



## **Species and Ecosystems at Risk in the Resort Municipality of Whistler 2018 Update**

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## Notes about this report

The data and conclusions presented here concerning species at risk in the Resort Municipality of Whistler (RMOW) are the culmination of more than a decade of work with the Whistler Biodiversity Project. The classification for each species is based on data compiled by the Whistler Biodiversity Project, from the BC Conservation Data Centre (CDC), other online and printed sources, and the experts mentioned below and referenced in the report. I chose to be as definitive as possible about the likelihood and, perhaps as importantly, non-likelihood of species at risk in the RMOW. This intention means that some species labelled, for example, “Likely” may never be found in the RMOW and some labelled “Unlikely” may eventually be found. Even more probable is that additional species, including some at-risk, will be documented in the coming years even though they are not currently listed in the RMOW by the CDC.

The uncertainty surrounding the distribution of species, whether at risk or not, is always an interesting challenge for biologists, and species often occur in unexpected locations. These facts highlight the need for qualified surveyors who conduct surveys for the species groups of interest at appropriate times and with appropriate protocols. Species at risk surveys require biologists with expertise in each targetted group and all such people I’ve been lucky enough to work with are delighted to prove a list incomplete by finding new species or correcting past data. Future versions of the lists presented here will undoubtedly decrease any errors and omissions as well as hone the accuracy of which species at risk and habitats should be considered for protection during conservation planning and the RMOW development process.

## Acknowledgements

When I started the Whistler Biodiversity Project in late 2004, a comprehensive list as presented here was one of my major goals. The results presented here would not have been possible without the contributions of the many scientists and volunteers listed in Appendix 3, notably the expert surveyors for the Whistler Biodiversity Project and the volunteer scientists with Whistler BioBlitz and Fungus Among Us. All three of those efforts would not be possible without support from the Community Foundation of Whistler (CFOW), Resort Municipality of Whistler (RMOW), Association of Whistler-Area Residents for the Environment (AWARE), Whistler Blackcomb EFund, and others.

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**Cover Photo:** A Western Screech-Owl videoed in February 2019 near Alta Lake Road (video screenshot courtesy of Mark Beaven).

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## Executive Summary

This report presents a 2018 update for the Resort Municipality of Whistler's (RMOW) first comprehensive list of species at risk published in 2016 and updated in 2017. It combines and updates local data collated by the Whistler Biodiversity Project (including important contributions from the Whistler Naturalists' BioBlitz), the knowledge of many experts, RMOW records, and museum and government data.

Part of the need for this report and the lists it presents is that the main source of information for species at risk in BC, the BC Conservation Data Centre (CDC), has less information about local species than has been compiled by the Whistler Biodiversity Project from targeted surveys, 12 years of Whistler BioBlitz, museum searches, and other sources. This statement is not meant to be controversial. It is just a fact that the CDC is too underfunded and understaffed to be able to collate all known data in BC, let alone conduct extensive surveys to significantly expand what is already known. As a result, online searches at the CDC website yield false positives (species which are unlikely or impossible in the RMOW) and false negatives (species which have been confirmed, likely, or possible but are not included in CDC searches).

This report includes the following updates since the 2017 report:

- Updated species rankings by the BC Conservation Data Centre (CDC) including the downlisting of 19 species (now ranked Yellow, or not at risk) and delisting of three species.
- Updated species rankings under Federal Species At Risk (SARA) legislation.
- A new section that includes all non-resident birds that are also species at risk. The purpose of this section is to help which non-resident birds require specific habitat(s) in Whistler during their migration.

A total of 177 species at risk were included in the 2018 report. This number includes species that have already been Confirmed in the RMOW, others that specialists considered Likely or Possible, and also species that are returned by the finest-scale CDC search for species at risk in the Whistler area (many of which are Unlikely to Not Possible). Totals for 2018 include the following (2017 totals in parentheses):

- 58 (70) Confirmed species within the RMOW;
- 12 (10) Likely species;
- 11 (n/a) Migratory bird species (annual or biannual presence).
- 2 (2) Data Deficient;
- 2 (0) Extirpated species.
- 23 (24) Possible species.
- 34 (46) Unlikely to Not possible species.
- 16 (n/a) Casual and Accidental bird species (without significant or and/or annual presence).

The report suggests that Confirmed species be given highest priority during conservation planning and also that Likely and Migratory species should also be considered. This approach would mean 81 species would be included as conservation priorities and the other 96 species included in this report would be excluded as conservation priorities, at least until new data changes this recommendation.

With 2018 updates, there are now seven Red-listed and 12 Blue-listed ecosystems in the RMOW. This total includes all but three forested ecosystems that occur in the area as well as two wetland ecosystems. Approximately half of this total is comprised of ecosystems in the Coastal Western Hemlock Southern Dry Submaritime Variant which borders the southern boundary of the RMOW. It is likely that at least some of that Variant occurs within the extreme southern part of the RMOW and certain that it occurs south of the RMOW border within the southernmost part of the Cheakamus Community Forest.

These updated lists of species and ecosystems at risk will help focus limited resources on species and their habitats that are most likely to be threatened by human actions and development within the RMOW. Future surveys targeted to a range of understudied species groups would certainly document additional species, some at-risk, and should therefore also be a priority. The following three pages list the status of species at risk considered in this report. The next page lists ecosystems at risk in the RMOW. These lists are updated to the end of 2018. The final page of the of the Executive Summary includes a Glossary of Terms used in the report.

Species at risk that have been **Confirmed** within the RMOW:

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA
Animals - Invertebrate	Butterflies	<i>Callophrys eryphon</i> ssp. <i>sheltonensis</i>	Western Pine Elfin, sheltonensis ssp.	Blue		
		<i>Parnassius clodius</i> ssp. <i>pseudogallatinus</i>	Clodius Parnassian, pseudogallatinus ssp.	Blue		
Animals - Vertebrate	Amphibians	<i>Anaxyrus boreas</i>	Western Toad	Yellow		SC/SC
		<i>Ascaphus truei</i>	Coastal Tailed Frog	Yellow	Yes	SC/SC
		<i>Rana aurora</i>	Northern Red-legged Frog	Blue	Yes	SC/SC
	Birds	<i>Accipiter gentilis</i> ssp. <i>laingi</i>	Northern Goshawk, laingi ssp.	Red	Yes	T/T
		<i>Ardea herodias</i> ssp. <i>fannini</i>	Great Blue Heron, fannini ssp.	Blue	Yes	SC/SC
		<i>Butorides virescens</i>	Green Heron	Blue		
		<i>Chordeiles minor</i>	Common Nighthawk	Yellow		SC/T
		<i>Coccythraustes vespertinus</i>	Evening Grosbeak	Yellow		SC/SC
		<i>Contopus cooperi</i>	Olive-sided Flycatcher	Blue		SC/T
		<i>Cypseloides niger</i>	Black Swift	Blue		E/pending
		<i>Hirundo rustica</i>	Barn Swallow	Blue		T/T
		<i>Megascops kennicottii kennicottii</i>	Western Screech-Owl, kennicottii ssp.	Blue		T/T
		<i>Patagioenas fasciata</i>	Band-tailed Pigeon	Blue		SC/SC
	Fish	<i>Salvelinus confluentus</i> pop. 28	Bull Trout - South Coast Population	Blue	Yes	SC/pending
	Mammals	<i>Gulo gulo luscus</i>	Wolverine, luscus ssp.	Blue	Yes	SC/SC
		<i>Myotis keenii</i>	Keen's Myotis	Blue	Yes	DD/SC
		<i>Myotis lucifugus</i>	Little Brown Myotis	Yellow		E/E
		<i>Oreamnos americanus</i>	Mountain Goat	Blue		
		<i>Ursus arctos</i>	Grizzly Bear	Blue	Yes	SC/SC
Fungi	Lichens	<i>Ahtiana sphaerosporella</i>	mountain candlewax	Blue		
		<i>Alectoria imshaugii</i>	spiny witch's hair	Blue		
		<i>Fuscopannaria leucostictoides</i>	frosted crackers	Blue		
		<i>Hypogymnia canadensis</i>	canuckle bone	Blue		
		<i>Nodobryoria subdivergens</i>	alpine redhead	Blue		
		<i>Sphaerophorus globosus</i>	arctic coral	Blue		
		<i>Stereocaulon glareosum</i>	alpine soil foam	Blue		
		<i>Umbilicaria decussata</i>	electric rocktripe	Blue		
Plants	Liverworts	<i>Umbilicaria krascheninnikovii</i>	lesser salted rocktripe	Blue		
		<i>Haplomitrium hookeri</i>	liverwort	Blue		
		<i>Jungermannia atrovirens</i>	liverwort	Blue		
		<i>Nardia breidlerii</i>	liverwort	Blue		
		<i>Nardia compressa</i>	liverwort	Blue		
		<i>Nardia geoscyphus</i>	liverwort	Blue		
		<i>Scapania curta</i>	liverwort	Blue		
		<i>Scapania obscura</i>	liverwort	Blue		
	Mosses	<i>Solenostoma confertissimum</i>	liverwort	Red		
		<i>Tritomaria polita</i> ssp. <i>polita</i>	liverwort	Blue		
		<i>Brachydontium olympicum</i>	Olympic brachydontium moss	Red		
		<i>Brachythecium holzingeri</i>	Holzinger's brachythecium moss	Blue		
		<i>Bryum pallescens</i>	tall-clustered thread-moss	Blue		
		<i>Grimmia caespiticia</i>	grimmia moss	Blue		
		<i>Grimmia donniana</i>	Donn's grimmia	Blue		
		<i>Grimmia incurva</i>	black grimmia	Red		
		<i>Homalothecium nevadense</i>	Nevada homalothecium moss	Blue		
		<i>Hygrohypnum alpinum</i>	alpine hygrohypnum moss	Blue		
		<i>Orthotrichum pylaisii</i>	Pylais' orthotrichum moss	Blue		
		<i>Pohlia cardotii</i>	Cardot's pohlia moss	Blue		
		<i>Pseudoleskea radicata</i> var. <i>pallida</i>	pseudoleskea moss	Blue		
		<i>Racomitrium pygmaeum</i>	pygmy racomitrium moss	Blue		
		<i>Schistidium crassipilum</i>	thickpoint grimmia	Blue		
		<i>Tripterocladium leucocladulum</i>	tripterocladium moss	Blue		
	Vascular Plants	<i>Botrychium ascendens</i>	upswept moonwort	Blue		
		<i>Cryptogramma cascadiensis</i>	Cascade parsley fern	Blue		
		<i>Pinus albicaulis</i>	whitebark pine	Blue		E/E
		<i>Pyrola elliptica</i>	shinleaf wintergreen	Blue		
		<i>Utricularia ochroleuca</i>	ochroleucous bladderwort	Blue		

Species at risk that are **Likely** in the RMOW but not yet recorded:

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA
Invertebrate	Snail - Terrestrial	<i>Pristiloma arcticum?</i>	Northern Tightcoil	Blue		
Vertebrate	Mammal	<i>Cervus elaphus roosevelti</i>	Roosevelt Elk	Blue		
Fungus	Lichens	<i>Leptogium californicum</i>	midlife vinyl	Blue		
Fungus		<i>Peltigera gowardii</i>	northwest waterfan	Red		SC/SC
Plant	Liverworts	<i>Marchantia alpestris</i>	liverwort	Blue		
		<i>Scapania scandica</i> var. <i>scandica?</i>	liverwort	Blue		
	Mosses	<i>Bryum alpinum?</i>	alpine thread-moss	Red		
		<i>Bryum schleicheri?</i>	Schleicher's thread-moss	Blue		
		<i>Grimmia anomala</i>	grimmia dry rock moss	Blue		
		<i>Pseudoleskea incurvata</i> var. <i>tenuetis</i>	brown leskea moss	Red		
		<i>Racomitrium affine?</i>	lesser fringe-moss	Blue		
		<i>Tortula leucostoma</i>	desmatodon moss	Blue		

**Migratory, Non-Resident Birds** that use Whistler habitats in spring and/or fall and therefore may require consideration during conservation planning:

Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA
<i>Aechmophorus occidentalis</i>	Western Grebe	Red		SC/SC
<i>Clangula hyemalis</i>	Long-tailed Duck	Blue		
<i>Cygnus columbianus</i>	Tundra Swan	Blue		
<i>Gavia adamsii</i>	Yellow-billed Loon	Blue		NAR
<i>Hydroprogne caspia</i>	Caspian Tern	Blue		NAR
<i>Larus californicus</i>	California Gull	Blue		
<i>Melanitta americana</i>	Black Scoter	Blue		
<i>Melanitta perspicillata</i>	Surf Scoter	Blue		
<i>Numenius americanus</i>	Long-billed Curlew	Blue	Yes	SC/SC
<i>Podiceps auritus</i>	Horned Grebe	Yellow		SC/SC

Species at risk that are **Data Deficient** or **Extirpated** in the RMOW:

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA
Data	Fish	<i>Oncorhynchus clarkii clarkii</i>	Coastal Cutthroat Trout	Blue		
Deficient	Vascular Plant	<i>Muhlenbergia racemosa</i>	satin grass	Unknown		
Extirpated?	Bird	<i>Riparia riparia</i>	Bank Swallow	Yellow		T/T
Extirpated	Bird	<i>Strix occidentalis</i>	Spotted Owl	Red	Yes	E/E

Species at risk that are **Possible** in the RMOW but not yet recorded:

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA
Invertebrate	Dragonfly	<i>Tanypteryx hageni</i>	Black Petaltail	Blue		
	Bee	<i>Bombus occidentalis ssp. occidentalis</i>	Western Bumble Bee	Blue		T/
	Butterfly	<i>Parnassius clodius ssp. claudianus</i>	Clodius Parnassian, claudianus ssp.	Blue		
	Molluscs - Freshwater	<i>Physella propinqua</i>	Rocky Mountain Physa	Blue		
		<i>Physella virginea</i>	Sunset Physa	Blue		
		<i>Sphaerium striatinum</i>	Striated Fingernailclam	Blue		
Vertebrate	Bird	<i>Falco peregrinus anatum</i>	Peregrine Falcon, anatum ssp.	Red		SC/SC
	Mammals	<i>Corynorhinus townsendii</i>	Townsend's Big-eared Bat	Blue		
		<i>Pekania pennanti</i>	Fisher	Blue	Yes	
	Reptile	<i>Charina bottae</i>	Northern Rubber Boa	Yellow		SC/SC
Fungi	Lichens	<i>Leptogium polycarpum</i>	peacock vinyl	Yellow		SC/SC
		<i>Pannaria rubiginosa</i>	considerable gingerbread	Red		
		<i>Stereocaulon pileatum</i>	pixie foam	Red		
Plant	Liverwort	<i>Frullania hattoriana</i>	liverwort	Blue		
	Mosses	<i>Andreaea heinemannii</i>	Heinemann's andreaea moss	Red		
		<i>Atrichum tenellum</i>	slender smoothcap moss	Red		
		<i>Bryum calobryoides</i>	bryum moss	Red		
		<i>Pohlia andalusica</i>	Roth's thread-moss	Red		
		<i>Pohlia tundrae</i>	tundra pohlia moss	Red		
		<i>Trematodon asanoi</i>	Boas' long-necked moss	Blue		
	Vascular Plants	<i>Botrychium spathulatum</i>	spoon-shaped moonwort	Blue		
		<i>Carex praeceptorum</i>	teacher's sedge	Blue		
		<i>Isoetes fletti</i>	Flett's quillwort	Red		

**Ecosystems at Risk** in the RMOW.

Site Series	Common Name	Scientific Name	BC List	ID Wildlife
CWHds1/01	Western Hemlock - Douglas-fir / Electrified Cat's-tail Moss ds1	<i>Tsuga heterophylla</i> - <i>Pseudotsuga menziesii</i> / <i>Rhytidiadelphus triquetrus</i> ds1	Blue	Yes
CWHms1/01	Western Hemlock - Amabilis Fir / Step Moss	<i>Tsuga heterophylla</i> - <i>Abies amabilis</i> / <i>Hylocomium splendens</i>	Blue	
CWHds1/02	Douglas-fir - Lodgepole Pine / Kinnikinnick Dry Submaritime	<i>Pseudotsuga menziesii</i> - <i>Pinus contorta</i> / <i>Arctostaphylos uva-ursi</i> Dry Submaritime	Red	
CWHms1/02	Douglas-fir - Lodgepole Pine / Kinnikinnick Moist Submaritime	<i>Pseudotsuga menziesii</i> - <i>Pinus contorta</i> / <i>Arctostaphylos uva-ursi</i> Moist Submaritime	Blue	
CWHds1/03; CWHms1/03	Douglas-fir - Western Hemlock / Falsebox	<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Paxistima myrsinites</i>	Blue	
CWHds1/04	Douglas-fir / Douglas maple / Hooker's Fairybells	<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> / <i>Prosartes hookeri</i>	Red	
CWHms1/04	Amabilis Fir - Western Redcedar / Oak Fern	<i>Abies amabilis</i> - <i>Thuja plicata</i> / <i>Gymnocarpium dryopteris</i>	Blue	
CWHds1/05	Western Redcedar - Douglas-fir / Vine Maple	<i>Thuja plicata</i> - <i>Pseudotsuga menziesii</i> / <i>Acer circinatum</i>	Blue	Yes
CWHds1/06	Western Hemlock / Queen's Cup	<i>Tsuga heterophylla</i> / <i>Clintonia uniflora</i>	Red	
CWHms1/06	Amabilis Fir - Western Redcedar / Devil's Club Moist Submaritime	<i>Abies amabilis</i> - <i>Thuja plicata</i> / <i>Oplopanax horridus</i> Moist Submaritime	Blue	
CWHds1/07	Western Redcedar / Devil's Club	<i>Thuja plicata</i> / <i>Oplopanax horridus</i>	Blue	Yes
CWHms1/07	Sitka Spruce / Salmonberry Moist Submaritime	<i>Picea sitchensis</i> / <i>Rubus spectabilis</i> Moist Submaritime	Red	
CWHds1/08	Sitka Spruce / Salmonberry Dry	<i>Picea sitchensis</i> / <i>Rubus spectabilis</i> Dry	Red	
CWHms1/08, CWHds1/09	Black Cottonwood - Red Alder / Salmonberry	<i>Populus trichocarpa</i> - <i>Alnus rubra</i> / <i>Rubus spectabilis</i>	Blue	
CWHms1/09	Black Cottonwood / Sitka Willow – Thimbleberry	<i>Populus trichocarpa</i> / <i>Salix sitchensis</i> - <i>Rubus parviflorus</i>	Red	
CWHds1/10	Black Cottonwood / Willows Dry Submaritime	<i>Populus trichocarpa</i> / <i>Salix</i> spp. Dry Submaritime	Blue	
CWHms1/11, CWHds1/12	Western Redcedar - Sitka Spruce / Skunk Cabbage	<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Lysichiton americanus</i>	Blue	
CWH/Ws51	Sitka Willow - Pacific Willow / Skunk Cabbage	<i>Salix sitchensis</i> - <i>Salix lasiandra</i> var. <i>lasiandra</i> / <i>Lysichiton americanus</i>	Red	
CWH/Wm04	Common Spike-Rush Herbaceous Vegetation	<i>Eleocharis palustris</i> Herbaceous Vegetation	Blue	

## Glossary of Terms

<b>Term</b>	<b>Definition</b>
<b>Resident?</b>	Does the species have a year-round or annual, seasonal presence in the RMOW?
<b>Breeds in RMOW</b>	This category applies only to wide-ranging species including birds, large mammals, and bats. For birds, local breeding is the main determinant of the importance of Whistler habitat.
<b>Important Habitat</b>	This category records an estimate of whether one or more specific habitat types within the RMOW are necessary for a species to continue to inhabit the area. More information about habitat requirements for each species at risk is needed to improve the accuracy of this determination.
<b>Confirmed</b>	Species at risk with at least one confirmed record in the RMOW. For large-ranging species such as birds and large mammals, this category is somewhat less straightforward and inclusion requires significant use of habitat in the RMOW for at least part of the year even if not nesting or denning within the RMOW.
<b>Likely</b>	Species at risk not yet confirmed in the RMOW with >75% (approximately) likelihood to be found in targeted surveys. That is, at least three out of four of these species should eventually be found in the RMOW and the others will be (or have been) documented in nearby or in similar habitats.
<b>Data Deficient (DD)</b>	There is not enough information about some species at risk to ascertain their current status within the RMOW. The 2018 report includes two Data Deficient species: Coastal Cutthroat Trout ( <i>Oncorhynchus clarkii clarkii</i> ) and satin grass ( <i>Muhlenbergia racemosa</i> ; Table 4.3).
<b>Extirpated</b>	A species that has been recorded within the RMOW in the past but which: (a) no longer occurs; and (b) is unlikely to re-establish in the future.
<b>Possible</b>	Species at risk not yet confirmed in the RMOW with a low probability of occurring in the RMOW. Although there is no particular reason they couldn't occur, there is also no data that strongly suggests they would. Only a small portion of the species in this category is likely to be documented in the RMOW regardless of search effort.
<b>Unlikely</b>	Species at risk that have a very low probability of occurring in the RMOW but are not impossible. If species in this category are eventually found in the RMOW, they would represent large range extensions (e.g., Pacific Water Shrew). This term also includes species that are Highly Unlikely to occur (due to habitat requirements and current range) but are not impossible.
<b>Not Possible</b>	Species that, given current data, have no chance of occurring in the RMOW due to habitat types that are not in Whistler.
<b>Seasonal</b>	This term includes birds that have a significant local presence during non-winter months but have not been confirmed to breed locally (e.g., Great Blue Heron). It mainly includes migratory birds.
<b>Migratory (Birds)</b>	A bird species that migrates through Whistler in spring and/or fall, and in all or most years. Since these species use Whistler habitats, they should ideally be included in conservation planning.
<b>Seasonal (Birds)</b>	Three types of birds use Whistler habitat seasonally. Migratory birds that breed in Whistler are generally present from late April/early May through early fall. Migratory birds that do not breed in Whistler pass through during spring and fall migrations. Non-breeding birds are a third type of seasonal species. The Great Blue Herons seen during the summer, for example, appear to be non-breeding individuals (breeding in the RMOW is possible but hasn't been confirmed).
<b>Casual (Birds)</b>	"1 to 10 birds per year. Not seen every year" (Ricker et al. 2014). These species do not have enough of a presence in Whistler to be a conservation concern.
<b>Accidental (Birds)</b>	"Only one on record for season noted" (Ricker et al. 2014). These species are generally far out of range and therefore not a conservation concern within the RMOW.



