally dominated by one species.

**MOR HUMUS FORM** // A humus form occurring mostly in coniferous and boreal forests where there is low biological activity in the soil. Mineralization of organic material is slow and creates layers. The majority of this humus form is the layer which is comprised of relatively intact vegetation matter interwoven with fungal hyphae.

**MOSAIC** // Having a mixture of features. A mosaic of habitats on the landscape includes a mixture of habitat types and ages, and is created by disturbance such as fire, storms, and anthropogenic sources.

**NATAL AREA** // Birthplace.

**NEOTROPICAL MIGRANT** // A bird that nests in temperate regions and migrates to the Neotropical faunal region, which includes the West Indies, Mexico, Central America and parts of South America.

**NITROPHILOUS** // Growing best in nitrogen rich environments.

**NOMADIC** // Organisms with no fixed home or territory that move according to the seasons in search of food, water, shelter, mates or any other life requisite.

**OBANCEOLATE** // Lance-shaped where the broadest part is above the middle.

**OBLIQUE** // Slanted.

**OBLOID** // 3-D version of oblong, but usually in reference to capsules with rounded edges and corners.

**OBLONG** // Longer than wide.

**OBTUS** // Bluntly pointed, forming an angle at the apex of more than 90 degrees.

**OIL BODIES** // A membrane bound organelle containing terpene, unique to liverworts.

**OLIGOTROPHIC** // Clear water bodies that are nutrient poor, slightly acidic and have high levels of dissolved oxygen.

**OMBROTROPHIC** // Vegetative communities that derive water and nutrients from rainwater. Usually isolated hydrologically, the plants are generally tolerant of acidic, low nutrient environments.

**OMNIVORE** // An organism that feeds on both animal and plant matter.

**OPERCULUM** // Lid covering the mouth of the capsule, falling off at maturity to release spores.

**OPPORTUNISTIC** // Describes an individual taking advantage of a given situation. An opportunistic feeder is one that will eat whenever food is available.

**OVIPOSITION** // The act of depositing eggs, especially as carried out by insects.

**OVULE** // Organ within the ovary that later matures into a seed.

**PALEAS** // The upper two bracts that enclose a grass flower.

**PALMATELY DIVIDED** // Divided into lobes or leaflets from a common point.

**PANNICLE** // A loosely branched inflorescence made up of stalked flowers.

**PAPILLAE** // Small, rounded, thickenings above the outer cell wall.

**PAPILLOSE** // Roughened due to 1 or more papillae.

**PAPPUS** // Structures such as hairs, bristles, and scales that are borne on the achenes of Asters.

**PARAOICOUS** // Antheridia and archegonia are close together, or in the same inflorescence, but not mixed.

**PARAPHENYLENEDIAMINE (PD)** // Used in microchemistry spot test for lichens; a few grains of PD are dissolved in ethyl alcohol to form the toxic solution necessary for the spot test.

**PATCH** // Areas on the landscape that are distinct from the matrix and are isolated from other similar patches.

**PATENT** // Leaves spread out at an angle of 45° or more.

**PATHOGENS** // An agent that causes disease, especially a living microorganism, such as a bacterium or fungus.

**PENDANT** // Hanging.

**PERENNIAL** // A plant that grows for 3 or more years, usually producing fruit each year.

**PERIANTH** // Sheathing organ that covers archegonia in leafy liverworts.

**PERICHAETIUM** // Female inflorescence made of leaves and bracts surrounding the archegonia.

**PERIGONIA** // Male inflorescence made of leaves and bracts surrounding the antheridia.

**PERIGYNIA** // An inflated bract that encloses the achene of *Carex* spp.

**PERISTOME CAPSULE** // Single or double ring of teeth around the mouth of the capsule.

**PH AMPHITOLERANT** // Tolerates both acidic and basic conditions

**PHILOPATRIC** // Describes an organism that exhibits philopatry (see philopatry).

**PHILOPATRY** // The tendency of an individual to return to, or stay in, its home area or another adopted locality. Latin for “love of place”.

**PINNAE** // The first division of a pinnately divided leaf.

**PINNATE** // A feather-like compound leaf where leaflets lie on either side of the stem.

**PINNULES** // The second and ultimate division in a pinnately divided compound leaf.

**PISCIVOROUS** // An organism that feeds on fish.

**PISTIL** // The female organ of the flower that contains the ovule; comprised of the ovary, style and stigma.

**PLICATE** // Folded into longitudinal pleats and furrows.

**PODETIIUM (PODETIA)** // A stalk-like thalline elevation supporting an apothecium or apothecia in the genera *Cladina*, *Cladonia*, and *Baeomyces*.

**POTASSIUM IODIDE (I)** // Aqueous solution used in microchemistry spot tests for lichens; also known as iodine tincture.

**POTASSIUM HYDROXIDE (KOH)** // Used in microchemistry spot test for lichens; a solution of 20 household lye pellets in 20 ml of water (10 to 20 %) is typically used.

**PREDATOR-PREY DYNAMICS** // Ecological interaction between predators (e.g. wolves) and their prey (e.g. moose).

**PROPAGULUM (PROPAGULA)** // A reduced bud, branch or leaf serving in asexual reproduction.

**PROVINCIAL** // A general status evaluation of the well-being of wild species populations in Alberta. General status evaluations are conducted every five years and ranks are updated as new information becomes available. For more information visit: <http://srd.alberta.ca/fishwildlife/wildspecies/>

**PRUINOSE** // Having a frosted appearance.

**PSEUDOCYHELLUM** // White patch, dot and line on the upper and/or lower cortex of some foliose and fruticose lichens caused by a break in the cortex and extension of the medulla to the surface.

**PSEUDOPORES** // Small, thin dots which look like pores in hyaline cells of *Sphagnum* spp. branch leaves.

**PYCNIDIUM** // Small flask-shaped structures in which pycnoconidia (spore-like conidia) are produced; having an ostiole and resembling a perithecium.

**RACEME** // A dense cluster of stalked flowers in an unbranched inflorescence.

**RACHILLA** // The main axis in a compound leaf.

**RECURVED** // An indentation or notch in the rounded apex.

**REDD** // A nest prepared by a fish in the gravel, stones or sand bottom of a water body, where eggs are deposited.

**RHIZINES** // Threadlike branched, unbranched, tufted, or brush-like organ of attachment that is composed of fungal hyphae.

**RHIZOIDS** // Branching filaments that function in anchoring and absorption.

**RHIZOME** // A creeping underground stem differentiated from the roots by nodes, buds or scales.

**RIPARIAN** // Relating to, living, or located on the bank of a watercourse, water body, or tidewater.

**RIVERINE** // An aquatic environment with water conveyed by a channel. It often refers to influences, characteristics, and habitats within the river channel itself.

**ROOST(ING)** // Location used by birds or bats for thermal and security cover, resting, and hunting.

**ROSTRATE** // Having a beak-shaped part.

**SADDLE** // A ridge between two peaks in a shape where it is raised on both ends with a depression in the middle.

**SALMONID** // Belonging or pertaining to the family Salmonidae, including the salmon, trout, char, and whitefishes.

**SAPROPHYTIC** // A plant that derives nutrients from decaying matter.

**SARA** // Species at Risk Act 2003. The classification of species under COSEWIC is taken to the Minister of the Environment of Canada who issues a response statement indicating if the species will be listed, the recovery process for those species identified as being at risk, and provides timelines for action. For more information visit: [www.speciestrisk.gc.ca](http://www.speciestrisk.gc.ca)

**SCALE** // Any small, thin, or flat structure.

**SCAVENGERS** // An organism that feeds on refuse or dead organic matter.

**SECUND** // Turned to one side.

**SENESCENCE (SENESCENT)** // The aging process in mature individuals or the period near the end of an organism's life cycle. In deciduous plants, this process occurs before the shedding of leaves.

**SENSORY DISTURBANCE** // An intrusion pertaining to touch (pain), taste, smell, sight, and especially hearing. Sensory disturbance by noisy machinery may cause a bird to abandon its nest resulting in failure of eggs to hatch or young to survive.

**SEPAL** // A modified flower leaf, usually green and leafy, which is on the outside ring of the flower.

**SEPTATE** // Divided into two or more parts by a septum or wall, in septate spores composed of more than one cell.

**SERIAL STAGE** // Any stage of development of an ecosystem from a disturbed, unvegetated state to a climax plant community.

**SERRATE** // Saw-toothed with teeth pointing forwards.

**SERRULATE** // Minutely serrate.

**SESSILE** // Permanently attached or established, not free to move about; without a stalk.

**SETAE** // Stalk supporting the capsule.

**SHEATH** // An organ that surrounds or partially surrounds another organ, such as the sheath of a leaf blade surrounds the stem.

**SHOAL** // A place in a body of water where the water is particularly shallow, or a group of several species of fish, which swim and congregate together.

**SILICA PAPILLAE** // Wart-like projections.

**SILIQUE** // A pod-like fruiting structure characteristic of the Mustard family.

**SITE FIDELITY** // The quality of being faithful to a site, such as the tendency of an animal (after dispersal) to remain in a particular location. See philopatry.

**SOREDIAE** // Having soredia.

**SOREDIIUM [SOREDIA]** // Small powdery propagule that contains several algal cells and fungal hyphae, originating in the algal layer and breaking through the cortex of lichen.

**SORI** // A cluster of spore cases (sporangia) on the underside of a fern leaf.

**SPATIAL SEPARATION** // The physical distance between elements.

**SPATULATE** // Spatula-shaped, being broad at the apex and narrow below.

**SPAWNING** // The act of depositing eggs or sperm directly into the water, especially by fish but also amphibians, molluscs and crustaceans. It also refers to the eggs of these organisms.

**SPIKE** // A cluster of flowers in an elongated inflorescence similar to a raceme but with unstalked (sessile) flowers.