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## 1.0 Introduction

### 1.1 Background and Report Goals

Whistler's first comprehensive list of species and ecosystems at risk in the Resort Municipality of Whistler (RMOW) was published in 2016 (Brett 2016a<sup>1</sup>). It analyzed 150 species and grouped them into five classes based on their likelihood of being resident in the RMOW: Confirmed, Likely, Probable, Unlikely, and Not Possible. The intention of that classification was to better direct conservation efforts on species known or likely to be in the RMOW.

The 2016 report documented some of the challenges in determining which species at risk occur or are likely to occur in the Whistler area. In particular, it described current strengths and weaknesses of the CDC's Species and Ecosystem Explorer for planners, developers, and scientists working to conserve species and their habitats. The biggest challenge is that the Species and Ecosystem Explorer does not have complete and accurate species locations and can therefore return results for the RMOW area that include both false positives and false negatives. The 2017 report (Brett 2017) and this updated 2018 report do not include the extended discussion of the CDC.

The 2016 report also described how new data compiled by the Whistler Biodiversity Project (WBP) was an essential precursor to the first comprehensive list of species at risk in the RMOW.<sup>2</sup> That dataset includes 354 detailed and georeferenced records of species at risk which were submitted to the Conservation Data Centre<sup>3</sup> (CDC) as part of the 2017 update. Once that data is added to the CDC's database, the accuracy of their Species and Ecosystem Explorer will be improved. Even then, this report and future updates should also be consulted for the latest information and analysis.

This report updates species and ecosystems at risk in the RMOW to the end of 2018. Its goals were to:

1. Update species and ecosystem listings (changes, additions, and deletions) that occurred in the last year;
2. Add any species documented in 2018 by Whistler BioBlitz, the Whistler Biodiversity Project, and other sources.
3. Reassess the likelihood to occur for species not yet documented in the RMOW.
4. Provide suggestions and content to allow better species at risk resources on the RMOW website.

The main change in 2018 was the CDC's downlisting or delisting of 20 species now considered Secure (Yellow list) and the delisting of two species no longer considered to occur at all in BC. These changes reflect new knowledge about these species since their original listings.<sup>4</sup> More details about which species were affected by these changes are included in Section 3.3.

This report also includes the first attempt to assess the use of habitat in the RMOW by species at risk that are non-resident birds. These 27 bird species have been documented in Whistler (Ricker et al. 2014) but only annual migrators are likely to require specific habitats while passing through.

Section 4 presents the updated list of species at risk in the RMOW. See Appendix 2 for a detailed description of how the determinations of 2018 status were made.

#### Readers' Note:

For most readers, this 2018 update effectively replaces the 2016 and 2017 versions since most sections have been retained and updated. Two sections from the 2016 report are not included here: (1) a detailed account of the strengths and weaknesses of using the CDC's Species and Ecosystem Explorer; and (2) comparisons to earlier reports that dealt with potential habitat for species at risk (Leigh-Spencer 2004; Green et al. 2005).

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<sup>1</sup> [https://www.whistler.ca/sites/default/files/2017/Oct/related/22976/2016\\_species\\_at\\_risk\\_in\\_the\\_rmow\\_final.pdf](https://www.whistler.ca/sites/default/files/2017/Oct/related/22976/2016_species_at_risk_in_the_rmow_final.pdf).

<sup>2</sup> Primary sources for that data were targetted surveys by the WBP since 2004, the Whistler Naturalists' BioBlitz and Fungus Among Us, and online searches of museum and university databases.

<sup>3</sup> BC Species and Ecosystem Explorer (CDC 2019). URL: <http://a100.gov.bc.ca/pub/eswp/>.

<sup>4</sup> Curtis Björk, by email, June 7, 2018

## 1.2 Legislation and Terminology for Species at Risk

Municipalities have struggled with an increasing maze of legislation, strategies, plans, and guidelines introduced at Federal and Provincial levels, including the Species at Risk Act (SARA 2018), the Migratory Birds Convention Act (MBCA 2018), conservation threat assessments by the BC Conservation Data Centre (Red and Blue listings in particular; CDC 2019), the Identified Wildlife Management Strategy (BC MOE 2019a), as well as species-specific Management Plans, Recovery Strategies, and Implementation Plans. These initiatives don't provide municipalities clear guidance about their legal obligations nor tools to implement conservation goals (SAR LGWG 2011, 2012, 2013; Bedore 2014).

Leigh-Spencer (2004; Table 1.1) discussed a number of different ways a species can be determined to be "at risk." At the Provincial level, risks to a species are identified three ways: (i) by Red and Blue lists; (ii) as Identified Wildlife under the Forest and Range Practices Act; and (iii) under the Provincial Wildlife Act. At the Federal level, species at risk are identified by: (i) the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); (ii) the Species at Risk Act (SARA); and/or (iii) the Migratory Bird Conventions Act (MBCA).

**TABLE 1.1:** Summary of Federal and Provincial species at risk jurisdictions, legislative frameworks, and means of protections (Leigh-Spencer 2004, p. 2 and Green et al. 2005, pp. 2-3, with minor updates to 2018).

Jurisdiction	Responsible Agency	Legislative Framework	Form of Protection	Ranking System (risk of extinction)
Federal	COSEWIC (Committee on the Status of Endangered Wildlife in Canada)	Species at Risk Act (SARA, 2018)	Recovery Strategies are required for extirpated, endangered and threatened species and Management Plans for species of concern. Protecting species from being killed and protecting "residences" is paramount.	<p><b>Endangered:</b> species facing imminent extirpation or extinction<sup>5</sup>;</p> <p><b>Threatened:</b> species likely to become endangered if nothing is done to reverse factors leading to its extirpation or extinction.</p> <p><b>Special Concern:</b> species that may become threatened or endangered because of a combination of biological characteristics and identified threats.<sup>6</sup></p>
British Columbia	NatureServe and CDC (Conservation Data Centre)		Provide an objective ranking system based on all sources of credible information regarding distribution, abundance, trends and threats.	S = Provincial; N = National; G = Global; X = Extirpated or extinct; H = Historical 1=critically imperiled; 2=imperiled; 3=vulnerable; 4=apparently secure; 5=secure; ?=unranked; U=unrankable
	Province of BC, Ministry of Water, Land and Air Protection	Wildlife Act; BC Species at Risk Strategy (Endangered Species and Ecosystems in BC)	Red- listed (sometimes Blue-listed) species require special management attention by protecting critical habitat in the form of special management guidelines.  Wildlife Habitat Areas (WHA), General Wildlife Measures (GWM), and Higher Level Plans	<p><b>Red:</b> Any species or ecosystem that is at risk of being lost (Extirpated, Endangered or Threatened)</p> <p><b>Blue:</b> Any species or ecosystem that is of special concern (formerly Vulnerable).</p> <p><b>Yellow:</b> Any species or ecosystem that is secure.<sup>7</sup></p>
	Ministry of Water, Land and Air Protection	Forest and Range Practices Act  Identified Wildlife Management Strategy (IWMS)	Wildlife Habitat Areas (WHA), General Wildlife Measures, and Higher Level Plans	Schedule 1 species list (section 11 (1)) (May 6th, 2004): Red and Blue- listed species negatively affected by forest or range management on Crown Lands.

<sup>5</sup> Endangered and Threatened rankings are now based on quantitative thresholds defined in [http://www.cosewic.gc.ca/htmlDocuments/Assessment\\_process\\_and\\_criteria\\_e.pdf](http://www.cosewic.gc.ca/htmlDocuments/Assessment_process_and_criteria_e.pdf) (p. 11). Additional definitions are included in [http://www.cosewic.gc.ca/eng/sct2/sct2\\_6\\_e.cfm](http://www.cosewic.gc.ca/eng/sct2/sct2_6_e.cfm).

<sup>6</sup> <https://www.canada.ca/en/environment-climate-change/services/committee-status-endangered-wildlife/wildlife-species-assessment-process-categories-guidelines/status-categories.html>

<sup>7</sup> [https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre/explore-cdc-data/faq#red\\_blue\\_and\\_yellow](https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre/explore-cdc-data/faq#red_blue_and_yellow)

A similar summary was prepared by the South Coast Conservation Program (Bedore 2014; SCCP 2016). It adds helpful interpretations of the various processes, terms, and legislation that impact the management of species at risk in BC and is included with the kind permission of the SCCP<sup>8</sup> as an appendix to this report (Appendix 1).

#### Terminology for Species at Risk

The number of terms used to describe species at risk can cause confusion, and that confusion is sometimes compounded when some of these terms have both legal and more casual uses. Even the term “species at risk” may cause confusion to people who may be more familiar with the related terms “rare species” and “endangered species.”

For the purposes of this report, all species listed under any of BC or Canadian Government processes (Table 1.1; Appendix 1) are considered species at risk. The situation for ecosystems at risk is much easier since it is simply a BC process that assesses them similarly to the Red and Blue (or Yellow) listings for species.

“Wildlife” is another term that can cause confusion. In the past, the only species groups to be assessed and listed were animals (primarily game mammals and fish), so the legal and public uses of the term were the same. Now that a much wider range of species groups and ecosystems have been assessed, the meaning of the term has been wildly stretched so that butterflies, plants, and even ecological communities (ecosystems) can be labelled “Identified Wildlife.” Excepting that legally designated term, “wildlife” will not be used in this report.

To help reduce confusion, this report capitalizes terms when they refer to legal or other distinct categories, for example: Endangered, Threatened, Special Concern, Red-listed, and Blue-listed. It also extends that capitalization to the likelihood that a species is resident in the RMOW (as defined in Table 4.1), for example, Confirmed, Likely or Possible.

### **1.3 Sources of Species Data**

The process to rank species in BC and Canada includes a vast dataset and many experts. These efforts are published on BC’s very helpful Species and Ecosystem Explorer and on the Federal Species at Risk Public Registry.<sup>9</sup> These data are nonetheless incomplete due to the scale of effort needed to document species at risk which poses a challenge for municipalities when assessing conservation risks. The RMOW is fortunately ahead of many municipalities in Canada due to new sources of data including:

1. The Whistler Biodiversity Project (WBP) surveys and data collation since 2004 (Brett 2007; 2015; 2019).
2. Data generated by Fungus Among Us (since 2003) and Whistler BioBlitz (since 2007) which are incorporated into Whistler Biodiversity Project lists.
3. Greatly expanded access to data online, including museum collections and citizen science initiatives such as EBird, and EFlora and EFauna (Klinkenberg 2019a, b). Whistler data from these sources has been compiled and edited by the Whistler Biodiversity Project.

Scientific knowledge of species diversity has expanded greatly since E.O. Wilson (1988) promulgated the prospect that there were probably five to as many as 30 million species on the planet. Since then, scientists have continued to expand what is known about the diversity of species in various habitats, including the RMOW. Combined with this increase in scientific knowledge has been an increase in the belief that all species deserve to be protected from extirpation or extinction, especially by human causes. For these two reasons, the CDC continues to add species groups to its database, for example, mosses, liverworts, lichens, and insects (Section 3.3). Many of the species in these groups are currently unranked but threats to them will presumably be assessed as resources allow.

<sup>8</sup> P. Zevit, pers. comm.

<sup>9</sup> <http://a100.gov.bc.ca/pub/eswp/> and [https://wildlife-species.canada.ca/species-risk-registry/sar/index/default\\_e.cfm](https://wildlife-species.canada.ca/species-risk-registry/sar/index/default_e.cfm)

## 1.4 The Whistler Biodiversity Project

When Green et al. (2005) compiled their list of confirmed and possible species at risk in the RMOW, fewer than 500 species were publicly documented in Whistler (Brett 2016b). The majority of those species were vertebrates, mainly mammals, birds, and fish. Any information about other groups such as vascular plants and amphibians were not published or comprehensive.

Whistler's situation in 2005 was similar to that of many communities in BC. Most of the mammal and fish data was originally compiled by the BC Government, often with contributions from universities (especially UBC) and the Royal BC Museum. In Whistler, there is a wealth of vertebrate data starting in the 1920s from Ken Racey and, later, his son-in-law and namesake of the UBC Cowan Tetrapod Collection (2017), Ian McTaggart-Cowan (e.g., Racey and McTaggart Cowan 1935). The Whistler Naturalists and its predecessors (before 1999) are the main source of information about birds (Gotz et al. 1996, Ricker and Baines 2005; Ricker et al. 2009, 2014). The RMOW itself has also added to the amount known about species, especially in its partnerships with the Whistler Fish Stewardship Group and the BC Government.

The vast majority of species groups therefore remained mostly unknown in 2005, for example, fungi, lichens, mosses and liverworts, amphibians, reptiles, butterflies and moths, dragonflies, snails and slugs, spiders, other insects, etc. Even when past surveys had targetted some of these groups, the results of those surveys were not compiled or easily accessible. Due to three main sources of new data (Section 1.3), Whistler has access to more information about local species than almost any other community in BC or Canada.

The Whistler Biodiversity Project began in late 2004 and has been the primary source of new data, both through surveys and data compilation (Brett 2007; 2015; 2019). One of its primary goals was to improve the inventory of species in Whistler and thereby aid conservation planning. It engaged specialists in many species groups to conduct the first targetted surveys in a number of species groups, especially between 2005 and 2011. It also conducted the first comprehensive data searches from museums and universities in BC and across Canada. These surveys and data searches helped establish for the first time species lists in the species groups mentioned above. As of 2017, the total number of species known in Whistler is over 4,000 (Figures 1.1 and 1.2; Brett 2016b; 2019).

Starting in 2007, Whistler BioBlitz established itself as an essential source of new knowledge about local species.<sup>10</sup> BioBlitz is organized by the Whistler Naturalists to increase public interest in biodiversity and also provide real data from all the volunteer scientists who participate. The data from BioBlitz, compiled by the Whistler Biodiversity Project, has added over 1,400 species to the total list in just 12 years. The Whistler event is Canada's longest-running BioBlitz and has helped spawn similar events across BC. Its impact on local knowledge is apparent in the proportion of species documented in Whistler by source (Figure 1.1).

Fungus Among Us,<sup>11</sup> a Whistler Naturalists event that started in 2003 is another important source of information. Almost 900 species of fungi have been documented to date, mostly from this event (Figure 1.2; Brett 2019). Although fungi have not yet been assessed by the CDC, it is likely some are rare and threatened by human activities and therefore in need of protection. If and when they are assessed, this source of local information will be invaluable, as it was for mosses and lichens when they were assessed.

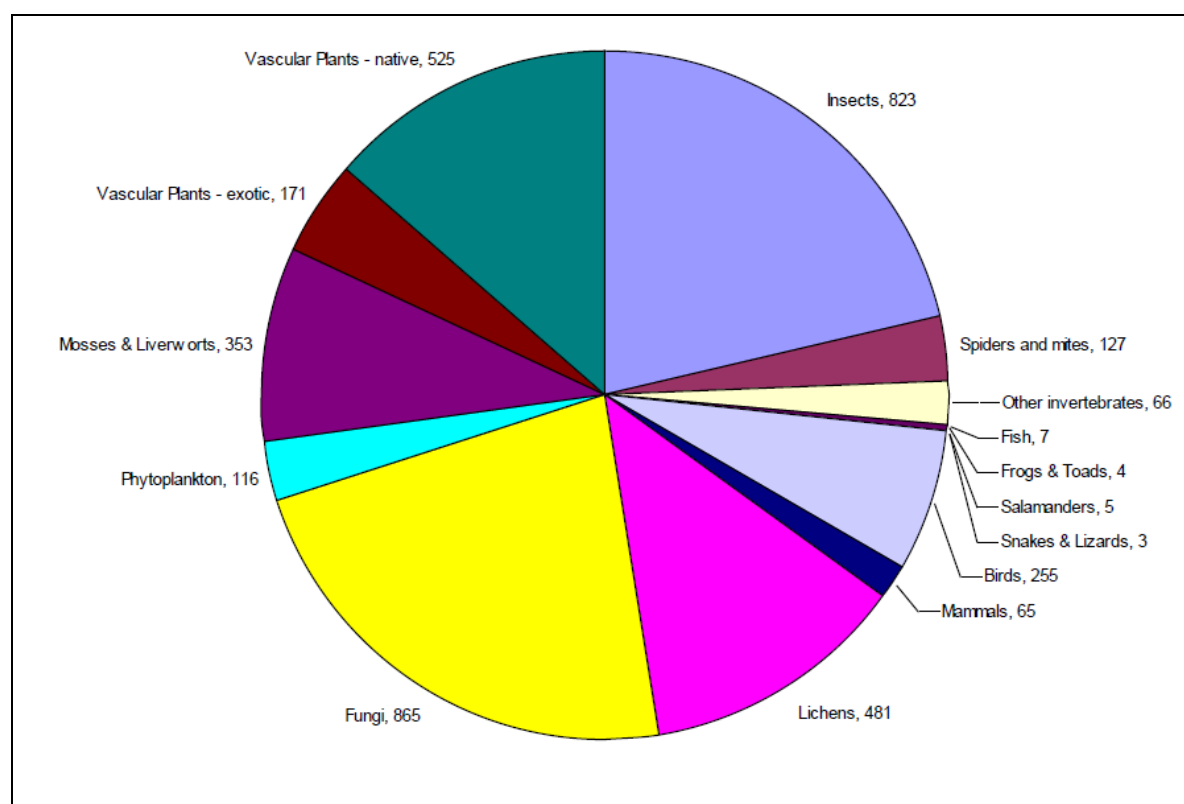
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<sup>10</sup> [www.whistlerbioblitz.ca](http://www.whistlerbioblitz.ca).

<sup>11</sup> [www.whistlernaturalists.ca](http://www.whistlernaturalists.ca)



**FIGURE 1.1:** Number of species documented in the RMOW by year and source through 2015 (Brett 2016b). The breakdown by source is estimated. The trends shown here have continued through 2018.



**FIGURE 1.2:** Number of species in Figure 1.1 by group (Brett 2016b). A similar chart updated to the end of 2018 would show a further decrease in the proportion of vertebrates due to the addition of many newly documented insects.

The other important source of species data has been databases from various collections, notably, the UBC Herbarium<sup>12</sup> (lichens, vascular plants, bryophytes, algae, and fungi), the UBC Cowan Tetrapod Collection,<sup>13</sup> and the Royal BC Museum (2017).<sup>14</sup> These and some other collections (e.g., Canadian Museum of Nature) were painstakingly searched early in the Whistler Biodiversity Project (Elke Wind in Brett 2007). Since then, there's been a large increase in the amount and quality of online data from many collections. It is likely that even more historic records will become available in the future from these and similar collections.