**SPINOUS** // Having sharp, spiny teeth or projections.

**SPORANGIA** // A case containing spores.

**SPORANGIUM** // The spore sac inside the capsule.

**SPORE** // Produced in an ascus (lichens), capsule (mosses and liverworts) or sporangium (ferns); capable of giving rise to a new plant; can be single-celled, two-celled or multi-celled; hyaline greenish or brown; always haploid and the result of meiosis.

**SPOROPHYTE** // The spore bearing part of the plant, produced sexually, attached and dependant on the gametophyte stage; consists of foot, seta and capsule.

**SQUAMULE** // A small scale-like lobe or areole, which lacks a lower cortex and generally is at least partially ascending.

**SQUAMULOSE** // Scaly, a thallus made up of squamules.

**SQUARROSE** // Leaves bent at right angles to the stem.

**STAMEN** // The organ of a flower that bears pollen.

**STELLATE** // Star-shaped.

**STIGMA** // The tip of the female organ (pistil) that catches pollen.

**STIPE** // The stalk of a structure providing support.

**STIPULE** // Appendage (usually in a pair) at the base of a leaf.

**STOLON** // A creeping elongated stem lying above ground.

**STYLE** // The stalk that holds the stigma to the ovary.

**SUBHYDRIC** // Wet soil; soil where the water table is at or near the surface and is removed so slowly that it remains this way for most of the year. This condition is found in seepage sites, water receiving sites, and areas of poor drainage.

**SUBMERGENT VEGETATION** // Vegetation that grows entirely beneath the surface of the water.

**SUBSTRATE(S)** // An underlying layer. The surface on which an organism grows that may provide support and a source of food.

**SUBTERMINAL** // Located at or occurring near an end.

**SUBULATE** // Slender, long-acuminate.

**SUCCULENT** // Thick, fleshy and juicy; plants which store water in their leaves or stems.

**SUMAC** // Any of several shrubs or small trees belonging to the genus *Rhus* of the cashew family, having milky sap, compound leaves, and small, fleshy fruit.

**SYMBIOSIS** // An interdependent or mutually beneficial relationship between dissimilar organisms.

**SYNOICOUS** // Describes where antheridia and archegonia are located on the same plant, and mixed in the same inflorescence.

**TANNIN** // Any of the various, complex, phenolic substances found in the vacuoles of certain plant cells which are astringent and bitter-tasting and may protect the plant or function in pigment formation.

**TEMPORAL VULNERABILITY** // Susceptibility to a risk during a particular time. For example birds are more vulnerable to disruption during the nesting period when they are brooding eggs or young.

**THALLOID** // Composed of flat tissue.

**THALLUS (THALLI)** // The lichen body, consisting of both fungus and alga. Or, a plant body not differentiated into a stem and leaf in liverworts.

**THERMAL STRATIFICATION** // The formation of layers of temperatures in a water body, caused by the sinking of cold water and rising of warm water. This results in layers with different temperature ranges.

**THERMOCLINE** // A distinct layer in a large body of water, such as an ocean or lake, in which temperature changes more rapidly with depth than it does in the layers above or below. It may be a permanent feature or may form temporarily in response to effects like solar heating during the day.

**THERMOREGULATION** // Maintenance of a constant body temperature independent of the environmental temperature.

**TRANSVERSELY ATTACHED** // Where the leaf is attached perpendicular to the leaf axis.

**TUBERCLES** // A small projection or nodules.

**TUBULOSE** // Tube-like, leaves with strongly incurved or broadly overlapping leaf margins.

**TURBID** // Water that is cloudy due to suspended sediments.

**UMBEL** // A racemous inflorescence with a short axis and elongated flower stalks which appear to come from a common point.

**UNDULATING** // Leaf margins that are wavy, alternating between concave and convex.

**UNGULATES** // Belonging or pertaining to the Ungulata, a former order of all hoofed mammals, now divided into the odd-toed perissodactyls and even-toed artiodactyls.

**UNISERIATE** // Hair-like structure, made from a single row of cells.

**URBANIZED** // To make or cause to become more city-like or industrialized. Adapting to living in city environments may urbanize species.

**URN** // Part of the capsule which bears the spores.

**VARIABLE RETENTION** // A forest harvesting practice that retains unharvested portions of forest within harvested areas for integration into the post-harvest stand to achieve various ecological objectives. These objectives can range from retaining habitat, movement corridors, protective cover, as well as future nutrient-inputs for the forest soil productivity or seed recruitment into regenerating forests. The size and form of retention is variable depending on the desired effect (e.g. single tree, small clumps, large patches).

**VELUM** // A thin membrane that covers sore clusters in *Isoetes* spp.

**WHORLS** // Where three or more similar structures form a ring around a common point.

**XERIC** // Extremely dry soil.

**XEROPHYTIC** // Prefers dry habitats.

**ZOOPLANKTON** // The small or microscopic animal constituent of plankton, which float or drift in great numbers in fresh or saltwater, especially at or near the surface, and serve as food for fish and other larger organisms.

**ZYGOMORPHIC** // Bilaterally symmetrical, where two identical parts are divisible in only one plane.



# PARTS OF A MOSS

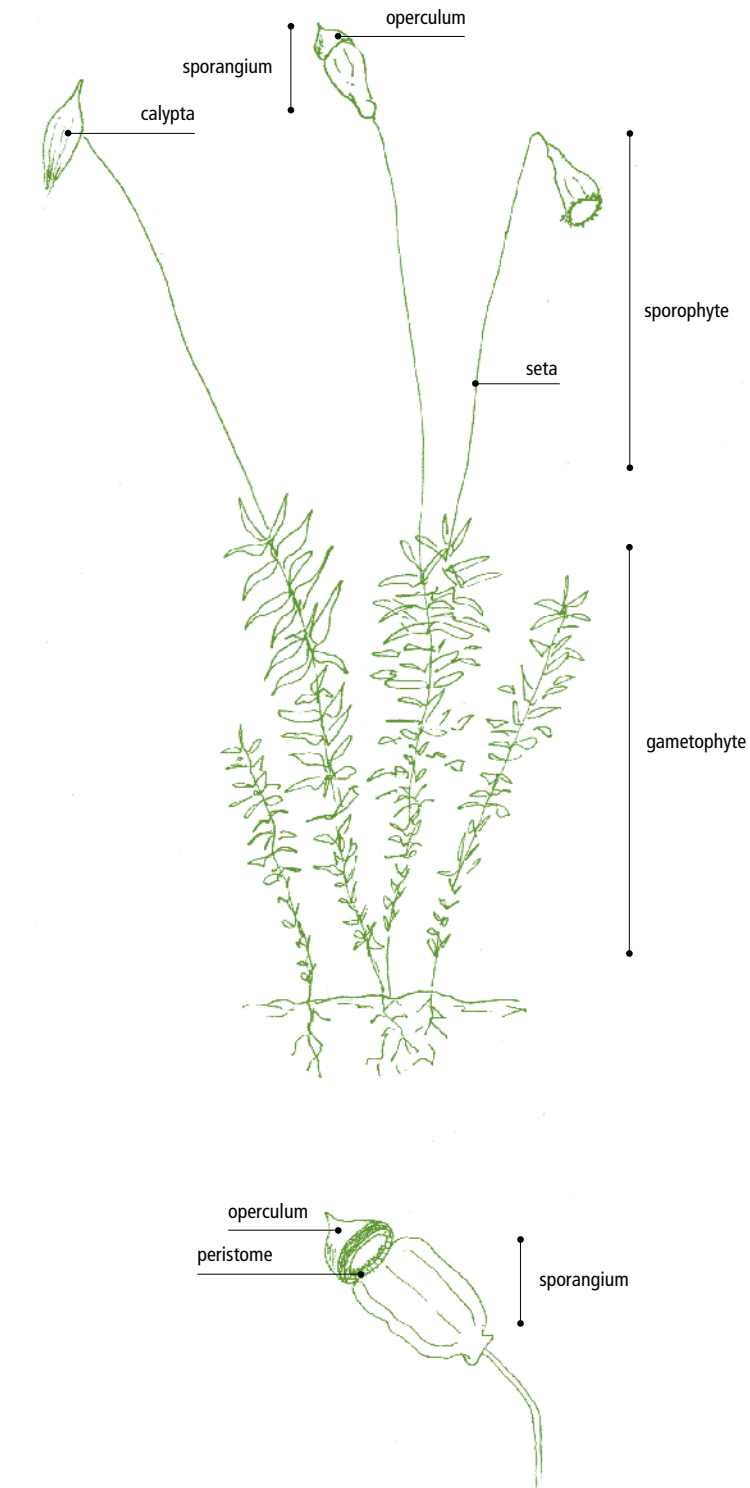