The RMOW is in an enviable position compared to many municipalities: it knows a great deal about the species that inhabit the area. As a result of new data since 2005, it can also determine with a high degree of certainty what other species are likely and, often as importantly, what is not likely or not possible in Whistler. The data presented here is more comprehensive and accurate than available through the BC Conservation Data Centre (CDC). That data gap will lessen when Whistler Biodiversity Project data delivered with this update is added to the CDC database. This report shows the essential role that municipal-level surveys and data compilation can play.

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<sup>12</sup> <http://www.biodiversity.ubc.ca/museum/herbarium/database.html>.

<sup>13</sup> <http://www.biodiversity.ubc.ca/museum/herbarium/database.html>.

<sup>14</sup> <http://search-collections.royalbcmuseum.bc.ca/>.

## 2.0 Species at Risk – Search Methods and Terminology

This report considers 178 species at risk total that were included if they:

- a) Were classified as at-risk by the BC (Red or Blue Listed by the CDC) and/or Canadian Government Endangered, Threatened, or Special Concern under COSEWIC;
- b) Had been documented at least once within or near the RMOW (Brett 2019);
- c) Were considered by specialists to be Likely or Possible within the RMOW (Appendix 2); and/or,
- d) Were returned by a search on the CDC Species and Ecosystems Explorer for species at risk in the Whistler area.<sup>15</sup>

The latter source is not very precise, both because the finest-scale search includes a much larger area than Whistler, and because it includes marine and other species that are Highly Unlikely or Not Possible in the RMOW. See Brett (2016a) for a more detailed discussion of the strengths and current weaknesses of CDC data.

A Glossary of Terms is included on page viii of this report (just before the Table of Contents). The definitions in the Glossary were used to classify species by their current status within the RMOW (e.g., Confirmed, Likely, etc.), and also more detailed information about habitat use (that is, whether they are resident, seasonal, breed in the RMOW, etc.). Refer to Appendix 2 for more detailed information about each species and rationales for their classification. Species classified as Unlikely to Not Possible are not included in Appendix 2 because they have such a low probability of occurring within the RMOW (this information is included as Section 3 in Brett 2016a).

Changes from the 2017 to 2018 lists are presented in Section 3. The updated 2018 list is presented in Section 4, and a comparison with past lists is presented in Section 5.

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<sup>15</sup> <http://a100.gov.bc.ca/pub/eswp/> The finest scale search at present includes: Red and Blue List + Squamish Forest District (DSQ) + Coastal Western Hemlock (CWH) + Mountain Hemlock (MH) + Coastal Mountain Alpine (CMA).



### 3.0 Species at Risk - Changes in 2018

#### 3.1 Internal Changes from 2017 to 2018

Significant internal changes from the 2017 report include:

1. The status of 20 species has been updated (Table 3.1) due to new information or a reassessment of past data.
2. Six of those 20 changes were terrestrial animals categorized as Not Possible in 2017. Although it is highly improbable any of these species would occur in Whistler, it is not impossible.
3. For the first time, the status of non-resident birds has been assessed with guidance from Karl Ricker. The resulting list includes 11 Migratory birds (species with an annual or bi-annual presence during migration, and therefore of potential conservation concern; Table 4.3) and 16 Casual and Accidental birds (species that do not have a significant presence in Whistler; Table 4.9).

**Table 3.1.** Internal changes in species status from 2017 to 2018.

Group 2	Species	Common Name	2017 Status	2018 Status	Notes
Bird	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Possible	Confirmed	<sup>16</sup>
Bird	<i>Megascops kennicottii kennicottii</i>	Western Screech-Owl, kennicottii ssp.	Possible	Confirmed	<sup>17</sup>
Lichen	<i>Sphaerophorus globosus</i>	arctic coral	Not Included	Confirmed	<sup>18</sup>
Liverwort	<i>Jungermannia atrovirens</i>	liverwort	Likely	Confirmed	<sup>19</sup>
Liverwort	<i>Solenostoma confertissimum</i>	liverwort	Not Included	Confirmed	<sup>20</sup>
Mammal	<i>Cervus elaphus roosevelti</i>	Roosevelt Elk	Possible	Likely	<sup>21</sup>
Liverwort	<i>Scapania scandica</i> var. <i>scandica</i> ?	liverwort	Confirmed	Likely	<sup>22</sup>
Moss	<i>Grimmia anomala</i>	grimmia dry rock moss	Possible	Likely	<sup>23</sup>
Moss	<i>Pseudoleskea incurvata</i> var. <i>tenuetis</i>	brown leskea moss	Possible	Likely	<sup>24</sup>
Fish	<i>Oncorhynchus clarkii clarkii</i>	Coastal Cutthroat Trout	Unlikely	Data Deficient	<sup>25</sup>
Bird	<i>Strix occidentalis</i>	Spotted Owl	Unlikely	Extirpated	<sup>26</sup>
Bird	<i>Riparia riparia</i>	Bank Swallow	Not Included	Extirpated?	<sup>27</sup>
Bird	<i>Falco peregrinus anatum</i>	Peregrine Falcon, anatum ssp.	Unlikely	Possible	<sup>28</sup>
Insect	<i>Epargyreus clarus</i> ssp. <i>californicus</i>	Silver-spotted Skipper, californicus ssp.	Not Possible	Unlikely	Highly Unlikely but not impossible.
Insect	<i>Erynnis propertius</i>	Propertius Duskywing	Not Possible	Unlikely	
Insect	<i>Euphyes vestris</i> (ssp. <i>vestris</i> )	Dun Skipper	Not Possible	Unlikely	
Herb	<i>Oenothera pallida</i> ssp. <i>pallida</i>	pale evening-primrose	Not Possible	Unlikely	
Herb	<i>Sidalcea hendersonii</i>	Henderson's checker-mallow	Not Possible	Unlikely	
Bird	<i>Melanitta perspicillata</i>	Surf Scoter	Confirmed	Migratory	<sup>29</sup>

<sup>16</sup> Confirmed but not seen every year (Karl Ricker, pers. comm., Dec. 2018).

<sup>17</sup> New data shows greater presence.

<sup>18</sup> Omitted in error in 2016 and 2017.

<sup>19</sup> UBC records from 1980 entered in 2014.

<sup>20</sup> Added 2018.

<sup>21</sup> Range is expanding into the RMOW (Steve Rochetta, pers. comm.).

<sup>22</sup> Alternative ssp. no longer Blue-listed.

<sup>23</sup> Based on comments from Steve Joya (pers. comm.).

<sup>24</sup> ibid.

<sup>25</sup> Differing opinions about current status.

<sup>26</sup> Highly improbable to re-inhabit the RMOW.

<sup>27</sup> Extirpated status based on Karl Ricker (pers. comm., Dec. 2018).

<sup>28</sup> Based on possible nesting at Soo Bluffs (Karl Ricker, pers. comm., Dec. 2018).

<sup>29</sup> Moved to new Migratory category.

### 3.2 Changes in Federal Species at Risk Lists

Three species considered in this report were listed under SARA in 2018, and listing under SARA is pending for another two species (Table 3.2).<sup>30</sup> A further two species, Common Nighthawk and Olive-sided Flycatcher were downlisted from Threatened to Special Concern by COSEWIC which means their listing under SARA is likely to change in future to match.

**TABLE 3.2.** Changes in Federal listings of species at risk that are considered in this report.

Change in 2018	RMOW Status	Group	Scientific Name	Common Name	2017	2018	Note
Listed under SARA	Likely	Lichen	<i>Peltigera gowardii</i>	northwest waterfan	SC/	SC/SC	1
	Possible		<i>Leptogium polycarpum</i>	peacock vinyl	SC/	SC/SC	2
	Unlikely	Dragonfly	<i>Argia vivida</i>	Vivid Dancer	SC/	SC/SC	3
Proposed for SARA listing	Confirmed	Bird	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	SC/	SC/prop.	4
		Fish	<i>Salvelinus confluentus</i> pop. 28	Bull Trout - South Coast Pop.	SC/	SC/prop.	5
Downlisted by COSEWIC	Confirmed	Bird	<i>Chordeiles minor</i>	Common Nighthawk	T/T	SC/T	6
			<i>Contopus cooperi</i>	Olive-sided Flycatcher	T/T	SC/T	7

**Notes:**

1. SARA listing in 2018 ([https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails\\_e.cfm?sid=1246](https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1246))
2. SARA listing in 2017 ([https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails\\_e.cfm?sid=1149](https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1149))
3. SARA listing in 2019 ([https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails\\_e.cfm?sid=1287](https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1287))
4. Proposed SARA listing (<http://gazette.gc.ca/rp-pr/p1/2018/2018-12-29/html/reg1-eng.html>)
5. Proposed SARA listing in 2019 (<http://gazette.gc.ca/rp-pr/p1/2019/2019-03-23/html/reg1-eng.html>).
6. Likely to be downlisted under SARA to match ([https://wildlife-species.canada.ca/species-risk-registry/document/dspHTML\\_e.cfm?ocid=13056](https://wildlife-species.canada.ca/species-risk-registry/document/dspHTML_e.cfm?ocid=13056))
7. Likely to be downlisted under SARA to match ([https://wildlife-species.canada.ca/species-risk-registry/document/dspHTML\\_e.cfm?ocid=13060](https://wildlife-species.canada.ca/species-risk-registry/document/dspHTML_e.cfm?ocid=13060))

### 3.3 Changes in Provincial (CDC) Species at Risk Lists

The CDC's most significant change in 2018 was the downlisting of 20 species (primarily lichens) from at-risk designation to Secure (Yellow list; CDC 2018; Table 3.3). One ecological community (ecosystem) was downlisted from Red to Blue (see Section 6.3), as was teacher's sedge (*Carex praeceptorum*). Three vascular plants were delisted, that is, no longer considered to occur within BC, at least until provenance can be confirmed. One of these delistings, *Muhlenbergia racemosa*, is likely an error which is why that species is included in Section 4 as Data Deficient<sup>31</sup> while the other two have been excluded from the Whistler list.

The CDC now has over 8,000 species of insects on their tracking list, including 2,457 moths and 74 wasps added in 2018 (CDC 2018). Very few of these insects have been assessed for conservation ranking. One exception, Western Bumblebee (*Bombus occidentalis*), remains on the 2018 RMOW list as a Possible resident.

<sup>30</sup> COSEWIC/SARA: 2019. Species at risk public registry – A to Z species index [https://wildlife-species.canada.ca/species-risk-registry/sar/index/default\\_e.cfm](https://wildlife-species.canada.ca/species-risk-registry/sar/index/default_e.cfm) accessed throughout 2018 and to May 20, 2019.

<sup>31</sup> Curtis Björk, by email, June 7, 2018. He also notes the population in the Whistler Wildlife Refuge may have been incorrectly identified by Hans Roemer as *M. racemosa* and instead is likely *M. glomerata* (which is not at-risk).

**Table 3.3.** Changes by the CDC (2018) since 2017 to listings of species at risk considered in this report.

Change	RMOW Status	Group	Scientific Name	Common Name	CDC 2017	CDC 2018	Note
Downlisted to Blue	Confirmed	Ecological Community	<i>Tsuga heterophylla</i> - <i>Pseudotsuga menziesii</i> /	western hemlock - Douglas-fir / electrified	Red	Blue	1
	Likely	Plant - Vascular	<i>Rhytidadelphus triquetrus</i> Dry Submaritime 1	cat's-tail moss Dry Submaritime 1	Red	Blue	3
Name change	Confirmed	Fish	<i>Salvelinus confluentus</i> pop. 28	Bull Trout - South Coast Population	Blue	Blue	2
Downlisted to Yellow (Not at Risk)	Confirmed	Lichen	<i>Allantoparmelia almqvistii</i>	lesser rock grub	Blue	Yellow	3
	Confirmed	Lichen	<i>Arctoparmelia incurva</i>	finger ring	Blue	Yellow	3
	Confirmed	Lichen	<i>Cladonia singularis</i>	wax candle pixie	Blue	Yellow	3
	Confirmed	Lichen	<i>Hypogymnia recurva</i>	recoiling bone	Red	Yellow	3
	Confirmed	Lichen	<i>Leptogium intermedium</i>	forty-five vinyl	Blue	Yellow	3
	Possible	Lichen	<i>Leptogium polycarpum</i>	peacock vinyl	Red	Yellow	3
	Confirmed	Lichen	<i>Letharia columbiana</i>	brown-eyed wolf	Blue	Yellow	3
	Confirmed	Lichen	<i>Lobaria oregana</i>	lettuce lung	Blue	Yellow	3
	Confirmed	Lichen	<i>Physcia dubia</i>	grinning rosette	Blue	Yellow	3
	Confirmed	Lichen	<i>Pseudocyphellaria anthraxis</i>	reticulate specklebelly	Blue	Yellow	3
	Likely	Lichen	<i>Psoroma tenue</i> var. <i>boreale</i>	tundra tarts	Red	Yellow	3
	Possible	Lichen	<i>Stereocaulon symphycheilum</i>	two-toned foam	Red	Yellow	3
	Confirmed	Lichen	<i>Umbilicaria lambii</i>	windward rocktripe	Blue	Yellow	3
	Confirmed	Lichen	<i>Vahlia californica</i>	sun snaps	Red	Yellow	3
	Unlikely	Plant - Vascular	<i>Allium geyeri</i> var. <i>tenerum</i>	Geyer's onion	Blue	Yellow	3, 6
	Possible	Plant - Vascular	<i>Botrychium crenulatum</i>	dainty moonwort	Blue	Yellow	3
	Possible	Plant - Vascular	<i>Botrychium simplex</i> var. <i>compositum</i>	least moonwort	Blue	Yellow	3
	Unlikely	Plant - Vascular	<i>Draba lactea</i>	milky draba	Blue	Yellow	3
	Possible	Plant - Vascular	<i>Erythranthe breweri</i>	Brewer's monkey-flower	Blue	Yellow	3
	Possible	Plant - Vascular	<i>Stellaria obtusa</i>	blunt-sepaed starwort	Blue	Yellow	3
Delisted	Confirmed	Plant - Vascular	<i>Draba stenopetala</i>	star-flowered draba	Red	Unknown	4, 8
	Confirmed	Plant - Vascular	<i>Muhlenbergia racemosa</i>	satin grass	Red	Unknown	5, 8
	Unlikely	Plant - Vascular	<i>Schoenoplectus americanus</i>	American bulrush	Red	Unknown	7

**Notes:**

1. SARA listing in 2018 ([https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails\\_e.cfm?sid=1246](https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1246))
2. SARA listing in 2017 ([https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails\\_e.cfm?sid=1149](https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1149))
3. SARA listing in 2019 ([https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails\\_e.cfm?sid=1287](https://wildlife-species.canada.ca/species-risk-registry/species/speciesDetails_e.cfm?sid=1287))
4. Proposed SARA listing (<http://gazette.gc.ca/rp-pr/p1/2018/2018-12-29/html/reg1-eng.html>)
5. Proposed SARA listing in 2019 (<http://gazette.gc.ca/rp-pr/p1/2019/2019-03-23/html/reg1-eng.html>).
6. Likely to be downlisted under SARA to match ([https://wildlife-species.canada.ca/species-risk-registry/document/dspHTML\\_e.cfm?ocid=13056](https://wildlife-species.canada.ca/species-risk-registry/document/dspHTML_e.cfm?ocid=13056))
7. Likely to be downlisted under SARA to match ([https://wildlife-species.canada.ca/species-risk-registry/document/dspHTML\\_e.cfm?ocid=13060](https://wildlife-species.canada.ca/species-risk-registry/document/dspHTML_e.cfm?ocid=13060))

## 4.0 Species at Risk - 2018 List

**TABLE 4.1 (Page 1 of 2): Confirmed** species at risk in the RMOW. Key: E (Endangered), T (Threatened), SC (Special Concern), DD (Data Deficient). Breeding status is only recorded for wide-ranging species (large mammals, bats, and birds).

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	RMOW Record?	Resident?	Breeds in RMOW?	Impt. Habitat?	Notes
Animals - Invertebrates	Butterflies	<i>Callophrys eryphon</i> ssp. <i>sheltonensis</i>	Western Pine Elfin, sheltonensis ssp.	Blue			Yes	Yes		Yes	<sup>32</sup>
		<i>Parnassius clodius</i> ssp. <i>pseudogallatinus</i>	Clodius Parnassian, pseudogallatinus ssp.	Blue			Yes? (Tent. ID)	Yes (Tent. ID)		Yes?	
Animals - Vertebrates	Amphibians	<i>Anaxyrus boreas</i>	Western Toad	Yellow		SC/SC	Yes	Yes	Yes	Yes	
		<i>Ascaphus truei</i>	Coastal Tailed Frog	Yellow	Yes	SC/SC	Yes	Yes	Yes	Yes	
		<i>Rana aurora</i>	Northern Red-legged Frog	Blue	Yes	SC/SC	Yes	Yes	Yes	Yes	
	Birds	<i>Accipiter gentilis</i> ssp. <i>laingi</i>	Northern Goshawk, laingi ssp.	Red	Yes	T/T	Yes	Yes	Yes	Yes	<sup>33</sup>
		<i>Ardea herodias</i> ssp. <i>fannini</i>	Great Blue Heron, fannini ssp.	Blue	Yes	SC/SC	Yes	Seasonal	Possible	Yes?	
		<i>Butorides virescens</i>	Green Heron	Blue			Not Recently	Seasonal (Sporadic)	Not Recently	Yes	<sup>34</sup>
		<i>Chordeiles minor</i>	Common Nighthawk	Yellow		SC/T	Yes	Seasonal	Likely	Uncertain	<sup>35</sup>
		<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Yellow		SC/SC	Yes	Yes?	Yes?	Uncertain	<sup>36</sup>
		<i>Contopus cooperi</i>	Olive-sided Flycatcher	Blue		SC/T	Yes	Seasonal	Yes	Uncertain	
		<i>Cypseloides niger</i>	Black Swift	Blue		E/pending	Yes	Seasonal	Yes	Yes	<sup>37</sup>
		<i>Hirundo rustica</i>	Barn Swallow	Blue		T/T	Yes	Seasonal	Yes	Uncertain	
		<i>Megascops kennicottii kennicottii</i>	Western Screech-Owl, kennicottii ssp.	Blue		T/T	Yes	Yes	Yes?	Yes?	<sup>38</sup>
		<i>Patagioenas fasciata</i>	Band-tailed Pigeon	Blue		SC/SC	Yes	Seasonal	Likely	Yes?	<sup>39</sup>
	Fishes	<i>Salvelinus confluentus</i> pop. 28	Bull Trout - South Coast Population	Blue	Yes	SC/pending	Yes	Yes	Yes	Yes	<sup>40</sup>
		<i>Gulo gulo luscus</i>	Wolverine, luscus ssp.	Blue	Yes	SC/SC	Yes	Yes	Likely	Likely	<sup>41</sup>
	Mammals	<i>Myotis keenii</i>	Keen's Myotis	Blue	Yes	DD/SC	Yes	Yes	Yes?	Yes	<sup>42</sup>
		<i>Myotis lucifugus</i>	Little Brown Myotis	Yellow		E/E	Yes	Yes	Yes	Yes	
		<i>Oreamnos americanus</i>	Mountain Goat	Blue			Yes	Yes	Likely	Yes	<sup>43</sup>
		<i>Ursus arctos</i>	Grizzly Bear	Blue	Yes	SC/SC	Yes	Yes	Yes	Yes	<sup>44</sup>

[Continued on next page.]

<sup>32</sup> Ssp. *pseudogallatinus* is the likely identity of three specimens to date according to Crispin Guppy (pers. comm.). The alternative is ssp. *claudianus* which is also blue-listed.

<sup>33</sup> Active nests confirmed 2014-2017 (MFLNRO and Madrone 2014, 2015; Palmer and Snowline 2017, 2018).

<sup>34</sup> Not recorded since 2013 on Green Lake by Karl Ricker (pers. comm., Dec. 2018).

<sup>35</sup> Listed as a possible breeder in Ricker et al. (2014), but spring records suggest it is likely.

<sup>36</sup> Not seen every year (Karl Ricker, pers. comm., Dec. 2018).

<sup>37</sup> Breeds at Brandywine Falls and Soo Bluffs (Karl Ricker, pers. comm., Dec. 2018).

<sup>38</sup> Recorded by Greg Ferguson (Ferguson 2017) and Karl Ricker (pers. comm., Dec. 2018). Need to confirm breeding.