Illustration Credit: Leah McGraw

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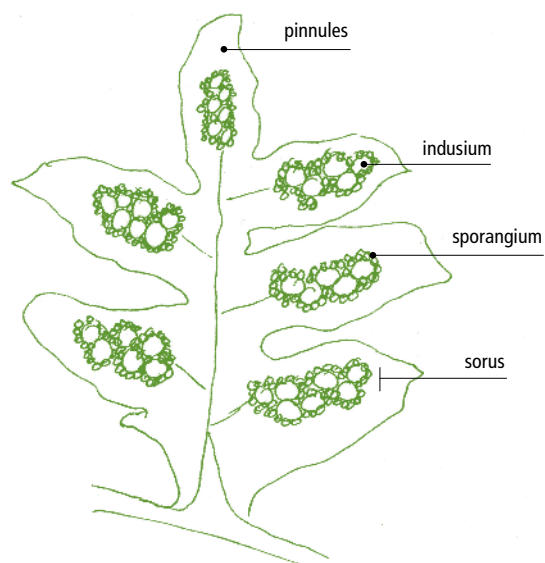
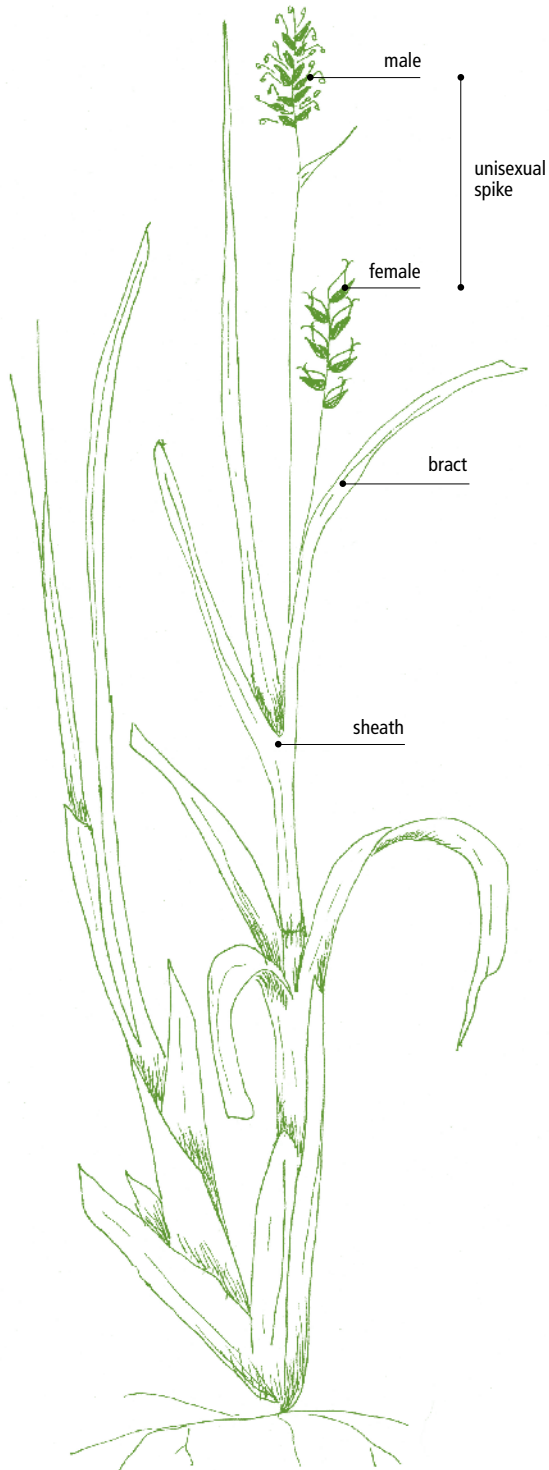


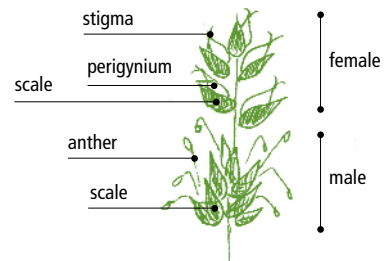
Illustration Credit: Leah McGraw



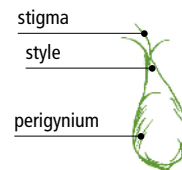
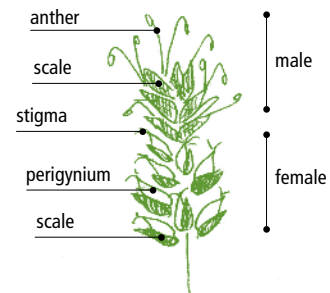
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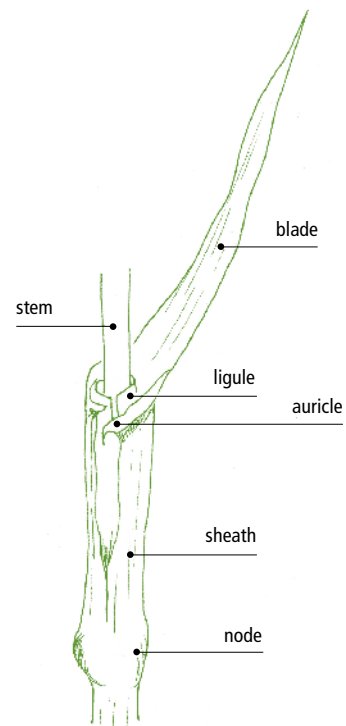
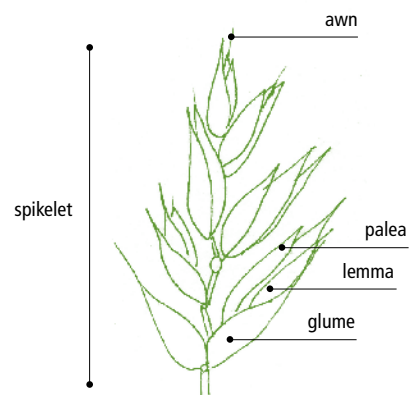
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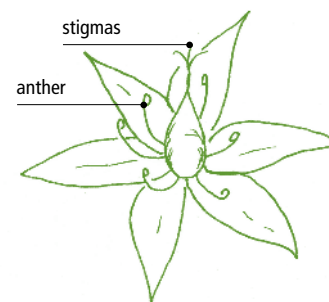
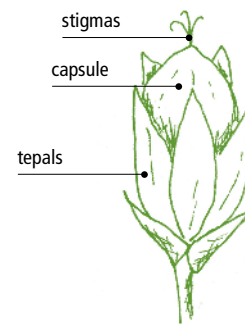
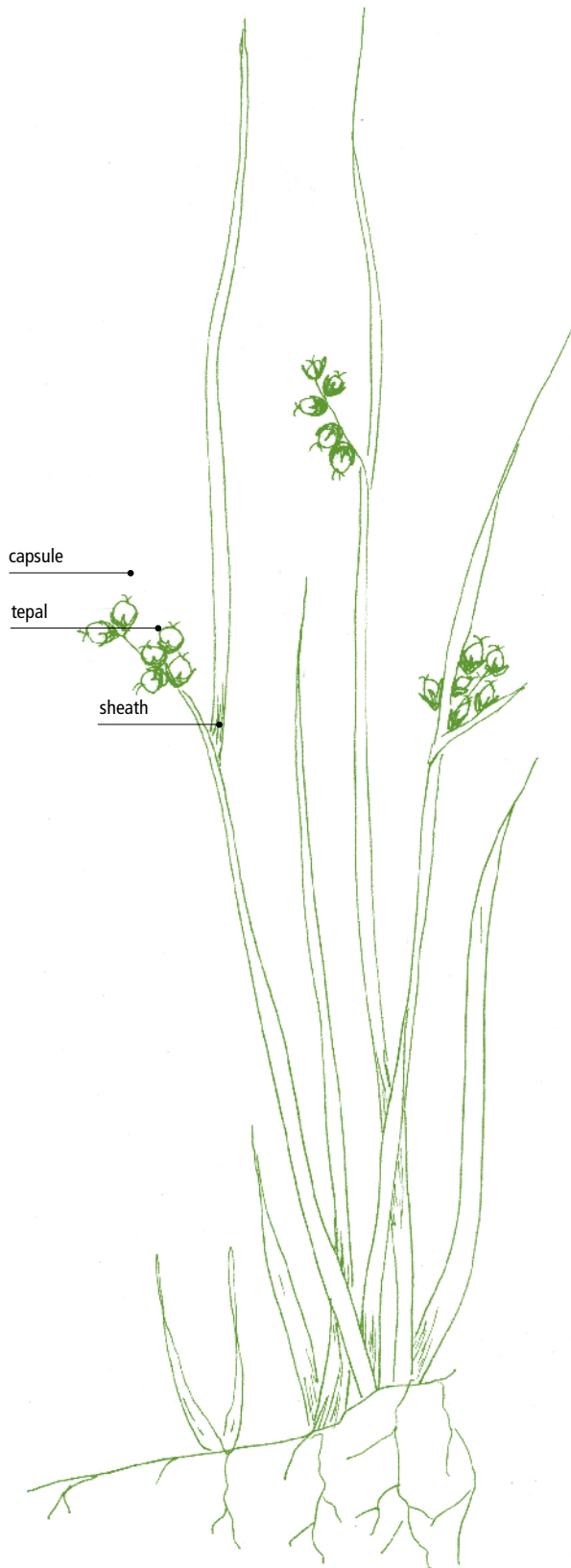
## ANDROGYNOUS SPIKE