<sup>39</sup> Listed as a possible breeder in Ricker et al. (2014), but spring records suggest it is likely.

<sup>40</sup> Spawning locations need to be confirmed.

<sup>41</sup> Present in in Whistler though large home ranges (Steve Rochetta by email, Feb. 2, 2019) make confirmation of habitat use difficult.

<sup>42</sup> This taxon is likely to be reclassified within *Myotis evotis*, possibly as a subspecies (Lausen 2017).

<sup>43</sup> Historic breeding; possible current winter use of Sproatt (Steve Rochetta by email, date).

<sup>44</sup> "Some breeding and habitat use specifically Brandywine, Callaghan, Sproatt." (Steve Rochetta, by email, Nov. 2016).

**TABLE 4.1 (Page 2 of 2): Confirmed** species at risk in the RMOW. Key: E (Endangered), T (Threatened), SC (Special Concern), DD (Data Deficient).  
Breeding status is only recorded for wide-ranging species (large mammals, bats, and birds).

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	RMOW Record?	Resident?	Breeds in RMOW?	Impt. Habitat?	Notes
Fungi	Lichens	<i>Ahtiana sphaerosporella</i>	mountain candlewax	Blue			Yes	Yes		Yes	
		<i>Alectoria imshaugii</i>	spiny witch's hair	Blue			Yes	Yes		Yes	
		<i>Fuscopannaria leucostictoides</i>	frosted crackers	Blue			Yes	Yes		Yes	
		<i>Hypogymnia canadensis</i>	canuckle bone	Blue			Yes	Yes		Yes	
		<i>Nodobryoria subdivergens</i>	alpine redhead	Blue			Yes	Yes		Yes	
		<i>Sphaerophorus globosus</i>	arctic coral	Blue			Yes	Yes		Yes	<sup>45</sup>
		<i>Stereocaulon glareosum</i>	alpine soil foam	Blue			Yes	Yes		Yes	
		<i>Umbilicaria decussata</i>	electric rocktripe	Blue			Yes	Yes		Yes	
		<i>Umbilicaria krascheninnikovii</i>	lesser salted rocktripe	Blue			Yes	Yes		Yes	
Plants	Liverworts	<i>Haplomitrium hookeri</i>	liverwort	Blue			Yes	Yes		Yes	
		<i>Jungermannia atrovirens</i>	liverwort	Blue			No	Yes		Yes	<sup>46</sup>
		<i>Nardia breidleri</i>	liverwort	Blue			Yes	Yes		Yes	
		<i>Nardia compressa</i>	liverwort	Blue			Yes	Yes		Yes	
		<i>Nardia geoscyphus</i>	liverwort	Blue			Yes	Yes		Yes	
		<i>Scapania curta</i>	liverwort	Blue			Yes	Yes		Yes	
		<i>Scapania obscura</i>	liverwort	Blue			Yes	Yes		Yes	
		<i>Solenostoma confertissimum</i>	liverwort	Red			Yes	Yes		Yes	<sup>47</sup>
		<i>Tritomaria polita ssp. polita</i>	liverwort	Blue			Yes	Yes		Yes	
	Mosses	<i>Brachydontium olympicum</i>	Olympic brachydontium moss	Red			Yes	Yes		Yes	
		<i>Brachythecium holzingeri</i>	Holzinger's brachythecium	Blue			Yes	Yes		Yes	
		<i>Bryum pallescens</i>	tall-clustered thread-moss	Blue			Yes	Yes		Yes	
		<i>Grimmia caespiticia</i>	grimmia moss	Blue			Yes	Yes		Yes	
		<i>Grimmia donniana</i>	Donn's grimmia	Blue			Yes	Yes		Yes	
		<i>Grimmia incurva</i>	black grimmia	Red			Yes	Yes		Yes	
		<i>Homalothecium nevadense</i>	Nevada homalothecium moss	Blue			Yes	Yes		Yes	
		<i>Hygrohypnum alpinum</i>	alpine hygrohypnum moss	Blue			Yes	Yes		Yes	
		<i>Orthotrichum pylaisii</i>	Pylais' orthotrichum moss	Blue			Yes	Yes		Yes	
		<i>Pohlia cardotii</i>	Cardot's pohlia moss	Blue			Yes	Yes		Yes	
		<i>Pseudoleskea radicata var. pallida</i>	pseudoleskea moss	Blue			Yes	Yes		Yes	
		<i>Racomitrium pygmaeum</i>	pygmy racomitrium moss	Blue			Yes	Yes		Yes	
		<i>Schistidium crassipilum</i>	thickpoint grimmia	Blue			Yes	Yes		Yes	
		<i>Tripterocladium leucocladulum</i>	tripterocladium moss	Blue			Yes	Yes		Yes	
	Vascular Plants	<i>Botrychium ascendens</i>	upswept moonwort	Blue			Yes	Uncertain		Uncertain	
		<i>Cryptogramma cascadiensis</i>	Cascade parsley fern	Blue			Yes	Yes		Yes	
		<i>Pinus albicaulis</i>	whitebark pine	Blue		E/E	Yes	Yes		Yes	
		<i>Pyrola elliptica</i>	shinleaf wintergreen	Blue			Yes	Yes		Yes	
		<i>Utricularia ochroleuca</i>	ochroleucous bladderwort	Blue			Yes	Yes		Yes	

<sup>45</sup> Five records between 1980 and 2016. Omitted by error in previous reports (Brett 2016, 2017).

<sup>46</sup> 1980 records from Brandywine Creek via UBC entered 2014 (Brett 2019).

<sup>47</sup> Ibid.

**TABLE 4.2** Species at risk that are **Likely** in the RMOW. Key: SC (Special Concern). Breeding status is only recorded for wide-ranging species (large mammals, bats, and birds)..

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	RMOW Record?	Resident?	Breeds in RMOW?	Impt. Habitat?	Notes
Invertebrate	Snail - Terrestrial	<i>Pristiloma arcticum?</i>	Northern Tightcoil	Blue			Tent. ID	Yes?		Yes?	<sup>48</sup>
Vertebrate	Mammal	<i>Cervus elaphus roosevelti</i>	Roosevelt Elk	Blue			Yes	Yes (Non-Breeding?)	Likely (Future)	Likely (Future)	<sup>49</sup>
Fungi	Lichens	<i>Leptogium californicum</i>	midlife vinyl	Blue			No	Likely		Likely	<sup>50</sup>
		<i>Peltigera gowardii</i>	northwest waterfan	Red		SC/SC	No	Likely		Likely	<sup>51</sup>
Plants	Liverworts	<i>Marchantia alpestris</i>	liverwort	Blue			No	Likely		Likely	
		<i>Scapania scandica</i> var. <i>scandica?</i>	liverwort	Blue			Tent. ID	Yes?		Yes?	<sup>52</sup>
	Mosses	<i>Bryum alpinum?</i>	alpine thread-moss	Red			Tent. ID	Yes?		Yes?	<sup>53</sup>
		<i>Bryum schleicheri?</i>	Schleicher's thread-moss	Blue			Tent. ID	Yes?		Yes?	<sup>54</sup>
		<i>Grimmia anomala</i>	grimmia dry rock moss	Blue			No	Possible		Possible	
		<i>Pseudoleskea incurvata</i> var. <i>tenuetis</i>	brown leskea moss	Red			Possible ID	Likely		Likely	<sup>55</sup>
		<i>Racomitrium affine?</i>	lesser fringe-moss	Blue			Tent. ID	Yes?		Yes?	
		<i>Tortula leucostoma</i>	desmatodon moss	Blue			No	Likely		Likely	

**TABLE 4.3.** Bird species that are at risk that have been recorded in the RMOW and not resident. **Migratory:** annual or biannual migration through the RMOW. Their use of specific habitats within the RMOW, though yet to compiled or assessed suggests these species should be considered in conservation planning.

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	RMOW Record?	Resident?	Breeds in RMOW?	Impt. Habitat?	Notes
Non-Resident/ Non-Breeding Birds	Migratory	<i>Aechmophorus occidentalis</i>	Western Grebe	Red		SC/SC	Yes	Seasonal	No	Uncertain	
		<i>Clangula hyemalis</i>	Long-tailed Duck	Blue						Unlikely	
		<i>Cygnus columbianus</i>	Tundra Swan	Blue						Unlikely	
		<i>Gavia adamsii</i>	Yellow-billed Loon	Blue		NAR				Unlikely	
		<i>Hydroprogne caspia</i>	Caspian Tern	Blue		NAR				Unlikely	
		<i>Larus californicus</i>	California Gull	Blue						Unlikely	
		<i>Melanitta americana</i>	Black Scoter	Blue						Unlikely	
		<i>Melanitta perspicillata</i>	Surf Scoter	Blue						Uncertain	
		<i>Numenius americanus</i>	Long-billed Curlew	Blue	Yes	SC/SC				Unlikely	
		<i>Podiceps auritus</i>	Horned Grebe	Yellow		SC/SC				Uncertain	
		<i>Podiceps nigricollis</i>	Eared Grebe	Blue						Unlikely	

<sup>48</sup> Tentative ID by Kristina Ovaska, 2013.<sup>49</sup> "Elk are present and potentially expanding within the RMOW" (Steve Rochetta by email Feb. 2, 2019). Significant habitat use not yet confirmed but likely in future as range expands.<sup>50</sup> One record from Brandywine Falls, just outside RMOW boundary; one 1964 record from "Near Brandywine - Whistler area" (Brett 2019).<sup>51</sup> One 2011 record from Brew Lake (Brett 2019) suggests this species also occurs within the RMOW.<sup>52</sup> Only var. *scandica* listed by CDC. The alternative (var. *dimorpha*), previously blue-listed, no longer appears on the CDC list.<sup>53</sup> One tentative record from the Whistler Mt. alpine from O. Lee and S. Joya (Brett 2019).<sup>54</sup> One tentative record from Blackcomb Lake from O. Lee and S. Joya (Brett 2019).<sup>55</sup> Nine records from mid- to alpine elevations (Brett 2019). This is the most likely subspecies for the specimens (Steve Joya, pers. comm.).

**TABLE 4.4** Species at risk in the RMOW that are **Data Deficient**. Breeding status is only recorded for wide-ranging species (large mammals, bats, and birds).

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	RMOW Record?	Resident?	Breeds in RMOW?	Impt. Habitat?	Notes
Vertebrate	Fish	<i>Oncorhynchus clarkii clarkii</i>	Coastal Cutthroat Trout	Blue			Historic	Unlikely?	Unlikely?	Unlikely?	<sup>56</sup>
Plant	Vascular Plant	<i>Muhlenbergia racemosa</i>	satin grass	Unknown			Yes?	Yes?		Yes?	<sup>57</sup>

**TABLE 4.5** Species at risk that are **Extirpated** in the RMOW. Key: E (Endangered), T (Threatened).

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	RMOW Record?	Resident?	Breeds in RMOW?	Impt. Habitat?	Notes
Vertebrate	Birds	<i>Riparia riparia</i>	Bank Swallow	Yellow		T/T					<sup>58</sup>
		<i>Strix occidentalis</i>	Spotted Owl	Red	Yes	E/E	Historic	Historic	Historic	Historic	

<sup>56</sup> See notes in Appendix 2.<sup>57</sup> Delisting shouldn't have happened; the Whistler records may be Yellow-listed *M. glomerata* (Curtis Björk, by email, June 7, 2018). Specimens need to be re-examined.<sup>58</sup> Extirpated (?); not seen recently (Karl Ricker, pers. comm., Dec. 2018).

**TABLE 4.6.** Species at risk that are **Possible** in the RMOW but not yet documented. Key: T (Threatened), SC (Special Concern), DD (Data Deficient). Breeding status is only recorded for wide-ranging species (large mammals, bats, and birds).

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	RMOW Record?	Resident?	Breeds in RMOW?	Impt. Habitat?	Notes
Animals - Invertebrate	Dragonfly	<i>Tanypteryx hageni</i>	Black Petaltail	Blue			No	Possible		Possible	
	Bee	<i>Bombus occidentalis</i> ssp. <i>occidentalis</i>	Western Bumble Bee	Blue		T/	No	Possible	Possible	Possible	
	Butterfly	<i>Parnassius clodius</i> ssp. <i>claudianus</i>	Clodius Parnassian, claudianus ssp.	Blue			Possible ID	Possible		Possible	<sup>59</sup>
	Molluscs - Freshwater	<i>Physella propinqua</i>	Rocky Mountain Physa	Blue			No	Possible (DD)		Possible	
		<i>Physella virginea</i>	Sunset Physa	Blue			No	Possible (DD)		Possible	
		<i>Sphaerium striatinum</i>	Striated Fingernailclam	Blue			No	Possible (DD)		Possible	
Animals - Vertebrate	Bird	<i>Falco peregrinus anatum</i>	Peregrine Falcon, anatum ssp.	Red		SC/SC	Yes	Possible	Possible	Possible	<sup>60</sup>
	Mammals	<i>Corynorhinus townsendii</i>	Townsend's Big-eared Bat	Blue			No	Possible	Possible	Possible	
		<i>Pekania pennanti</i>	Fisher	Blue	Yes		Historic	Possible	Possible	Historic	<sup>61</sup>
	Reptile	<i>Charina bottae</i>	Northern Rubber Boa	Yellow		SC/SC	No	Unlikely		Unlikely	<sup>62</sup>
Fungi	Lichen	<i>Leptogium polycarpum</i>	peacock vinyl	Yellow		SC/SC	No	Possible		Possible	<sup>63</sup>
Plants	Liverwort	<i>Frullania hattoriana</i>	liverwort	Blue			No	Possible		Possible	
	Mosses	<i>Andreaea heinemannii</i>	Heinemann's andreaea moss	Red			No	Possible		Possible	
		<i>Atrichum tenellum</i>	slender smoothcap moss	Red			No	Possible		Possible	
		<i>Bryum calobryoides</i>	bryum moss	Red			No	Possible		Possible	
		<i>Pohlia andalusica</i>	Roth's thread-moss	Red			No	Possible		Possible	
		<i>Pohlia tundrae</i>	tundra pohlia moss	Red			No	Possible		Possible	
		<i>Trematodon asanoi</i>	Boas' long-necked moss	Blue			No	Possible		Possible	
	Vascular Plants	<i>Botrychium spathulatum</i>	spoon-shaped moonwort	Blue			No	Possible		Possible	
		<i>Carex praeceptorum</i>	teacher's sedge	Blue			Nearby	Possible		Possible	
		<i>Isoetes fletti</i>	Flett's quillwort	Red?			No	Possible		Possible	<sup>64</sup>

<sup>59</sup> Ssp. *pseudoallatinus* is the likely identity of three specimens to date according to Crispin Guppy (pers. comm.). The alternative is ssp. *claudianus* which is also blue-listed and is possible with the RMOW.

<sup>60</sup> Nesting site at Soo Bluffs; possible within RMOW (Karl Ricker, pers. comm., Dec. 2018). Moved to Possible based on that information.

<sup>61</sup> Most recent records are from 1956 (Brett 2019).

<sup>62</sup> Nearest record is from Rutherford Creek (Leslie Anthony, pers. comm.).

<sup>63</sup> 2018: downlisted by CDC; listed by SARA; "still counts as a conservation priority" (Curtis Björk, email June 7, 2018).

<sup>64</sup> Possibility that population in Brandywine Park basalt ponds (Brett 2019) is this species.



**TABLE 4.7.** Species at risk that are **Unlikely** to **Highly Unlikely** in the RMOW. Key: E (Endangered), T (Threatened), SC (Special Concern). Breeding status is only recorded for wide-ranging species (large mammals, bats, and birds).

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	RMOW Record?	Resident?	Breeds in RMOW?	Impt. Habitat?	Notes
Animals - Invertebrate	Dragonfly	<i>Ophiogomphus occidentis</i>	Sinuous Snaketail	Blue			No	Unlikely		Unlikely	
	Damselfly	<i>Argia vivida</i>	Vivid Dancer	Blue		SC/	No	Unlikely	Unlikely	Unlikely	
	Beetle	<i>Cicindela hirticollis</i>	Hairy-necked Tiger Beetle	Blue			No	Unlikely		Unlikely	
	Butterflies	<i>Epargyreus clarus ssp. californicus</i>	Silver-spotted Skipper, californicus ssp.	Red			No	No		No	
		<i>Erynnis propertius</i>	Propertius Duskywing	Red			No	No		No	<sup>65</sup>
		<i>Euphyes vestris (ssp. vestris)</i>	Dun Skipper	Red		T/T	No	No		No	<sup>66</sup>
	Molluscs - Freshwater	<i>Galba bulimoides</i>	Prairie Fossaria	Blue			No	Unlikely		Unlikely	
		<i>Galba dalli</i>	Dusky Fossaria	Blue			No	Unlikely		Unlikely	
		<i>Gyraulus crista</i>	Star Gyro	Blue			No	Unlikely		Unlikely	
Animals - Vertebrate	Bird	<i>Brachyramphus marmoratus</i>	Marbled Murrelet	Blue	Yes	T/T	No	Unlikely	Unlikely	Unlikely	<sup>67</sup>
	Mammal	<i>Sorex bendirii</i>	Pacific Water Shrew	Red	Yes	E/E	No	Unlikely	Unlikely	Unlikely	
	Reptile	<i>Contia tenuis</i>	Sharp-tailed Snake	Red		E/E	No	No	No	No	
Fungi	Lichen	<i>Pseudocyphellaria rainierensis</i>	old growth specklebelly	Blue		SC/SC	No	Unlikely		Unlikely	
Plants	Mosses	<i>Andreaea sinuosa</i>	small-spored rock-moss	Red			No	Unlikely		Unlikely	
		<i>Atrichum flavisetum</i>	moss	Blue			No	Unlikely		Unlikely	
		<i>Brotherella roellii</i>	Roell's brotherella	Red		E/E*	No	Unlikely		Unlikely	
		<i>Callicladium haldanianum</i>	callicladium moss	Blue			No	Unlikely		Unlikely	
		<i>Polytrichastrum sexangulare var. vulcanicum</i>	moss	Red			No	Unlikely		Unlikely	
		<i>Sphagnum contortum</i>	twisted peat-moss	Blue			No	Unlikely		Unlikely	
	Vascular Plants	<i>Allium amplexans</i>	slimleaf onion	Blue			No	No		No	
		<i>Bidens amplissima</i>	Vancouver Island beggarticks	Blue		SC/SC	No	Unlikely		Unlikely	
		<i>Boechera paupercula</i>	tiny suncress	Red			No	Unlikely		Unlikely	
		<i>Carex hystericina</i>	porcupine sedge	Blue			No	Unlikely		Unlikely	
		<i>Castilleja rupicola</i>	cliff paintbrush	Blue		T/T	No	Unlikely		Unlikely	
		<i>Claytonia washingtoniana</i>	Washington springbeauty	Red			No	Unlikely		Unlikely	
		<i>Dryopteris marginalis</i>	marginal wood fern	Red			No	Unlikely		Unlikely	
		<i>Gentianella tenella ssp. tenella</i>	slender gentian	Red			No	Unlikely		Unlikely	
		<i>Oenothera pallida ssp. pallida</i>	pale evening-primrose	Red			No	No		No	
		<i>Sidalcea hendersonii</i>	Henderson's checker-mallow	Blue			No	No		No	<sup>68</sup>

<sup>65</sup> Present in Pemberton (Brett 2019).

<sup>66</sup> Derrick Marven (pers. comm.) recorded Dun Skipper in Mt. Currie in ca. 2005.

<sup>67</sup> There is Federally-designated Critical Habitat within the RMOW (Environment Canada 2014a) but no records of this species in Whistler (Ricker et al. 2014).

<sup>68</sup> One 1941 record from Alta Lake (Brett 2019) was likely misidentified or planted.

**TABLE 4.8.** Species at risk that are **Not Possible** in the RMOW even though they may appear in CDC search results. Key: E (Endangered), T (Threatened), SC (Special Concern). Breeding status is only recorded for wide-ranging species (large mammals, bats, and birds).