# PARTS OF A GRASS



# PARTS OF A RUSH



# PARTS OF AN ORCHID

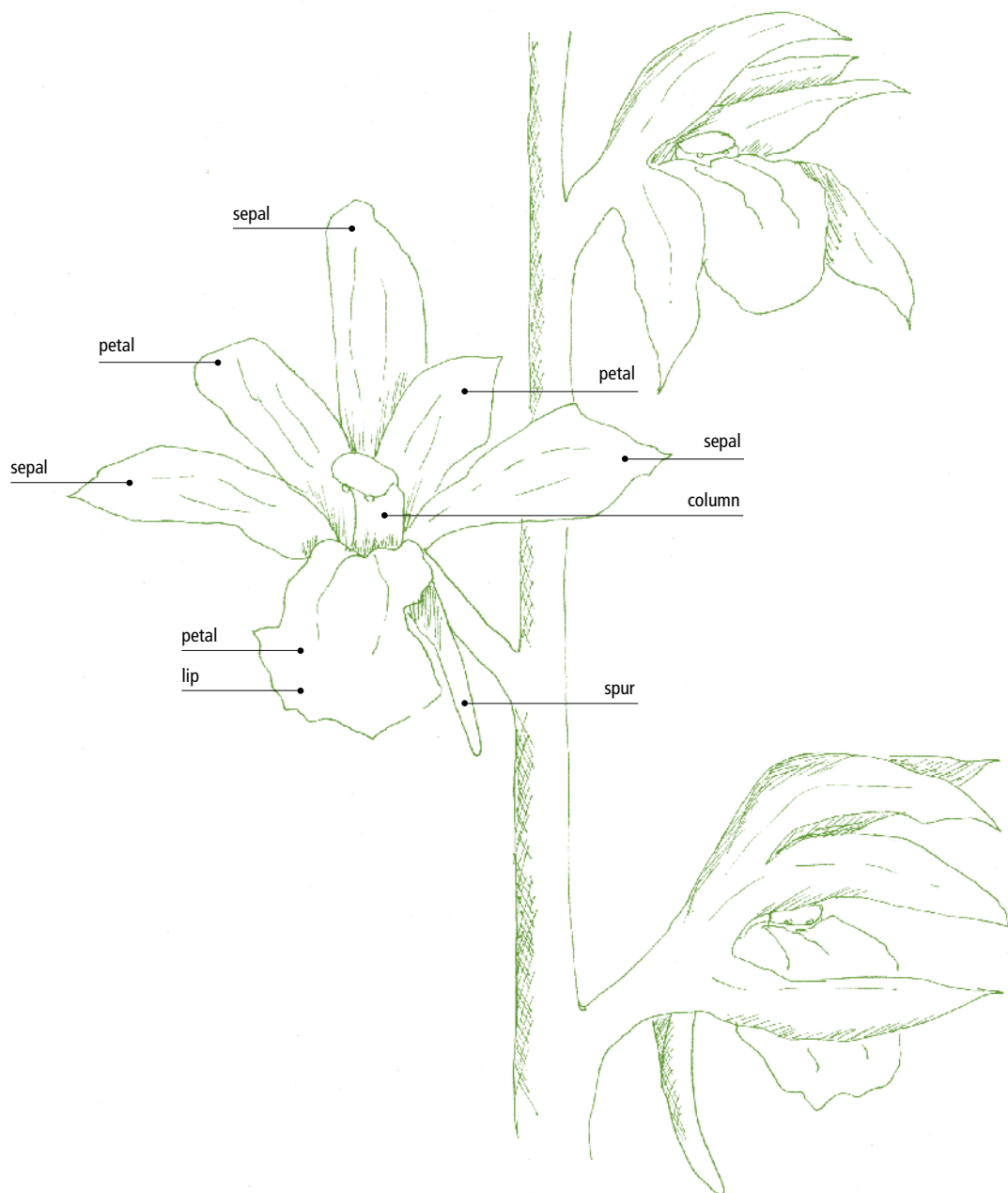
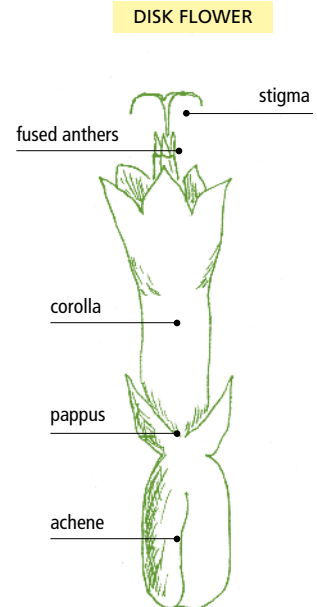
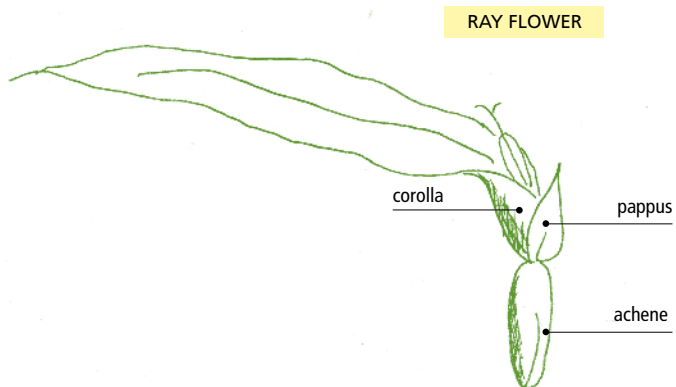
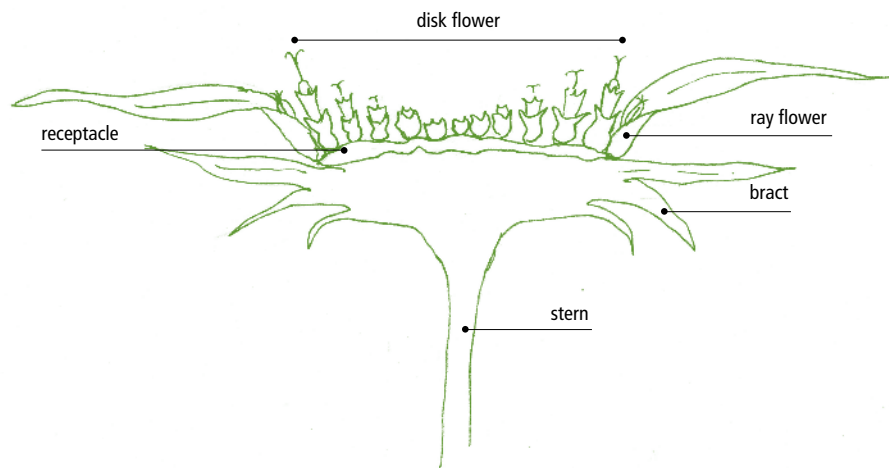