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	RMOW Record?	Resident?	Breeds in RMOW?	Impt. Habitat?
Animals - Invertebrate	Molluscs - Marines	<i>Haliotis kamtschatkana</i>	Northern Abalone	Red		E/E	No	No	No	No
		<i>Ostrea conchaphila</i>	Olympia Oyster	Blue		SC/SC				
Animals - Vertebrate	Fishes	<i>Acipenser medirostris</i>	Green Sturgeon	Red		SC/SC				
		<i>Oncorhynchus kisutch</i>	Coho Salmon	Yellow		T/				
		<i>Thaleichthys pacificus</i>	Eulachon	Blue		E/				

**TABLE 4.9.** Bird species that are at risk that have been recorded in the RMOW that are not resident and do not have significant presence of habitat use. **Casual** = “1 to 10 birds per year. Not seen every year” (Ricker et al. 2014). These species do not have enough of a presence in Whistler to be a conservation concern. **Accidental** = “Only one on record for season noted” (Ricker et al. 2014). These species are generally far out of range and also not a conservation concern within the RMOW.

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	RMOW Record?	Resident?	Breeds in RMOW?	Impt. Habitat?	Notes
	Casual	<i>Ammodramus savannarum</i>	Grasshopper Sparrow	Red	Yes			No		No	
		<i>Botaurus lentiginosus</i>	American Bittern	Blue						No	
		<i>Buteo lagopus</i>	Rough-legged Hawk	Blue		NAR				No	
		<i>Euphagus carolinus</i>	Rusty Blackbird	Blue		SC/SC				No	
		<i>Falco mexicanus</i>	Prairie Falcon	Red	Yes	NAR				No	
		<i>Limnodromus griseus</i>	Short-billed Dowitcher	Blue						No	
		<i>Phalaropus lobatus</i>	Red-necked Phalarope	Blue		SC/				No	
	Accidental	<i>Asio flammeus</i>	Short-eared Owl	Blue	Yes	SC/SC				No	
		<i>Melanerpes lewis</i>	Lewis’s Woodpecker	Blue	Yes	T/T				No	
		<i>Phalacrocorax auritus</i>	Double-crested Cormorant	Blue						No	
		<i>Pluvialis dominica</i>	American Golden-Plover	Blue						No	
		<i>Progne subis</i>	Purple Martin	Blue						No	
		<i>Sterna forsteri</i>	Forster’s Tern	Red		DD/				No	
		<i>Tringa incana</i>	Wandering Tattler	Blue						No	
		<i>Tyto alba</i>	Barn Owl	Red		T/T				No	
		<i>Zonotrichia querula</i>	Harris’ Sparrow	Unknown		SC/				No	

**TABLE 4.10** Species at risk that were included in the 2017 report but, due to downlisting or delisting, are **Excluded** from assessment in this report.<sup>69</sup>

2018 Rank Change	2017 List (Brett 2017)	Group	Species	Common Name	BC List 2017	BC List 2018	COSEWIC / SARA	Notes
Extirpated?	Not included	Bird	<i>Riparia riparia</i>	Bank Swallow	NR	NR	T/T	<sup>70</sup>
Downlisted	Confirmed	Lichen	<i>Allantoparmelia alquistii</i>	lesser rock grub	Blue	Yellow		
Downlisted	Confirmed	Lichen	<i>Arctoparmelia incurva</i>	finger ring	Blue	Yellow		
Downlisted	Confirmed	Lichen	<i>Cladonia singularis</i>	wax candle pixie	Blue	Yellow		
Downlisted	Confirmed	Lichen	<i>Hypogymnia recurva</i>	recoiling bone	Red	Yellow		
Downlisted	Confirmed	Lichen	<i>Leptogium intermedium</i>	forty-five vinyl	Blue	Yellow		
Downlisted	Confirmed	Lichen	<i>Letharia columbiana</i>	brown-eyed wolf	Blue	Yellow		
Downlisted	Confirmed	Lichen	<i>Lobaria oregana</i>	lettuce lung	Blue	Yellow		
Downlisted	Confirmed	Lichen	<i>Phycia dubia</i>	grinning rosette	Blue	Yellow		
Downlisted	Confirmed	Lichen	<i>Pseudocyphellaria anthraxis</i>	reticulate specklebelly	Blue	Yellow		
Downlisted	Likely	Lichen	<i>Psoroma tenue</i> var. <i>boreale</i>	tundra tarts	Red	Yellow		
Downlisted	Possible	Lichen	<i>Stereocaulon symphycheilum</i>	two-toned foam	Red	Yellow		
Downlisted	Confirmed	Lichen	<i>Umbilicaria lambii</i>	windward rocktripe	Blue	Yellow		
Downlisted	Confirmed	Lichen	<i>Vahliella californica</i>	sun snaps	Red	Yellow		
Downlisted	Unlikely	Vascular Plant	<i>Allium georgii</i> var. <i>tenerum</i>	Geyer's onion	Blue	Yellow		
Downlisted	Unlikely	Vascular Plant	<i>Draba lactea</i>	milky draba	Blue	Yellow		
Delisted	Confirmed	Vascular Plant	<i>Draba stenopetala</i>	star-flowered draba	Blue	Unknown		<sup>71</sup>
Downlisted	Possible	Vascular Plant	<i>Erythranthe breweri</i>	Brewer's monkey-flower	Blue	Yellow		
Delisted	Red	Vascular Plant	<i>Schoenoplectus americanus</i>	American bulrush	Red	Unknown		<sup>72</sup>
Downlisted	Possible	Vascular Plant	<i>Stellaria obtusa</i>	blunt-sepaed starwort	Blue	Yellow		
Downlisted	Possible	Vascular Plant	<i>Botrychium crenulatum</i>	dainty moonwort	Blue	Yellow		
Downlisted	Possible	Vascular Plant	<i>Botrychium simplex</i> var. <i>compositum</i>	least moonwort		Yellow		

<sup>69</sup> “The de-listings of most of the lichens in [the RMOW] list are due mostly to all the work I've been sent out on in northern BC, which was a lichenological frontier (and still is). So much of what was thought to be rare turned out to be common in the north. If BC got split into two provinces with the 53rd parallel as the border, the southern half would have most of these species back on as rare and tracked again. In some important ways, the way we list species for conservation is very faulty.” (Curtis Björk, by email, June 7, 2018.)

<sup>70</sup> Extirpated (?); not seen recently (Karl Ricker, pers. comm., Dec. 2018).

<sup>71</sup> 1917 Whistler record almost certainly a mid-ID since it would be way out of range in Whistler (Curtis Björk, by email, June 7, 2018).

<sup>72</sup> “The only confirmed report of this species in BC is from Meager Creek Hot Springs. Provenance is in question” (CDC 2018).

## 5.0 Species at Risk – Comparisons with Past Years

### 5.1 Species-Level Conservation Priorities

Most conservation planning is based on species and ecosystems (habitats) that are known to be at-risk. That definition would definitely include the 58 species that have been documented at least once in Whistler (Confirmed species; Table 5.1). Past reports (Brett 2016s, 2017) have suggested that species deemed Likely to occur in Whistler should also be included in conservation planning. This 2018 report, for the first time, assessed at-risk bird species and designated 11 of them Migratory. That is, those 11 bird species have an annual or biannual presence and may require specific habitats within Whistler. They should therefore also be considered during conservation planning, a task that will be made more accurate once more habitat-specific data is compiled for those species.

**TABLE 5.1** Species at risk considered within this report by RMOW status and conservation priority.

<u>Cons. Priority?</u>	<u>RMOW Residency</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>
<b>Yes</b>	Confirmed	69	70	58
<b>Yes?</b>	Likely	9	10	12
<b>Yes?</b>	Migratory Birds	n/a	n/a	11
	Data Deficient	3	3	2
	Extirpated	0	0	2
	Possible	23	23	23
	Unlikely to Highly Unlikely	33	33	29
	Not Possible	12	13	5
	Casual and Accidental Birds	n/a	n/a	16
	Excluded	n/a	n/a	22
		149	152	177

### 5.2 Comparison with Previous Years

The 58 Confirmed species at risk in 2018 is 12 fewer than in 2017 (Table 5.1). The main cause of that decrease was the downlisting (to Yellow, or Secure) of 13 lichens present in the RMOW by the CDC (2018; Section 3.3). These lichens as well as eight vascular plants were removed as species at risk in BC due to new data that showed they were more common than previously thought.<sup>73</sup>

Almost half the Confirmed and Likely species are not returned by CDC searches (unpubl. data). That is, a CDC search for Whistler would significantly underestimate the number of species at risk to be considered in conservation planning. In addition, there are many species at risk returned in a CDC search that are Unlikely to Not Possible in Whistler. The list presented in Section 4 is therefore more accurate and complete for the Whistler area than data available online from the CDC.

While the total number of species classed as either Confirmed or Likely is lower than in the first two years of the report, the total number of species that should potentially be considered for conservation planning has remained constant due to the addition of Migratory Birds (Table 5.2). These annual or biannual migrations of these 11 birds make use of habitats in Whistler, though the importance of specific habitats by species has not yet been compiled.

In summary, just under half (46%) of the species at risk described in this report are potential conservation priorities (Confirmed, Likely, or Migratory; Table 5.1). A further 13% are Possible and may be worth searching for in future surveys, especially if of particular interest to the RMOW. Scarce resources should likely not be directed to any of the 41% of species, because of the low likelihood they occur within the RMOW or their lack of significant presence in the area.<sup>74</sup>

<sup>73</sup> Curtis Björk, pers. comm., June 7, 2018

<sup>74</sup> Excluding Unlikely species from targetted searches does not mean they could not occur here but rather that future surveying effort would be better directed towards other species.

**TABLE 5.2:** Proportion of species at risk by likelihood of occurring in the RMOW.

<b>RMOW Residency</b>	<b>2018 Total</b>
Confirmed, Likely, or Migratory	81 (46%)
Possible (including Data Deficient)	23 (13%)
Unlikely, Possible, Extirpated, Casual, Accidental, Excluded	73 (41%)

Vertebrates comprise only one-third (19 or 58) species listed as Confirmed in 2018 (Table 5.3). This result is a reminder that vertebrates represent a small fraction of total biodiversity and that future conservation efforts could include a wider range of species groups.

**TABLE 5.3:** Summary of species at risk by group and status within the RMOW.

<b>Group 1</b>	<b>Group 2</b>	<b>Confirmed</b>	<b>Likely</b>	<b>Data Deficient</b>	<b>Extirp- ated(?)</b>	<b>Possible</b>	<b>Unlikely</b>	<b>Not Possible</b>	<b>Total</b>
<b>Animals - Invertebrate</b>	Dragonfly					1	1		2
	Insect	2				2	5		9
	Mollusc - Freshwater					3	3		6
	Mollusc - Marine							2	2
	Snail - Terrestrial		1						1
	<b>Total Invertebrates</b>	2	1	0	0	6	9	2	20
<b>Animals - Vertebrate</b>	Amphibian	3							3
	Bird	10			2	1	1		14
	Fish	1		1				3	5
	Mammal	5	1			2	1		9
	Reptile					1	1		3
	<b>Total Vertebrates</b>	19	1	1	2	4	3	3	34
<b>Fungi</b>	<b>Total Lichens</b>	9	2			3	1		15
<b>Plants</b>	Liverwort	9	2			1			12
	Moss	14	6			6	5		31
	Peat Moss						1		1
	Vascular Plant	5		1		3	10		19
	<b>Total Plants</b>	28	8	1	0	10	16	0	63
	<b>Total</b>	<b>58</b>	<b>12</b>	<b>2</b>	<b>2</b>	<b>21</b>	<b>29</b>	<b>5</b>	<b>131</b>

## 6.0 Ecosystems At Risk

### 6.1 Search Methods

The CDC assesses and ranks possible threats to ecological communities, synonymous in this usage with “ecosystems.”<sup>75</sup> The term refers to distinctive plant communities that can occur in a variety of Biogeoclimatic (BGC) Zones and similar growing conditions (represented by the most specific class in the BGC system, Site Series).

#### Search Criteria

The narrowest search for ecosystems at risk on the BC Species and Ecosystems Explorer<sup>76</sup> includes the following search terms (Table 6.1; Figure 6.1):

- Ecosystem Realm-Groups: Flood Group (F) OR Forest OR Grassland Group (G) OR Hydrogenic Group (H) OR Rock Group (R) OR Subalpine Shrub Group (S) OR Mineral Wetland Group OR Peatland Group OR Alpine Group (A) OR Beach Group (B)
- AND BC Conservation Status: Red (Extirpated, Endangered, or Threatened) OR Blue (Special Concern)
- AND Forest Districts: Squamish Forest District (DSQ) ( Restricted to Red, Blue, and Legally designated species )
- AND BGC Zone:
- AND BGC Zone, Subzone, Variant, Phase: CMAun, CMAunp, CWHds1, CWHms1, MHunp, MHmm2

The BGC units included in the search for ecosystems at risk in the RMOW were: low elevation ecosystems in the Coastal Western Hemlock (CWH) Zone, subalpine forested and parkland ecosystems in the Mountain Hemlock (MH) Zone, and alpine ecosystems in the Coastal Mountain-heather Alpine (CMA) Zone (Table 5.1). Within each of these units, the most restrictive (lowest level) unit was chosen from CDC search options. For the CWH Zone and MHmm Subzone it was possible to specify Variant which restricted search results to ecosystems that are most likely to occur in Whistler. The most restrictive search term for MH parkland was at the next higher (more general) Subzone level (MHmmp) which includes parkland ecosystems with a more maritime influence west of Whistler. Two search terms were necessary to return all results for alpine ecosystems: CMAun and CMAunp (the latter includes some parkland ecosystems). Estuarine ecosystems were excluded since that habitat does not occur in the RMOW.

**TABLE 6.1.** Full Biogeoclimatic (BGC) unit names that occur in the RMOW. Small patches of the Engelmann Spruce – Subalpine Fir (ESSF) Zone occur in the RMOW that are not included here.

<b><u>BGC Unit</u></b>	<b><u>BGC Class</u></b>	<b><u>Full Description</u></b>
CMAun	Zone	Coastal Mountain-heather Alpine – undifferentiated
CMAunp	Zone + Subzone	Coastal Mountain-heather Alpine - undifferentiated and parkland
CWHds1	Variant	Coastal Western Hemlock Southern Dry Submaritime
CWHms1	Variant	Coastal Western Hemlock Southern Moist Submaritime
MHmm2	Variant	Mountain Hemlock Leeward Moist Maritime
MHmmp	Subzone	Mountain Hemlock Moist Maritime Parkland

A further check of all CWH ecosystems added one more ecosystem: CWH/Ws51 (Sitka willow - Pacific willow / skunk cabbage) which the CDC lists as occurring within Whistler.

<sup>75</sup> <http://a100.gov.bc.ca/pub/eswp/search.do>

<sup>76</sup> Accessed January 7, 2019.

**Basic Search**

Name ?  ☒ Scientific ☒ English ☐ Species Code

Groups ?

- ☐ Animals
- ☐ Plants
- ☐ Fungi (Lichens and Macrofungi)
- ☒ Ecological Communities
  - ☒ Estuarine Realm
    - ☐ Estuarine Marsh Class (Em)
    - ☐ Estuarine Meadow Class (Ed)
    - ☐ Estuarine Tidal Flat Class (Et)
  - ☒ Terrestrial Realm
  - ☒ Wetland Realm
    - ☒ Mineral Wetland Group
    - ☒ Peatland Group

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**Advanced Search** Expand All Collapse All


Note: when selecting multiple criteria in an Advanced Search, the Search Results will show taxa that meet all chosen conditions. E.g. Blue-listed lichens in the CDF zone, within the Capital Regional District.

☒ Native / Endemic ?

☒ Conservation Status ? ✓

☒ BC List (Red, Blue, Yellow, Extinct)

- ☒ Red (Extirpated, Endangered, or Threatened)
- ☒ Blue (Special Concern)
- ☐ Yellow (Not at Risk)
- ☐ Extinct (Species only)



Regional Districts

Biogeoclimatic Units

Zone	Zone, Subzone (Variant, Phase) (Ecosystems only)
BWBS - Boreal White and Black Spruce	CWHds - Dry Submaritime
CDF - Coastal Douglas-fir	CWHds1 - Southern Dry Submaritime
CMA - Coastal Mountain-heather Alpine	CWHds2 - Central Dry Submaritime
CWH - Coastal Western Hemlock	CWHmm - Moist Maritime
ESSF - Engelmann Spruce - Subalpine Fir	CWHmm1 - Submontane Moist Maritime
ICH - Interior Cedar - Hemlock	CWHmm2 - Montane Moist Maritime
IDF - Interior Douglas-fir	CWHms - Moist Submaritime
IMA - Interior Mountain-heather Alpine	CWHms1 - Southern Moist Submaritime
MH - Mountain Hemlock	CWHms2 - Central Moist Submaritime
MS - Montane Spruce	CWHun - Undifferentiated

**FIGURE 6.1.** Screenshot from the CDC Species and Ecosystem Explorer showing some of the search terms used to narrow results for ecological communities that occur in the Squamish Forest District.

## 6.2 Notes on the inclusion of CWHds1 and exclusion of ESSFmwp Variants

### CWHds1:

Two reports (MOT 2003; Timberline 2007) mapped the forests at the south end of the RMOW (near Brandywine Provincial Park) and further south as CWHds1. The CDC recorded a Species Occurrence of CWHds1 at the north end of that park, but has not verified it with a field visit.<sup>77</sup> Green (2010) mapped all low-elevation ecosystems in the RMOW as Moist Submaritime (CWHms1), but he acknowledged that the southern boundary between the Moist and Dry Submaritime Subzones (CWHms and CWHds, respectively) was difficult to establish (p. 8). Ecological communities from the CWHds1 Variant were included within Section 6 for three reasons:

- (i) There are arguably sites within the southern end of the RMOW that could be classed as CWHds1 (references above and personal observations);
- (ii) 10% of the Whistler Landscape Unit for the Cheakamus Community Forest (in which the RMOW is a partner) is classified as CWHds1 (Green 2010); and
- (iii) The CWHds1 Variant has a higher percentage of Red-listed ecosystems than the CWHms1 Variant and a prudent approach would be to assume higher risk to them.

### ESSFmwp:

Although previous mapping has sometimes included polygons of the Engelmann Spruce – Subalpine Fir Parkland Moist Warm Parkland (ESSFmwp) Variant on the west aspect slopes of Blackcomb and Whistler Mountains, it was excluded as a search term here. Green (2010) did not map any Engelmann Spruce – Subalpine Fir (ESSF) Zone ecosystems in the Whistler Landscape Unit of the Cheakamus Community Forest and there is some contention whether such small, discontinuous occurrences from another BGC Zone fit within the overall BGC system (Karel Klinka, pers. comm.). Either way, many of the ecological communities that would be found in the ESSFmwp would also be found in the MHmwp2. Finally, the listings for high-elevation plant communities for the BC Coast have not yet been completed so will need to be reassessed when they are (Will MacKenzie, pers. comm.). Two sources for this future work include plots and ecosystem classification in the Whistler area (Brett et al. 2001; Brett and Bjork 2016c).

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<sup>77</sup> B.C. Conservation Data Centre. 2014. Occurrence Report Summary, Shape ID: 118616, western hemlock - Douglas-fir / electrified cat's-tail moss Dry Submaritime 1. B.C. Ministry of Environment. Available: <http://maps.gov.bc.ca/ess/hm/cdc>, (accessed May 5, 2019).



### 6.3 Ecosystems at Risk within the RMOW (2018)

The results show seven Red-listed and 12 Blue-listed ecosystems in the Whistler area (Table 6.2). This result means that the CDC considers all but three terrestrial ecosystems (Site Series) within the RMOW to be at-risk.<sup>78</sup> There was only one change in ranking in 2018: the CWHds1/01 (zonal sites) was downlisted from Red to Blue but retained its status as Identified Wildlife under the Forest and Range Practices Act (BC MOE 2019a). Floodplain communities (Site Series 07, 08, 09) are the most likely to be Red-listed (most at risk).

**TABLE 6.2.** Ecosystems at risk in the Whistler area (accessed on January 9, 2019). The “ID Wildlife” column lists three plant communities designated as Identified Wildlife (BC MOE 2019a). Ecosystems that the CDC lists as present in Whistler are shown in the first column.

Present?	Site Series	Common Name	Scientific Name	BC List	ID Wildlife
Yes	CWHds1/01	Western Hemlock - Douglas-fir / Electrified Cat's-tail Moss ds1	<i>Tsuga heterophylla</i> - <i>Pseudotsuga menziesii</i> / <i>Rhytidiadelphus triquetrus</i> ds1	Blue <sup>79</sup>	Yes
Yes	CWHms1/01	Western Hemlock - Amabilis Fir / Step Moss	<i>Tsuga heterophylla</i> - <i>Abies amabilis</i> / <i>Hylocomium splendens</i>	Blue	
Yes	CWHds1/02	Douglas-fir - Lodgepole Pine / Kinnikinnick Dry Submaritime	<i>Pseudotsuga menziesii</i> - <i>Pinus contorta</i> / <i>Arctostaphylos uva-ursi</i> Dry Submaritime	Red	
Yes	CWHms1/02	Douglas-fir - Lodgepole Pine / Kinnikinnick Moist Submaritime	<i>Pseudotsuga menziesii</i> - <i>Pinus contorta</i> / <i>Arctostaphylos uva-ursi</i> Moist Submaritime	Blue	
Yes	CWHds1/03; CWHms1/03	Douglas-fir - Western Hemlock / Falsebox	<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Paxistima myrsinites</i>	Blue	
Yes	CWHds1/04	Douglas-fir / Douglas maple / Hooker's Fairybells	<i>Pseudotsuga menziesii</i> / <i>Acer glabrum</i> / <i>Prosartes hookeri</i>	Red	
Yes	CWHms1/04	Amabilis Fir - Western Redcedar / Oak Fern	<i>Abies amabilis</i> - <i>Thuja plicata</i> / <i>Gymnocarpium dryopteris</i>	Blue	
Yes	CWHds1/05	Western Redcedar - Douglas-fir / Vine Maple	<i>Thuja plicata</i> - <i>Pseudotsuga menziesii</i> / <i>Acer circinatum</i>	Blue	Yes
Yes	CWHds1/06	Western Hemlock / Queen's Cup	<i>Tsuga heterophylla</i> / <i>Clintonia uniflora</i>	Red	
Yes	CWHms1/06	Amabilis Fir - Western Redcedar / Devil's Club Moist Submaritime	<i>Abies amabilis</i> - <i>Thuja plicata</i> / <i>Oplopanax horridus</i> Moist Submaritime	Blue	
Yes	CWHds1/07	Western Redcedar / Devil's Club	<i>Thuja plicata</i> / <i>Oplopanax horridus</i>	Blue	Yes
Yes	CWHms1/07	Sitka Spruce / Salmonberry Moist Submaritime	<i>Picea sitchensis</i> / <i>Rubus spectabilis</i> Moist Submaritime	Red	
Yes	CWHds1/08	Sitka Spruce / Salmonberry Dry	<i>Picea sitchensis</i> / <i>Rubus spectabilis</i> Dry	Red	
Yes	CWHms1/08, CWHds1/09	Black Cottonwood - Red Alder / Salmonberry	<i>Populus trichocarpa</i> - <i>Alnus rubra</i> / <i>Rubus spectabilis</i>	Blue	
Yes	CWHms1/09	Black Cottonwood / Sitka Willow – Thimbleberry	<i>Populus trichocarpa</i> / <i>Salix sitchensis</i> - <i>Rubus parviflorus</i>	Red	
Yes	CWHds1/10	Black Cottonwood / Willows Dry Submaritime	<i>Populus trichocarpa</i> / <i>Salix</i> spp. Dry Submaritime	Blue	
Yes	CWHms1/11, CWHds1/12	Western Redcedar - Sitka Spruce / Skunk Cabbage	<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Lysichiton americanus</i>	Blue	
Yes	CWH/Ws51	Sitka Willow - Pacific Willow / Skunk Cabbage	<i>Salix sitchensis</i> - <i>Salix lasiandra</i> var. <i>lasiandra</i> / <i>Lysichiton americanus</i>	Red	
No	CWH/Wm04	Common Spike-Rush Herbaceous Vegetation	<i>Eleocharis palustris</i> Herbaceous Vegetation	Blue	

**Excluded:**

No	CWHds1/00	Garry oak - bigleaf maple - cherries	<i>Quercus garryana</i> - <i>Acer macrophyllum</i> - <i>Prunus</i> spp.*	Red	
Yes**	CWHds1	Dune Wildrye - Beach Pea	<i>Leymus mollis</i> ssp. <i>mollis</i> - <i>Lathyrus japonicus</i> **	Red	

\* Garry Oak and this plant community is not possible near the RMOW. The only occurrence mapped by the CDC is in the Fraser Valley.

\*\* The *Lathyrus mollis* plant community is not possible in the RMOW -- these are seaside communities. The CDC nonetheless lists this plant community occurring in Whistler.

<sup>78</sup> The three not at-risk include: CWHds1/11 and CWHms1/10 (Lodgepole pine – Sphagnum), plus CWHms1/01 (Western hemlock – amabilis fir – step moss).

<sup>79</sup> Downlisted from Red to Blue (CDC 2018).

Two ecosystems were excluded because they are not possible in the RMOW (see notes in Table 6.2). Two wetland ecosystems are included as occurring or possible within the RMOW. Common Spike-Rush Herbaceous Vegetation and Sitka willow - Pacific willow / skunk cabbage (Mackenzie and Moran 2004). I have seen similar ecosystems to the first in shallow parts of the Alta Lake shoreline and at the Brandywine basalt flats (among other locations). Analogues to the second occur in shallow water in floodplain forests and wetlands (Mackenzie and Moran 2004). I have seen similar ecosystems in the Emerald Forest and at the south end of the Chateau Golf Course (among other locations). The RMOW's Terrestrial Ecosystem Mapping (Green 2010) did not map non-forested ecosystems as described by Mackenzie and Moran.<sup>80</sup> They did, however, describe and map their own plant communities. Green's "Nuphar" site unit<sup>81</sup> appears to be the closest match to the MacKenzie and Moran's Common Spike-Rush community. Green's Alder/Willow – Skunk Cabbage site unit<sup>82</sup> appears to be a very close match to the CDC's Sitka willow - Pacific willow / skunk cabbage community. Field work would be necessary to confirm locations of these two wetland ecosystems within the RMOW.

No ecosystems are listed for the Mountain Hemlock (MH) Zone. The reason there are no listed ecosystems in the forested, lower portion of the MH (MHmm2) may be because there has, historically, been less logging and other developments at these higher elevations. Now that higher elevations are being targeted more for logging, some ecosystems are certainly at risk. As mentioned above, high elevation (non-forested) ecological communities on the BC Coast have yet to be thoroughly assessed so there are few listings. Will Mackenzie expects to finish that job within the next two years (pers. comm. in Brett and Björk 2016).

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<sup>80</sup> As noted above, non-forested ecosystems have only recently been classified and recognized in BC.

<sup>81</sup> Which is based on Klinka et al.'s (1997) *Nuphar polysepalum*: *Eleocharis palustris* subassociation.

<sup>82</sup> Coded as "DrWi-Skunk Cabbage."

## 7.0 Recovery Planning and Best Management Practices

While outside the immediate scope of this report, BC and Canadian Governments have published many plans and other documents to assess species at risk and propose management and recovery planning for them.<sup>83</sup> To date, most of these documents are non-binding but nonetheless provide useful information. The BC Government maintains a list of current recovery and management plans published for species at risk at BC and/or Federal levels.<sup>84</sup> All plans, if published, are included under the species accounts below (Table 6.1). Recovery and/or management plans for many species at risk have yet to be conducted. Based on the Provincial and Federal ranking, plans listed below may be at either or both the Provincial and Federal level.

Definitions provided by the BC Government<sup>85</sup> for the different types of plans are as follows:

**Recovery plan:** A document developed for a species or ecosystem in B.C. that has been designated as extirpated, endangered or threatened. This approach is used for B.C.-led recovery documents– it includes information to guide implementation as well as an outline of the survival and recovery habitat needed to meet the goal and objectives. In some cases, information is summarized in a more strategic recovery strategy followed by one or more action plans used to guide implementation measures.

**Management plan:** A document developed for "special concern" species or ecosystems in B.C. It outlines the coordinated conservation activities and land use measures needed to ensure, at a minimum, that a species or ecosystem does not become threatened or endangered.

**Implementation plan:** In addition to a recovery planning document, some species may also have an implementation plan that outlines the provincial government's response to managing species at risk – especially in cases where there could be significant socio-economic implications.

BC publishes non-binding guidelines on a variety of local species (titled as Best Management Practices or Develop With Care).<sup>86</sup> These guidelines and the documents listed in Table 6.1 should be references for future conservation efforts in the RMOW. BC does not yet enacted endangered species laws similar to the Canadian Species at Risk Act, in spite of a 2017 directive to the incoming Minister of Environment and Climate Change Policy.<sup>87</sup> As of April 2019, the BC backtracked on its commitment to endangered species legislation which is now not likely to be enacted before 2021.<sup>88</sup>

<sup>83</sup> The BC recovery planning process is best summarized in BC MOE (2016b).

<sup>84</sup> <http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk/recovery-planning/recovery-planning-documents/recovery-planning-documents>

<sup>85</sup> Ibid.

<sup>86</sup> <http://www.env.gov.bc.ca/wld/BMP/bmpintro.html#second>

<sup>87</sup> <https://www2.gov.bc.ca/assets/gov/government/ministries-organizations/premier-cabinet-mlas/minister-letter/heyman-mandate.pdf>

<sup>88</sup> <http://thenarwhal.ca/b-c-stalls-on-promise-to-enact-endangered-species-law/>

TABLE 5.1: Planning documents available from the BC or Canadian Government for species at risk in the RMOW.

Common Name (Scientific Name)	Most recent approved planning document(s); online links
Coastal Tailed Frog ( <i>Ascaphus truei</i> )	Federal Management Plan (ECCC 2018a): <a href="https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Mp-CoastalTailedFrog-v00-2018Oct-Eng.pdf">https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/plans/Mp-CoastalTailedFrog-v00-2018Oct-Eng.pdf</a>
Common Nighthawk ( <i>Chordeiles minor</i> )	Federal Recovery Strategy (Env. Canada 2016a): <a href="#">Recovery Strategy for the Common Nighthawk (Chordeiles minor) in Canada (PDF)</a>
Evening Grosbeak ( <i>Coccothraustes vespertinus</i> )	Federal assessment and status report (COSEWIC 2016): <a href="https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Evening%20Grosbeak_2016_e.pdf">https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Evening%20Grosbeak_2016_e.pdf</a> .
Great Blue Heron ( <i>Ardea herodias</i> ssp. <i>fannini</i> )	Proposed Federal Management Plan (Environment Canada 2016b): <a href="https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/mp_great_blue_heron_fannini_e_proposed.pdf">https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/mp_great_blue_heron_fannini_e_proposed.pdf</a>
Grizzly Bear ( <i>Ursus arctos</i> ):	Federal assessment and status report (COSEWIC 2013c): <a href="http://www.registrelep-sararegistry.gc.ca/document/default_e.cfm?documentID=2459">http://www.registrelep-sararegistry.gc.ca/document/default_e.cfm?documentID=2459</a> North Cascades Grizzly Bear Recovery Team (2004): <a href="http://www.env.gov.bc.ca/wld/documents/recovery/ncgbrt_final.pdf">http://www.env.gov.bc.ca/wld/documents/recovery/ncgbrt_final.pdf</a>
Little Brown Myotis ( <i>Myotis lucifugus</i> )	Federal Recovery Strategy (ECCC 2018b): <a href="file:///C:/Users/Snowline/Documents/2018%20SEAR/regulation%20-%20Recovery%20Plans%20BC%20and%20Canada/Little%20Brown%20Bat%20Recovery%20Strategy%20Env.%20Canada%20Final%202018.pdf">file:///C:/Users/Snowline/Documents/2018%20SEAR/regulation%20-%20Recovery%20Plans%20BC%20and%20Canada/Little%20Brown%20Bat%20Recovery%20Strategy%20Env.%20Canada%20Final%202018.pdf</a> .
Marbled Murrelet ( <i>Brachyramphus marmoratus</i> )	Federal Recovery Strategy (Env. Canada 2014a): <a href="#">Recovery Strategy for the Marbled Murrelet (Brachyramphus marmoratus) in Canada</a> Developing a BC Implementation Plan (MFLNRO 2015b): <a href="https://www.for.gov.bc.ca/ftp/rco/external/!publish/FMLT%20Publish/North%20Island%20Central%20Coast/February%2025%202016%20Meeting/MAMU%20Info%20Package_Dec%2017%202015.pdf">https://www.for.gov.bc.ca/ftp/rco/external/!publish/FMLT%20Publish/North%20Island%20Central%20Coast/February%2025%202016%20Meeting/MAMU%20Info%20Package_Dec%2017%202015.pdf</a>
Mountain Goat ( <i>Oreamnos americanus</i> )	BC Management Plan (Mountain Goat Management Team 2010): <a href="#">Management Plan for the Mountain Goat (Oreamnos americanus) in British Columbia (PDF)</a>
Northern Goshawk, <i>laingi</i> ssp. ( <i>Accipiter gentilis</i> ssp. <i>laingi</i> )	Developing a BC Implementation Plan (MFLNRO 2015a): <a href="https://www.for.gov.bc.ca/ftp/rco/external/!publish/FMLT%20Publish/North%20Island%20Central%20Coast/February%2025%202016%20Meeting/NOGO%20Info%20Package_Dec%2017%202015.pdf">https://www.for.gov.bc.ca/ftp/rco/external/!publish/FMLT%20Publish/North%20Island%20Central%20Coast/February%2025%202016%20Meeting/NOGO%20Info%20Package_Dec%2017%202015.pdf</a> BC Management Plan (BC MFLNRO 2013): <a href="#">Management Plan for the Northern Goshawk, <i>laingi</i> subspecies (Accipiter gentilis laingi) in British Columbia (PDF)</a> BC Recovery Strategy (Northern Goshawk Recovery Team 2008): <a href="#">Recovery Strategy for the Northern Goshawk, <i>laingi</i> subspecies (Accipiter gentilis laingi) in British Columbia (PDF)</a>
Northern Red-legged Frog ( <i>Rana aurora</i> )	BC Recovery Plan (BC MOE 2015). URL: <a href="http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10251">http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10251</a> . BC
Northern Spotted Owl ( <i>Strix occidentalis</i> ssp. <i>caurina</i> )	Federal Recovery Strategy (2006; <i>In</i> : Chutter et al. 2004): <a href="http://www.sararegistry.gc.ca/virtual_sara/files/plans/rs_spotted_owl_caurina_1006_e.pdf">http://www.sararegistry.gc.ca/virtual_sara/files/plans/rs_spotted_owl_caurina_1006_e.pdf</a>
Northwest (Western) Waterfan ( <i>Peltigera gowardii</i> )	BC Management Plan (BC MOE 2015a): <a href="http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10291">http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10291</a> Federal Status Assessment (COSEWIC 2013a): <a href="https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Western%20Waterfan_2013_e.pdf">https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Western%20Waterfan_2013_e.pdf</a>
Olive-sided Flycatcher ( <i>Contopus cooperi</i> )	Proposed Federal Management Plan (Environment Canada 2016c): <a href="http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_olive-sided%20flycatcher_e_final.pdf">http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_olive-sided%20flycatcher_e_final.pdf</a>
Old-growth Specklebelly ( <i>Pseudocypbellaria rainierensis</i> )	Federal management plan (COSEWIC 2017): <a href="http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&amp;n=1440C3BA-1">http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&amp;n=1440C3BA-1</a> Management plan for oldgrowth specklebelly ( <i>Pseudocypbellaria rainierensis</i> ) in British Columbia (BC MOE 2015c). <a href="http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10231">http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10231</a> .
Pacific Water Shrew ( <i>Sorex bendirii</i> )	Federal Recovery Strategy (Environment Canada 2014b): <a href="http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_pacific_water_shrew_e_final.pdf">http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_pacific_water_shrew_e_final.pdf</a> BC Recovery Strategy (Pacific Water Shrew Recovery Team 2009): <a href="http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=6612">http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=6612</a>
Western Screech-Owl ( <i>Megascops kennicottii</i> ssp. <i>kennicottii</i> )	Federal assessment and status report (COSEWIC 2012): <a href="http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_western_screech-owl_1012_e.pdf">http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_western_screech-owl_1012_e.pdf</a>

Western Bumblebee ( <i>Bombus occidentalis</i> )	Federal assessment and status report (COSEWIC 2014a): <a href="http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Western%20Bumble%20Bee_2014_e.pdf">http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Western%20Bumble%20Bee_2014_e.pdf</a>
Western Toad ( <i>Anaxyrus boreas</i> )	Federal Management Plan (ECCC 2016): <a href="http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/mp-western-toad-e-proposed.pdf">http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/mp-western-toad-e-proposed.pdf</a> .
Whitebark Pine ( <i>Pinus albicaulis</i> )	SARA recovery strategy (ECCC 2017): <a href="http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&amp;n=C6EB6568-1">http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&amp;n=C6EB6568-1</a>
Wolverine ( <i>Gulo gulo luscus</i> )	Federal assessment and status report (COSEWIC 2014b): <a href="http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=206">http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=206</a>

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## Appendix 1: Species and Ecosystems at Risk Definitions

Term	Definition
Federal Definitions <sup>8</sup> (COSEWIC and the Species At Risk Act [SARA] use same rankings. COSEWIC is not a legal listing; the legal list is under SARA)	
Extinct	A species that no longer exists.
Extirpated	A species that no longer exists in its native habitat, but may occur elsewhere.
Endangered	A species facing imminent extinction or extirpation. *
Threatened	A species that is likely to become endangered if limiting factors such as diminishing population sizes, isolated geographic distribution, and habitat threats are not reversed. *
Special Concern	A species of special concern because of characteristics that make it is particularly sensitive to human activities or natural events.
Not at Risk	A species that has been evaluated and found to be not at risk.
Data Deficient	A species for which there is insufficient scientific information to support status designation.
Provincial Definitions <sup>9</sup>	
Endangered Species (legal list under BC Wildlife Act)	A species of wildlife that is threatened with imminent extinction throughout all or a significant portion of its range in British Columbia because of the action of humans, not including controlled alien species. Only 3 species are legally listed as endangered under the BC Wildlife Act: Vancouver Island Marmot, American White Pelican and Burrowing Owl.
Threatened Species (legal list under BC Wildlife Act)	A species of wildlife that is likely to become endangered in British Columbia if the factors affecting its vulnerability are not reversed, not including controlled alien species. Only 1 species is legally listed as threatened under the BC Wildlife Act: Sea Otter.
Forest and Range Practices Act (Identified Wildlife Management Strategy)	B.C. designates both species and ecological communities under FRPA. There are 62 animal species, 2 plant species and 17 ecological communities provincially designated.
BC Ministry of Environment Conservation Data Centre Red list (not a legal list)	The list of ecological communities and indigenous species and subspecies that are extirpated, endangered or threatened in BC. They may or may not be considered candidates for provincial legal designations under the Wildlife Act or under FRPA. There are 98 species and 54 ecological communities on the CDC's red list in the South Coast. Although no species are actually listed as endangered or threatened under the Wildlife Act, individual vertebrates receive protection under the Wildlife Act (see above).
BC Ministry of Environment Conservation Data Centre Blue list (not a legal list)	The list of ecological communities and indigenous species and subspecies of special concern in BC. There are 177 species and 50 ecological communities blue-listed in the South Coast.

<sup>8</sup> Government of Canada Environment Canada. 2014. <[http://www.sararegistry.gc.ca/about/glossary/default\\_e.cfm](http://www.sararegistry.gc.ca/about/glossary/default_e.cfm)>

<sup>9</sup> Government of British Columbia Ministry of Environment. Ecosystems Branch. 2014. <<http://www.env.gov.bc.ca/atrisk/index.html>>

Source: Bedore 2014, p. 8 and SCCP 2016, used with permission of the SCCP (P. Zevit, pers. comm.).

## Appendix 2: Assessment Rationale for Species at Risk

The tables below, originally presented in the 2016 report, have been updated to the end of 2018.

The status of species at risk to the end of 2018 and the resulting lists (Section 4) are based on a very detailed compilation of records in Whistler and beyond, as well as consultations with a wide range of experts. Whistler Biodiversity Project (WBP) lists records species that have been recorded at least once in the RMOW (“Confirmed”). Defining this group is the most important step towards delineating habitat types and perhaps specific locations that require conservation.

Ranking the remaining, unconfirmed species by their likelihood of occurrence is also important since it: (a) helps define which unconfirmed but likely species at risk to target for future surveys; and (b) helps exclude species that are unlikely or not possible in the RMOW and therefore frees resources for higher priorities. As mentioned earlier, the species at risk included for consideration were either listed by the CDC as possible in the RMOW or known to occur nearby or in similar habitats (mainly based on consultation with specialists). Unconfirmed species were classed as Likely, Possible, Data Deficient, Extirpated, Unlikely (to Highly Unlikely), or Not Possible based on local occurrence data, range maps, known habitat affinities, my experience, and consultation with other biologists cited in Tables A2.1 to A2.5.