Illustration Credit: Leah McGraw

## PARTS OF A TYPICAL FLOWER FROM THE ASTER FAMILY



# PARTS OF A REGULAR FLOWER

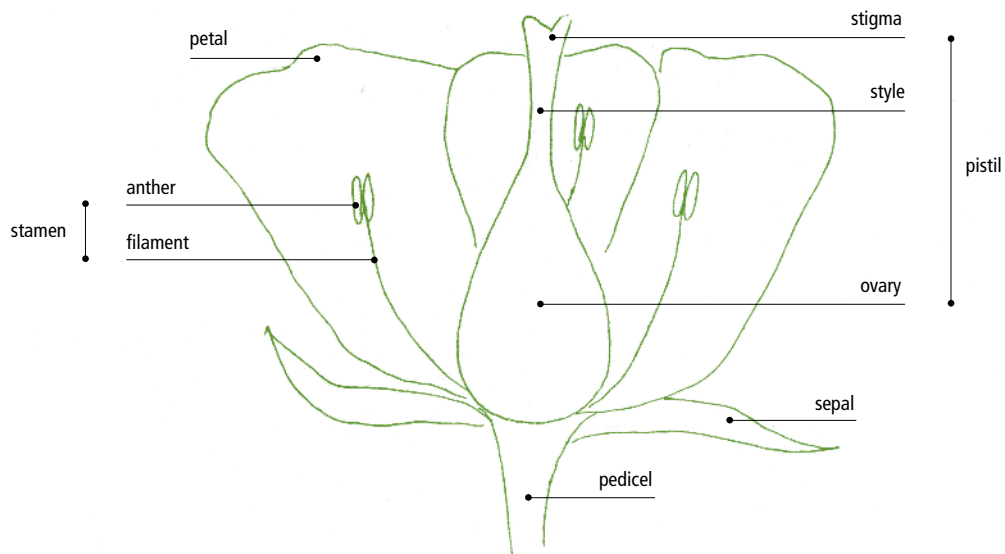
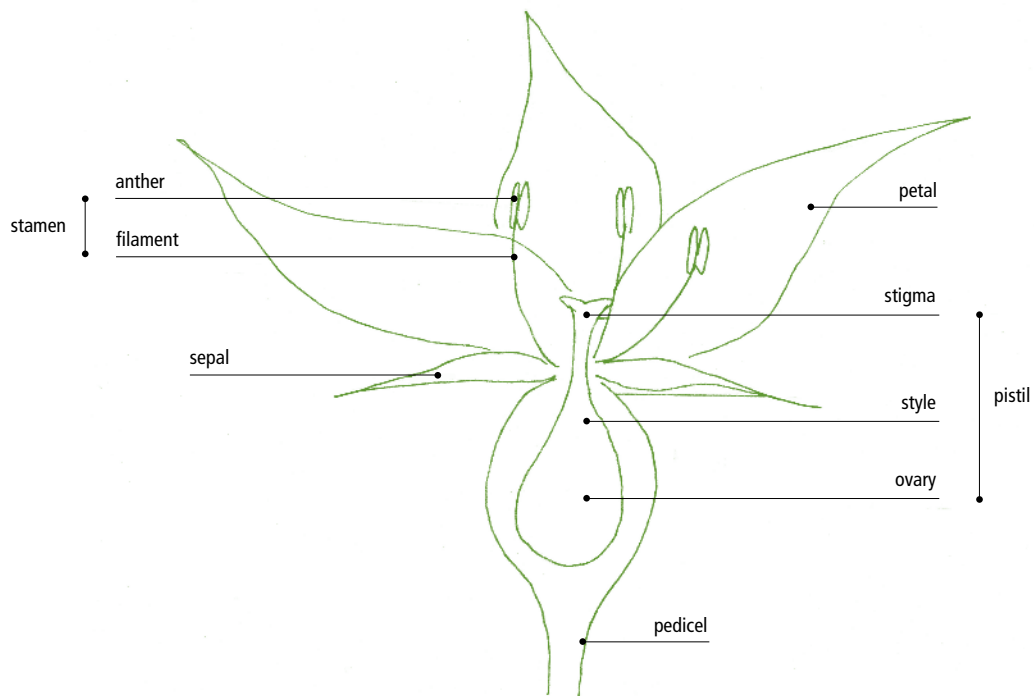
**SUPERIOR OVARY****INFERIOR OVARY**

Illustration Credit: Leah McGraw