**TABLE A2.1 [page 1 of 5]:** Habitat notes used to classify likelihood of species at risk in the RMOW – **Confirmed** species.

Group	Common (Scientific) Name	Biogeoclimatic (BGC) Zone from CDC	Whistler status and habitat notes	Habitat elsewhere (esp. if not documented in RMOW)
Butterflies	Clodius Parnassian ( <i>Parnassius clodius</i> ssp. <i>pseudogallatinus</i> )	CMA;CWH;ESSF;IDF;IMA; MH;MS	Based on range and photos, this is likely the ssp. in Whistler, otherwise the Blue-listed ssp. <i>claudianus</i> (C. Guppy, pers. comm.). It has been found in various low-elevation sites in Whistler (Brett 2015) and could extend to subalpine elevations (Guppy and Shepard 2001)	
	Western Pine Elfin ( <i>Callophrys eryphon</i> ssp. <i>sheltonensis</i> )	CWH	Low-elevation conifer forests (Brett 2015; their larval food plants are lodgepole and western white pine (Guppy and Shepard 2001); photo ID confirmed by C. Guppy.	
Amphibians	Coastal Tailed Frog ( <i>Ascaphus truei</i> )	CWH;ESSF;ICH;IDF;MH; MS	Mountainside creeks >6 deg. C water temperature, mainly between 700 and 1200 metres, especially with rounded cobbles; confirmed presence in 15 RMOW creeks with others likely (Brett 2007; 2015; unpubl. 2016 data).	
	Northern Red-legged Frog ( <i>Rana aurora</i> )	CDF;CWH;MH	Lakes and small ponds in warm sites at the south end of the RMOW, especially Brandywine; also confirmed on n. side of Callaghan R. on CalCheak FSR (Brett 2007).	
	Western Toad ( <i>Anaxyrus boreas</i> )	BG;BWBS;CDF;CWH;ESSF ;ICH;IDF;PP;SBS;SWB	Only known continuous breeding site in RMOW is Lost Lake (W. Horan 2007) but possible in any small or large pond including Cheakamus Crossing, Brandywine and almost certainly other sites (Brett 2007). Toads have been observed in summer in the alpine and far from Lost Lake.	
Birds	Band-tailed Pigeon ( <i>Patagioenas fasciata</i> )	CDF;CWH;ICH;IDF;MS;SB S	Seen in CWH & MH forest, riparian, urban areas (Ricker et al. 2014); can breed in urban edges and forests; historic (Campbell et al 1990b) and likely current breeding in Whistler (Ricker et al. 2014)	
	Barn Swallow ( <i>Hirundo rustica</i> )	BAFA;BG;BWBS;CDF;CW H;ESSF;ICH;IDF;IMA;MH; MS;PP;SBPS;SBS;SWB	Wetlands, grassy areas, riparian, urban areas, breeding (Ricker et al. 2014); nest at float plane wharf last year, not this year (K. Ricker, pers. comm.); 92% of documented nests were on structures (Campbell et al.1997)	
	Black Swift ( <i>Cypseloides niger</i> )	BAFA;BG;CDF;CMA;CWH ;ESSF;ICH;IDF;IMA;MH;M S;PP;SBPS;SBS;SWB	Alpine, CWH & MH forest (Ricker et al. 2014); nests in cliffs/steep bluffs (Campbell et al. 1990b); known nests in Brandywine Canyon and maybe Soo Bluffs (K. Ricker, pers. comm.)	
	Common Nighthawk ( <i>Chordeiles minor</i> )	BG;BWBS;CDF;CWH;ESSF ;ICH;IDF;MH;MS;PP;SBPS ;SBS;SWB	Lakes & ponds, CWH forest, riparian (Ricker et al. 2014); recorded most years in Breeding Bird Survey (D. Marven unpubl. data) and at Brandywine basalt flats (BioBlitz 2012).	Ground nester on open sites (Campbell et al. 1990b).
	Evening Grosbeak ( <i>Coccothraustes vespertinus</i> )	All non-alpine throughout BC.	Breeding in Whistler according to Ricker et al. (2014) but Karl Ricker (pers. comm., Dec. 2018) notes this species is not recorded each year.	
	Great Blue Heron ( <i>Ardea herodias</i> ssp. <i>fannini</i> )	CDF;CWH	Foraging mainly in valleybottom lakes, wetlands, and riparian areas (Campbell et al. 1990a; Ricker et al. 2014); no known breeding sites nearby; local herons may return to coast for breeding (K. Ricker, pers. comm.)	

**TABLE A2.1 [page 2 of 5]:** (cont.): Habitat notes used to classify likelihood of species at risk in the RMOW – **Confirmed** species.

Group	Common (Scientific) Name	Biogeoclimatic (BGC) Zone from CDC	Whistler status and habitat notes	Habitat elsewhere (esp. if not documented in RMOW)
Birds (cont.)	Green Heron ( <i>Butorides virescens</i> )	BG;CDF;CWH;ICH;IDF;PP; SBS	Rivers & streams, wetlands, riparian adjacent to shrub or small tree cover (Ricker et al. 2014; Campbell et al 1990a); Campbell et al. report breeding on Alta and Green Lakes but there are no recent records (K. Ricker, pers. comm.)	
	Northern Goshawk ( <i>Accipiter gentilis</i> ssp. <i>laingi</i> )	CDF;CWH	Alpine, CWH & MH forest, wetlands (Ricker et al. 2014); nest sites in old-growth montane forests at Wedge Creek (2014?) and Whistler (Brent Matsuda in Palmer and Snowline 2017), many aerial sightings (Ricker et al. 2014; Whistler BioBlitz)	
	Olive-sided Flycatcher ( <i>Contopus cooperi</i> )	BWBS; CDF; CWH; ESSF; ICH; IDF; MH; MS; PP; SBPS; SBS; SWB	CWH & MH forest, riparian habitats, breeding (Ricker et al. 2014); requires snags adjacent to openings (Campbell et al. 1997); breeds most commonly at mid-elevations, +/-1100 m (Campbell et al.1997); sightings decreasing (K. Ricker, pers. comm.)	
	Western Screech-Owl ( <i>Megascops kennicottii kennicottii</i> )	BG; CDF; CWH; ICH; IDF; PP	Deemed a non-resident (Ricker et al. 2014) and "essentially non-migratory" by Campbell et al. (1990b). Recent records from Greg Ferguson (2017) and Karl Ricker (pers. comm., Dec. 2018) suggest there may be resident (breeding?) birds.	Screech-owls are known to breed in Pemberton (Ferguson 2017) and are often associated with cottonwood and similar habitats where tree cavities are available for nesting.
Fish	Bull Trout ( <i>Salvelinus confluentus</i> - coastal lineage)	CDF;CWH;MH	Green Lake, Fitzsimmons Creek, occasionally Alta Lake and historic records from Lost Lake and 21-Mile Creek (Rebellato 2005)	
Mammals	Grizzly Bear ( <i>Ursus arctos</i> )	BAFA; BWBS; CMA; CWH; ESSF; ICH; IDF; IMA; MH; MS; SBPS; SBS; SWB	"Some breeding and habitat use specifically Brandywine, Callaghan, Sproatt" (S. Rochetta, pers. comm., Nov. 2016). Mother and cubs near Lord of the Squirrels trail in fall 2018.	
	Keen's Myotis ( <i>Myotis keenii</i> )	BWBS;CDF;CWH;MH	Confirmed in Edgewater old riparian forest and roosting in nearby old forest (Lost Lake Park); unknown hibernacula/migration patterns (C. Lausen and L.-A. Isaac in B. Brett 2015)	Data deficient; likely to be delisted and included with <i>M. evotis</i> (C. Lausen, pers. comm.). Likely to be subsumed under <i>M. evotis</i> due to interbreeding (Lausen et al. 2016).
	Little Brown Myotis ( <i>Myotis lucifugus</i> )	BG;BWBS;CDF;CWH;ESSF;ICH;IDF;MH;MS;PP;SBPS;SBS;SWB	Common over wetlands, lake edges, trails; roosts in houses (Brett 2007; Lausen and Isaac 2010; Isaac and Lausen 2012; Brett 2015) and likely loose bark of large trees and other sites (Nagorsen and Brigham 1993). Over-wintering survival threatened by white-nose fungus.	
	Mountain Goat ( <i>Oreamnos americanus</i> )	BAFA;BG;BWBS;CDF;CMA;CWH;ESSF;ICH;IDF;IMA;MH;MS;PP;SBPS;SBS;SWB	"Historically breeding and habitat use, however people, helicopters and snowmobiles have significantly impacted former range. Possibly there is still some use of Sproatt winter range?"(S. Rochetta, pers. comm.); also Overlord/Fitzsimmons (K. Ricker, pers. comm.), Brandywine Mt. (B. Brett, pers. obs.); maybe Phalanx through Singing Pass?	Overwinter habitat elsewhere is typically <1200m, in older forest and, crucially, close to escape terrain (cliffs; Wilson 2005).
	Wolverine, <i>luscus</i> ssp. ( <i>Gulo gulo luscus</i> )	BAFA;BWBS;CMA;CWH;ESSF;ICH;IDF;IMA;MH;MS;SBPS;SBS;SWB	"Potentially breeding and habitat use specifically Brandywine, Callaghan, Fitzsimmons and Cheakamus River (Steve Rochetta, pers. comm.); plus Whistler and Blackcomb Mts. alpine (Laird Brown photo and E. Crowe, pers. comm.)	



**TABLE A2.1 [page 3 of 5]:** (cont.): Habitat notes used to classify likelihood of species at risk in the RMOW – **Confirmed** species.

Group	Common (Scientific) Name	Biogeoclimatic (BGC) Zone from CDC	Whistler status and habitat notes	Habitat elsewhere (esp. if not documented in RMOW)
Lichens	alpine redhead ( <i>Nodobryoria subdivergens</i> )	no data	One 1994 record from Whistler alpine (T. Goward in Brett 2015),	On rocks and trees at treeline (Goward et al. 1994).
	alpine soil foam ( <i>Stereocaulon glareosum</i> )	CDF; CMA, CWH	Blackcomb alpine in wet soil (Brett 2007)	Sandy, gravelly soil at all elevations (Goward et al. 1994).
	arctic coral ( <i>Sphaerophorus globosus</i> )	CDF; CMA, CWH	Five records between 1980 and 2016, including Callaghan Valley and Harmony Bowl. (Brett 2019). Omitted by error in previous reports.	
	canuckle bone ( <i>Hypogymnia canadensis</i> )	no data	Rainbow Trail at 1050m in ancient forest (Brett 2015).	On conifers in cool, moist forests to mid elevation (McCune and Geiser 2009).
	electric rocktripe ( <i>Umbilicaria decussata</i> )	BAFA; MS	On granitic rock in exposed alpine sites (Brett 2015); only other BC record from J. Pojar, 1975, Spatsizi Plateau (C. Björk, pers. comm.).	
	frosted crackers ( <i>Fuscopannaria leucostictoides</i> )	CDF; CMA, CWH	On large black cottonwood (Brett 2007) on barks and twigs in open, old forests (Goward 1994; C. Björk, pers. comm.).	
	lesser salted rocktripe ( <i>Umbilicaria krascheninnikovii</i> )	no data	On acidic rock in exposed alpine sites (Brett 2015; Goward 1994)	
	mountain candlewax ( <i>Ahtiana sphaerosporella</i> )	ESSF; ICH; IMA	Frequent on whitebark pine; may decline significantly as that species declines (C. Björk, pers. comm.).	
	spiny witch's hair ( <i>Alectoria imshaugii</i> )	CWHwh	One record from Brandywine PP (Brett 2007)	Infrequent on low elevation conifers (Brett 2007; Goward 1994, McCune and Geiser 2009).
Liverworts	liverwort ( <i>Haplomitrium hookeri</i> )	no data	Humus and soil in the alpine (Brett 2015; Schofield 2002)	
	liverwort ( <i>Jungermannia atrovirens</i> )	no data	Wrongly labelled "Likely" in 2016 and 2017 reports. Two 1980 records from Brandywine Creek via the UBC database were added to the WBP list in 2014 (Brett 2019).	On emergent rock, upper edge of Brandywine Falls (Brett 2019). Found on damp calcareous rocks. <sup>89</sup>
	liverwort ( <i>Nardia breidlerii</i> )	no data	Wet soil at high elevations (Brett 2015; FNA 2018)	
	liverwort ( <i>Nardia compressa</i> )	no data	Over wet rocks along streams and peaty bogs, alpine and Brandywine PP (Brett 2019; FNA 2018)	
	liverwort ( <i>Nardia geoscyphus</i> )	no data	On dry rocks or damp rocks in streams, alpine (Brett 2015)	
	liverwort ( <i>Scapania curta</i> )	no data	On rock in the alpine (Brett 2015) no other data found	
	liverwort ( <i>Scapania obscura</i> )	no data	Peaty soil on late snowmelt sites in the alpine (Brett 2015; Wagner 2008)	
	liverwort ( <i>Solenostoma confertissimum</i> )	no data	Added in 2018 based on two 1980 UBC records from Whistler Mt. (presumably alpine; Brett 2019).	At high elevations and latitudes (CDC 2019).
	liverwort ( <i>Tritomaria polita</i> ssp. <i>polita</i> )	no data	Various substrates in the alpine (Brett 2019)	

<sup>89</sup> <http://rbg-web2.rbge.org.uk/bbs/Activities/liverworts/Jungermannia%20atrovirens.pdf>

**TABLE A2.1 [page 4 of 5]:** (cont.): Habitat notes used to classify likelihood of species at risk in the RMOW – **Confirmed** species.

Group	Common (Scientific) Name	Biogeoclimatic (BGC) Zone from CDC	Whistler status and habitat notes	Habitat elsewhere (esp. if not documented in RMOW)
Mosses	alpine hygrohypnum moss ( <i>Hygrohypnum alpinum</i> )	BAFA;CWH;ESSF;ICH;IDF; SWB	On emergent rocks in subalpine to alpine creeks (Brett 2015; FNA 2018)	
	black grimmia ( <i>Grimmia incurva</i> )	CMA	Damp acidic rock at high elevations (Brett 2015; FNA 2018)	
	Cardot's pohlia moss ( <i>Pohlia cardotii</i> )	CMA;CWH;IMA;MH	Moist, seepy sites, predominantly alpine (Brett 2015)	
	Donn's grimmia ( <i>Grimmia donniana</i> )	no data	On exposed, dry acidic rock at high elevations (Brett 2015; FNA 2018)	
	grimmia moss ( <i>Grimmia caespiticia</i> )	no data	On exposed, dry acidic rock at high elevations (Brett 2015; FNA 2018)	
	Holzinger's brachythecium moss ( <i>Brachythecium holzingeri</i> )	CDF;CMA;CWH;ESSF;ICH; IDF;IMA;MH;MS;SBS	On soil and boulders in alpine sites (Brett 2015; FNA 2018)	
	Nevada homalothecium moss ( <i>Homalothecium nevadense</i> )	no data	On rock in the valley bottom (Brett 2015) various substrates at low to high elevations (FNA 2018)	
	Olympic brachydontium moss ( <i>Brachydontium olympicum</i> )	MH	First and only record from Blackcomb Lake in 2014 (Brett 2015); only 4 records in BC (Klinkenberg 2019b; S. Joya, pers. comm.) makes this a significant record	Moist, acidic boulders mainly in the alpine (FNA 2018).
	pseudoleskea moss ( <i>Pseudoleskea radicata</i> var. <i>pallida</i> )	no data	On rock and mineral soil in the alpine (Brett 2015; FNA 2018)	
	pygmy racomitrium moss ( <i>Racomitrium pygmaeum</i> )	BAFA;ESSF;MH	Dry, acidic soil near treeline (Brett 2015; FNA 2018)	
	Pylais' orthotrichum moss ( <i>Orthotrichum pylaisii</i> )	BWBS [sic: mistake or omission?]	"McGuire area," dry basalt cliff walls (Brett 2015) granitic rock to alpine elevations (FNA 2018)	
	tall-clustered thread-moss ( <i>Bryum pallescens</i> )	no data	One record from thin soil over boulder in stream at 1219m (Brett 2015)	
	thickpoint grimmia ( <i>Schistidium crassipilum</i> )	no data	One record from Whistler Village, substrate not specified (Brett 2007)	On low elevation, often limestone substrates including sidewalks FNA (2018).
	tripterocladium moss ( <i>Tripterocladium leucocladulum</i> )	CWH;IDF;MH	On dry rocks at lower elevations, e.g., Brandywine Park (north?; Brett 2015)	

**TABLE A2.1 [page 5 of 5]:** (cont.): Habitat notes used to classify likelihood of species at risk in the RMOW – **Confirmed** species.

Group	Common (Scientific) Name	Biogeoclimatic (BGC) Zone from CDC	Whistler status and habitat notes	Habitat elsewhere (esp. if not documented in RMOW)
Fern	Cascade parsley fern ( <i>Cryptogramma cascadenensis</i> )	CMA, ESSFvc; ESSFvcp; IMA	One 2016 record from Whistler Mt., and likely in other rocky sites above treeline (Brett 2019)	
Herbs	ochroleucous bladderwort ( <i>Utricularia ochroleuca</i> )	BWBSdk; CDFmm; ESSFmv; ICHmw	One record from Wildlife Refuge wetland (Brett 2007)	
	shinleaf wintergreen ( <i>Pyrola elliptica</i> )	BWBSmw; CWHvm; ESSFmw; ICHmw; IDFww; IDFx; MHmm; MSxk; SBSdw; OSBSmh	Dry forest; two records from Brandywine Park area (Brett 2015)	
Moonwort	upswept moonwort ( <i>Botrychium ascendens</i> )	CMA	One 2005 record from Whistler Peak (in Brett 2007) that hasn't been re-located in many visits (B. Brett, unpubl. data)	Low to montane elevation grassy meadows (Klinkenberg 2019b).
Tree	whitebark pine ( <i>Pinus albicaulis</i> )	CMAunp; CWHds; CWHms; CWHun; MHmm; MHmmp + >40 other BGC units	Common on warm aspect sites near treeline (Brett 2007).	

**TABLE A2.2:** Habitat notes used to classify likelihood of species at risk in the RMOW – Likely species.

Group	Common (Scientific) Name	Biogeoclimatic (BGC) Zone from CDC	Whistler status and habitat notes	Habitat elsewhere (esp. if not documented in RMOW)
Gastropod	Northern Tightcoil ( <i>Pristiloma arcticum</i> )	ESSF;ICH	Tentatively confirmed by Kristiina Ovaska at Harmony Lake (Brett 2015); could occur in RMOW (R. Forsyth, pers. comm.) but see notes re taxonomy.	Under woody debris/litter (Burke 2013); wet subalpine sites under rocks/vegetation, should occur in Whistler but Coast Mt. sp. might be <i>P. crateris</i> instead (R. Forsyth, pers. comm.)
Lichens	midlife vinyl ( <i>Leptogium californicum</i> )	CDF; CWH; IDF	Brandywine PP area on <i>Acer macrophyllum</i> (just outside RMOW? Brett 2015)	On mossy rock (Goward 1994).
	northwest waterfan ( <i>Peltigera gowardii</i> )	no data	Not yet documented in RMOW (Brett 2019)	2 records s. of Whistler (Black Tusk and Brew Lake) in streams <1m wide near treeline (COSEWIC 2013; BC MOE 2015a)
Liverworts	liverwort ( <i>Marchantia alpestris</i> )	no data	Not yet documented in RMOW (Brett 2019) but almost certain.	Russet Lake; margins of snowmelt streams and high elevation ponds/lakes (Brett and Björk 2016). Often misidentified as <i>M. polymorpha</i> (C. Björk, pers. comm.).
	liverwort ( <i>Scapania scandica</i> var. <i>scandica</i> or <i>dimorpha</i> )	no data	Four RMOW records, none of which identify to variety. Both var. <i>scandica</i> and var. <i>dimorpha</i> are Blue-listed on EFlora (Klinkenberg 2019b) but only the former is included at all by CDC (2019). The four specimens are from diverse habitats from low to subalpine elevations (Brett 2019).	No other habitat or range information yet located.
Mammal	Roosevelt Elk ( <i>Cervus elaphus roosevelti</i> )	CWH; MH	Recently introduced to upper Squamish Valley; occasional sightings (K. Ricker, pers. comm.; Brett 2015). Only bull elk have been reported locally but elk could expand their range (S. Rochetta, pers. comm.)	Elk are wide-ranging animals that use a wide range of habitats at all elevations (CDC 2019). The relocation of elk into the Squamish Valley was part of an effort to re-establish them in their former range.
Mosses	alpine thread-moss ( <i>Bryum alpinum</i> [= <i>Imbybryum alpinum</i> ])	no data	One tentative record from Whistler alpine (O. Lee in Brett 2015); but may be <i>B. (Imbybryum) muehlenbeckii</i> (S. Joya, pers. comm.).	Rock and soil over rock at all elevations (FNA 2018).
	brown leskea moss ( <i>Pseudoleskea incurvata</i> var. <i>tenuetis</i> )	no data	Records not identified to subspecies from wet soil at Russet Lake, Brandywine lower MHmm1 moist subalpine forest, Blackcomb alpine. Very difficult to identify to subspecies even for Wilf Schofield (S. Joya, pers. comm.).	Exposed mineral soil, boulders, and outcrops at mid to high elevations (FNA 2018).
	desmatodon moss ( <i>Tortula leucostoma</i> )	BAFA;MH;SWB	Not yet documented in RMOW (Brett 2019) though likely.	Dry soil in alpine heath at Russet Lake (UBC Herbarium in Brett 2015)
	grimmia dry rock moss ( <i>Grimmia anomala</i> )	CWH;MH	Not yet documented in RMOW (Brett 2019); possible in RMOW (O. Lee, pers. comm.).	Exposed, damp soils at mid and high elevations (FNA 2018); closest record is from 1974 on Brew Lk. trail from Brandywine (Brett 2015).
	lesser fringe-moss ( <i>Racomitrium affine?</i> )	no data	Tent. ID from Rainbow Trail (Brett 2015)	Acidic, moist to dry sites to high elevations (FNA 2018).
	Schleicher's thread-moss ( <i>Bryum schleicheri</i> )	CMA;CWH;IMA;MH	Tent. ID by Olivia Lee from Blackcomb Lake (Brett 2015)	Other BC records from wet subalpine sites (UBC Herbarium 2017).

**TABLE A2.3:** Habitat notes used to classify likelihood of species at risk in the RMOW – **Data Deficient** and **Extirpated** species.

Group	Common (Scientific) Name	Biogeoclimatic (BGC) Zone from CDC	Whistler status and habitat notes	Habitat elsewhere (esp. if not documented in RMOW)
Bird	Bank Swallow ( <i>Riparia riparia</i> )	no data	<b>Extirpated?</b> Karl Ricker (pers. comm., Dec. 2018) says there are no recent sightings this bird may be extirpated within the RMOW.	Main range is east of the Coast Mountains (CDC 2019).
Bird	Spotted Owl ( <i>Strix occidentalis</i> <sup>90</sup> )	CWH; ESSF; IDF; MH	<b>Extirpated.</b> Historic in CWH & MH forest; extirpated (Ricker et al. 2014); last record from Ken Racey in 1946 (Campbell et al. 1990a).	Past records from near Lillooet Lake may be the closest occurrences. Likely to be extirpated in BC due partly to loss of habitat (old-growth forest) and competition with Barred Owls.
Fish	Coastal Cutthroat Trout ( <i>Oncorhynchus clarkii clarkii</i> )	BWBS;CDF;CWH;ICH;SBS	<b>Data Deficient.</b> Almost certain historic presence in local lakes and streams before introduction of Rainbow Trout (Eric Crowe, pers. comm.) but unlikely now, based on DNA evidence, within RMOW (E. Crowe and V. Woodruff, pers. comm.). Sterile cutthroat have been introduced to Alta Lake.	Still potentially viable in isolated water bodies north into Pemberton, e.g., Keyhole Falls (E. Crowe, pers. comm.).
Grass	satin grass ( <i>Muhlenbergia racemosa</i> )	BGxh; IDFxh	<b>Data deficient</b> . One <i>Muhlenbergia</i> sp. site confirmed in the Wildlife Refuge wetland (Brett 2019), which Hans Roemer identified as <i>M. racemosa</i> . A UBC specimen and one retrieved in 2018 need to be re-examined to determine if they are <i>M. racemosa</i> or the not-at-risk <i>M. glomerata</i> .	The CDC removed <i>Muhlenbergia racemosa</i> in error in 2018 (CDC 2018; Curtis Björk, by email, June 7, 2018). Given how far out of range this species would be in Whistler (based on other CDC records), it is possible the Whistler population is <i>M. glomerata</i> .

<sup>90</sup> COSEWIC includes this species as *S. occidentalis* ssp. *caurina*.

**TABLE A2.4:** Habitat notes used to classify likelihood of species at risk in the RMOW – **Possible** species (including Data Deficient).

Group	Common (Scientific) Name	Biogeoclimatic (BGC) Zone from CDC	Whistler status and habitat notes	Habitat elsewhere (esp. if not documented in RMOW)
Bee	Western Bumble Bee ( <i>Bombus occidentalis</i> ssp. <i>occidentalis</i> )	no data	Possible in the RMOW but rare and difficult to find (K. Needham, pers. comm.).	Mainly open areas and edges to subalpine elevations (COSEWIC 2014). Closest locations: Mt. Garibaldi and Blackwater Lake near Mt. Currie (Klinkenberg 2019b).
Butterfly	Clodius Parnassian ( <i>Parnassius clodius</i> ssp. <i>claudianus</i> )	CDF;CMA;CWH;MH	The one record (Brett 2015) is likely ssp. <i>pseudogallatinus</i> (tentative photo ID by C. Guppy) but this ssp. is possible in Whistler (C. Guppy, pers. comm.).	Riparian and moist meadows at low to subalpine elevations (Guppy and Shepard 2001).
Dragonfly	Black Petaltail ( <i>Tanypteryx hageni</i> )	CWH	Possible (even Likely) in Whistler (D. Marven and D. Knopp, pers. comm.).	"Found in seepage areas and bogs, flat or on hillsides, often associated with streams and usually not under forest canopy in wet mountain ranges" (CDC 2019).
Bivalve	Striated Fingernailclam ( <i>Sphaerium striatinum</i> )	BAFA;BG;BWBS;CDF;CMA;CWH;ESSF;ICH;IDF;IMA;MH;MS;PP;SBPS;SBS;SWB	Not yet documented; uncertain likelihood in Whistler due to lack of data Province-wide	Permanent bodies of water including lakes, ponds, and streams; only 3 BC records, none near Whistler (CDC 2019).
Gastropods	Rocky Mountain Physa ( <i>Physella propinqua</i> )	BAFA;CDF;CMA;CWH;ESSF;IDF;IMA;MH;MS;SBPS;SBS	Not documented in Whistler (Brett 2019) unknown likelihood in Whistler due to taxonomic/ID difficulties (R. Forsyth, pers. comm.).	Wet areas; the few records are not close to Whistler (CDC 2019); Physa spp. are an "outright taxonomic evil" (R. Forsyth, pers. comm.); i.e., it will be difficult to survey for and/or confirm the presence of these species.
	Sunset Physa ( <i>Physella virginea</i> )	BAFA;BG;CDF;CMA;CWH;ESSF;ICH;IDF;IMA;MH;MS;SBPS;SBS	Not documented in Whistler (Brett 2019) unknown likelihood in Whistler due to taxonomic/ID difficulties (R. Forsyth, pers. comm.).	Wet areas; the few records are not close to Whistler (CDC 2019); Physa spp. are an "outright taxonomic evil" (R. Forsyth, pers. comm.); i.e., it will be difficult to survey for and/or confirm the presence of these species.
Bird	Peregrine Falcon ( <i>Falco peregrinus anatum</i> )	BG; BWBS; CDF; CWH; IDF; MS; PP; SBS	CWH forest, wetlands, urban areas (Ricker et al. 2014); nests in cliffs/steep bluffs. May nest at Soo Bluffs (K. Ricker, pers. comm., Dec. 2018).	"Low population size still in recovery stage. Few breeding sites known. Significant contraction from historical range" (CDC 2019).
Mammals	Fisher ( <i>Pekania pennanti</i> )	BAFA;BWBS;CDF;CMA;CWH;ESSF;ICH;IDF;IMA;MH;MS;PP;SBPS;SBS;SWB	Unknown current status (S. Rochetta, pers. comm.); historic presence with last two records from Green Lake in 1956 (Brett 2007); Tetrapod Museum specimens)	Associated with old growth forests with large trees (CDC 2019).
	Townsend's Big-eared Bat ( <i>Corynorhinus townsendii</i> )	BG;CDF;CWH;ICH;IDF;PP	Karl Ricker (pers. comm.) included this species on an early list of mammals compiled with help from the RBCM but I have not been able to locate any records from there.	Buildings, caves, and mines; known only from locations far from Whistler (Nagorsen and Brigham 1993); may be possible in Whistler (C. Lausen, pers. comm.).
Reptile	Northern Rubber Boa ( <i>Charina bottae</i> )	BG;CWH;ICH;IDF;PP	Non-resident, though there have been unconfirmed anecdotal records (Johnny Mikes from Lost Lake; Cathy Ivany from Emerald Estates, pers. comm.).	Dry, warm sites with rock habitat; the closest record is from Rutherford Creek (Leslie Anthony, pers. comm.).

**TABLE A2.5** (cont.): Habitat notes used to classify likelihood of species at risk in the RMOW – **Possible** species (including Data Deficient).

Group	Common (Scientific) Name	Biogeoclimatic (BGC) Zone from CDC	Whistler status and habitat notes	Habitat elsewhere (esp. if not documented in RMOW)
Lichens	considerable gingerbread ( <i>Pannaria rubiginosa</i> )	CWHds; CWHvh; CWHwh; CWHxm	Not yet documented in RMOW (Brett 2019). Unknown likelihood to occur.	Returned in 2018 CDC search as occurring in CWHds1. Other sources suggest it found at sea level near tidewater ( <a href="https://www.fs.fed.us/r6/sfpnw/issssp/documents2/ca-li-pannaria-rubiginosa-2013-03.pdf">https://www.fs.fed.us/r6/sfpnw/issssp/documents2/ca-li-pannaria-rubiginosa-2013-03.pdf</a> ). Need to check current BC status.
	peacock vinyl ( <i>Leptogium polycarpum</i> )	no data	Not yet documented in RMOW (Brett 2019) but C. Björk (pers. comm.) suggests it's worth looking for.	One record from <i>Acer macrophyllum</i> in talus just south of Brandywine Falls; also on <i>Alnus rubra</i> and in spray zones (COSEWIC 2011).
	pixie foam ( <i>Stereocaulon pileatum</i> )	CMAunp	Not yet documented in RMOW (Brett 2019). Unknown likelihood to occur.	No habitat information other than "Confident or Certain" in the CMAunp (alpine ecosystems that occur within the RMOW; CDC 2019). Need to check current BC status.
Liverwort	liverwort ( <i>Frullania hattoriana</i> )	no data	Not yet documented in RMOW (Brett 2019). possible in RMOW (O. Lee, pers. comm.)	Epiphytic on bark, esp. yellow cedar and rocks; type specimen from Mt. Seymour (S. Joya, pers. comm.) otherwise little data (Schofield 2002).
Mosses	Boas' long-necked moss ( <i>Trematodon asanoi</i> )	MHmm	Not yet documented in RMOW (Brett 2019); possible in RMOW (O. Lee, pers. comm.)	Closest record at Table Mt. (UBC Herbarium 2016); moist, exposed soil on late snowmelt sites (Christy 2007).
	bryum moss ( <i>Bryum calobryoides</i> )	ESSF; MH	Not yet documented in RMOW (Brett 2019); possible in RMOW (O. Lee, pers. comm.)	On humus/rock at Little Diamond Head (UBC Herbarium 2016); calcareous damp soil to high elevations (FNA 2018).
	Heinemann's andreaea moss ( <i>Andreaea heinemannii</i> )	MH	Not yet documented in RMOW (Brett 2019); possible in Whistler (S. Joya and O. Lee, pers. comm.)	On rock in alpine sites (CDC 2019); on acidic rock at low to moderate elevations (FNA 2018); one 1983 record from Alice Ridge Trail to Diamond Head is closest (Klinkenberg 2019b).
	Roth's thread-moss ( <i>Pohlia andalusica</i> )	CMA	Not yet documented in RMOW (Brett 2019).	Acidic, disturbed soil to high elevations (FNA 2018); closest record from Garibaldi Neve (UBC Herbarium 2016).
	slender smoothcap moss ( <i>Atrichum tenellum</i> )	BAFA; ESSF	Not yet documented in RMOW (Brett 2019), but possible (O. Lee, pers. comm.)	Mainly an interior species; the lowland Squamish record could be a mis-ID (S. Joya, pers. comm.)
	tundra pohlia moss ( <i>Pohlia tundrae</i> )	MH	Not yet documented in RMOW (Brett 2019); possible in RMOW (O. Lee, pers. comm.)	On humus and alpine tundra (FNA 2018); closest record from Sentinel Glacier foreland (UBC Herbarium 2017).
Quillwort	Flett's quillwort ( <i>Isoetes fletti</i> )	no data	Isoetes population in basalt ponds at north end of Brandywine Falls needs to be confirmed as either <i>I. fletti</i> or <i>I. occidentalis</i> (not at risk; Adolf Ceska, pers. comm.)	Known from only seven extant but unspecified locations in BC (Ryan Batten in CDC 2019). Difficulties in identifying may contribute to the lack of knowledge (Adolf Ceska, pers. comm.)
Moonwort	spoon-shaped moonwort ( <i>Botrychium spathulatum</i> )	BWBSmw; ESSFwm; ESSFwmp; MSdk	Not yet documented in RMOW (Brett 2019); "pops up" in unexpected places (C. Björk, pers. comm.), i.e., possible in Whistler.	Mainly eastern BC, one 1941 record from Empetrum Ridge (Klinkenberg 2019b).
Sedge	teacher's sedge ( <i>Carex praeceptorum</i> )	no data	One record from a bog at Callaghan Lake (Brett 2019). Many sedge experts with the WBP have been in similar habitats since (e.g., H. Roemer, A. Ceska, and C. Björk). Possible here but if abundant would likely have already been found.	Margins of lakes, ponds, and seeps at mid- to high elevations.

### Appendix 3: Scientists Who Contributed to the Whistler Biodiversity Project

The Whistler Biodiversity Project (WBP) could not have compiled the data in this report without the 280 local and non-local scientists and naturalists named below (as well as others inadvertently not included in the list). Most have volunteered their valuable time and expertise to the WBP and the Whistler Naturalists' events BioBlitz, and Fungus Among Us, and only a few have been recompensed in any way. In short, these people have contributed to the project because of their love for nature and desire to protect it. I apologize for any omissions and thank everyone for their efforts.

Adolf Ceska	Connor McGillion	Greg Lee	Julie Wray	Marian Daubeney	Sam Cousins
Claire Ruddy	Cori Lausen	Greg Michalenko	Juliet Pendray	Mary Lightle	Sam Evans
Adriana Suarez-Gonzalez	Greg Ferguson	Hamzeh Karim-Ramezani	Karina Valeretto	Mathew Bayly	Samantha Woods
Adrien Baudouin	Curtis Björk	Karen Needham	Karl Ricker	Max Gotz	Sarah Yontez
Agnes Lynn	Dan Luoma	Hans Roemer	Kate Brandon	Meg Fellowes	Saskia Wolsak
Alex Burns	Dan McDonald	Harriet Jarvis	Kate Entwistle	Meg Loop	Scott Gilmore
Alexandra Gilliss	Dan Peach	Heather Baines	Kathleen Stormont	Sara Jennings	Sean Aldcroft
Alicia Fontaine	Daniel Mosquin	Heather Beresford	Kathy Jenkins	Melanie Tardif	Seth Rudman
Amy Burns	Danny Miller	Hillary Williamson	Kathy McGillion	Michael Thompson	Shannon Berch
Andree Janyk	Daren Romano	Hitomi Kimura	Keenan Peddie	Michele Thomas	Shannon Didier
Andy MacKinnon	Darren Copley	Hugh Daubeney	Keith Browning	Michelle Crowe	Shari Willmott
Angela Manweiler	Daryl Thompson	Irmgard Carter	Kem Luther	Mike Boyd	Sharmin Gamiet
Angus MacKinnon	Dave Cunningham.	Jaclyn Dee	Kent Anders	Mike Gravnic	Sharon Tootchin
Anita Wheatley	Dave Williamson	Jacqueline Shaben	Kent Brothers	Mike Tootchin	Shawn Caulfield
Anna Bazzicalupo	David Aldcroft	Jagoda Kozikowska	Kevin Bell	Mitchel Martin Downie	Sorcha Masterson
Anne Leathem	David Bell	James Holkko	Kevin Rosé	Morgan Black	Stephanie Hurst
Ariane Comeau	David Blades	James Miskelly	Kevin Trim	Murray Lashmar	Steve Joya
Asta Kovanen	David Cunningham	Jamie Fenneman	Kiran Pal-Ross	Nancy Lee	Sue Maxwell
Aynsley Thielmann	David Langor	Jamie Michel	Kris Shoup	Naomi Sands	Susan Hamersley
Bardia Khaledi	David Snair	Jasper George	Kristen Harrison	Nicola Brabyn	Susan Leech
Barry Janyk	David Walde	Jeff Joy	Kristen Jones	Nicole Basaraba	Suzie Lavallee
Ben Hircok	Davina Dube	Jeff Shatford	Kristiina Ovaska	Nicole Harrison	Tanya Luszcz
Betty Rebellato	Dawn Hanna	Jen Sibbald	Kristina Swerhun	Olivia Lee	Tara Schaufele
Bill Caulfield	Dawn Johnson	Jenn Barrett	Larissa Taylor	Oluna Ceska	Terry McIntosh
Bob Brett	Denis Knopp	Jennifer Chia	Larry Evans	Pablo Jost	Theresa Oswald
Breanne Johnson	Derrick Marvin	Jennifer Heron	Laura Dilley	Pamela Zevit	Thom O'Dell
Brent Matsuda	Don Brett	Jeremy Gatten	Leanne Elliott	Patricia Thomson	Thor Henrich
Brian Didier	Don MacLaurin	Jeremy Nilson	Leanne Gallon	Patrick Lilly	Tim Goater
Brian Klinkenberg	Doug Sinclair	Jeremy Winkler	Leanne Williams	Patrick Mulligan	Tim Howay
Brook Moyers	Doug Skilton	Jess Wagstaffe	Lee Larkin	Paul Higginson	Tim Joy
Brooke Fochuk	Dylan Rawlyk	Jill Cooper	Leigh Anne Isaac	Paul Kroeger	Tina Symko
Bryce Kendrick	Elke Wind	Jim Cuthbert	Lennart Sopuck	Peter Gaffney	Todd Bush
Candace Rose-Taylor	Emma Harrower	Jodie Krakowski	Leslie Anthony	Purnima Govindarajulu	Tom Plath
Cara Richard	Emma Tayless	Joe Kiegel	Lex Joseph	Rebecca MacKay	Tracy Fleming
Catherine Soper	Eric Crowe	John Swann	Libby Avis	Regina Chan	Trevor Goward
Cathy Ivany	Erin Campbell	Johnny Mikes	Lindsay Coulter	Rex Kenner	Tristan Galbraith
Chris Byrd	Erin Edal	Jonathan Goff	Lisa Neame	Rick Avis	Trystan Willmott
Chris Dale	Erin Edwards	Jordan Rosenfeld	Lisa Rockwell	Riley Fleet	Tyrel Pinnegar
Chris Ratzlaff	Erin Feldman	Jory Mullen	Liz Barrett	Rob Lyske	Valena Bradbury
Chrispin Guppy	Erin Rutherford	Joyce Eberhart	Liz Snair	Robb Bennett	Vanessa Logie
Christine Olsen	Ethan Askey	Joyce Lee	Lois Joseph	Robert Forsyth	Veronica Woodruff
Christopher Di Corrado	Felix Martinez	Judith Harpel	Ludovic Le Renard	Roger Bean	Vesna Young
Christopher Stinson	Fleur Sweetman	Judith Holm	Luke Harrison	Roland Treu	Virginia Skilton
Claire Johnson	Fraser Willmott	Julian Gan	Luke Mikler	Rose Klinkenberg	Wendy Horan
Clare O'Brien	Genevieve Rowe	Julian Heavyside	Lynne Henderson	Roxy Tripp	Will Gibson
Claudia Copley	Geoff Playfair	Julie Burrows	Mallory Clarke	Ruby Pennel	Zoey Slater
Colin Sanders	George Clulow	Julie Sims	Marcia Danielson	Ruth Joy	Zuleika Pevec