



Species and Ecosystems at Risk in the Resort Municipality of Whistler 2017 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. 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 many 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. I am also grateful for 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 Mountain Goat travelling across a ridge on Brandywine Mountain (B. Brett photo).

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Executive Summary

This report presents an update from the Resort Municipality of Whistler's (RMOW) first comprehensive list of species at risk published in 2016. 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, museum records, 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 targetted surveys, 11 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 far 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).

At present, we therefore know much more about species at risk in Whistler yet lack: (a) ways to access that information, and (b) strategies to implement habitat protection for many of those species. This report's goals were to address the first part of that deficit and:

1. Provide an updated list of species at risk known or likely to be in Whistler;
2. Update habitat requirements for these species based on current knowledge;
3. Submit all Whistler Biodiversity Project records of species at risk to the CDC; and also
4. Suggest a roadmap for future work, including local species accounts, Best Management Practices, and habitat protection tailored to the species at risk in the RMOW.

The first two goals were achieved and are presented in this 2017 update. Files containing detailed records of all species at risk compiled by the Whistler Biodiversity Project were submitted to the RMOW with this report. Some follow up with the CDC is necessary to facilitate the final transfer of data (i.e., matching data protocols). Links to new publications and legislation from the BC and Canadian governments were added to the report which will help inform further analysis of: (a) what is the legally required protection for each species at risk; and (b) suggestions for best ways to conserve local species at risk that go beyond legal requirements.

The extensive data compiled in this report provide the second compilation of species at risk in the RMOW. Three species have been added in 2017 (including one Confirmed, Evening Grosbeak). From an original total of 152 species at risk evaluated, there are now:

- 70 Confirmed species at risk;
- 10 Likely;
- 26 Possible or Uncertain; and
- 46 Unlikely or Not possible.

The CDC listed 35 species as "certain" or "confident" in the RMOW at the end of 2016. The number of Confirmed and Likely species documented by these reports more than double that number to 80 species. Another 46 species that can result from various CDC searches for the RMOW have so little chance of occurring in the RMOW (Unlikely or Not Possible) that they can be excluded from consideration by municipal staff and others involved in environmental assessments or conservation efforts. Future conservation efforts should instead focus on Confirmed species at risk and the habitats they require, as well as clarifying the status of Likely species.

This new, comprehensive list of species 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 targetted 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 species at risk that are Confirmed, Likely, or Possible in the RMOW as of December 2017.

Species at risk **Confirmed** in the RMOW:

	<u>Scientific Name</u>	<u>Common Name</u>	<u>Notes</u>
<u>Butterflies</u>	<i>Callophrys eryphon ssp. sheltonensis</i> <i>Parnassius clodius ssp. pseudogallatinus</i>	Western Pine Elfin, sheltonensis ssp. Clodius Parnassian, pseudogallatinus ssp.	Conf. - Tentative ID ¹
<u>Amphibians</u>	<i>Anaxyrus boreas</i> <i>Ascaphus truei</i> <i>Rana aurora</i>	Western Toad Coastal Tailed Frog Northern Red-legged Frog	
<u>Birds</u>	<i>Accipiter gentilis ssp. laingi</i> <i>Ardea herodias ssp. fannini</i> <i>Butorides virescens</i> <i>Coccothraustes vespertinus</i> <i>Chordeiles minor</i> <i>Contopus cooperi</i> <i>Cypseloides niger</i> <i>Hirundo rustica</i> <i>Megascops kennicottii kennicottii</i> <i>Melanitta perspicillata</i> <i>Patagioenas fasciata</i>	Northern Goshawk, laingi ssp. Great Blue Heron, fannini ssp. Green Heron Evening Grosbeak Common Nighthawk Olive-sided Flycatcher Black Swift Barn Swallow Western Screech-Owl, kennicottii ssp. Surf Scoter Band-tailed Pigeon	Seasonal only Not in RMOW every year. Uplisted (COSEWIC), 2017 Foraging only Migration only
<u>Fish</u>	<i>Salvelinus confluentus - coastal lineage</i>	Bull Trout - Coastal Lineage	
<u>Mammals</u>	<i>Gulo gulo luscus</i> <i>Myotis keenii</i> <i>Myotis lucifugus</i> <i>Oreamnos americanus</i> <i>Ursus arctos</i>	Wolverine, luscus ssp. Keen's Myotis Little Brown Myotis Mountain Goat Grizzly Bear	May be reclassified to M. evotis
<u>Vascular Plants</u>	<i>Cryptogramma cascadiensis</i> <i>Muhlenbergia racemosa</i> <i>Draba stenopetala</i> <i>Pyrola elliptica</i> <i>Utricularia ochroleuca</i> <i>Botrychium ascendens</i> <i>Pinus albicaulis</i>	Cascade parsley fern satin grass star-flowered draba shinleaf wintergreen ochroleucous bladderwort upswept moonwort whitebark pine	
<u>Mosses</u>	<i>Brachydontium olympicum</i> <i>Brachythecium holzingeri</i> <i>Bryum pallescens</i> <i>Grimmia caespiticia</i> <i>Grimmia donniana</i> <i>Grimmia incurva</i> <i>Homalothecium nevadense</i> <i>Hygrohypnum alpinum</i> <i>Orthotrichum pylaisii</i> <i>Pohlia cardotii</i> <i>Pseudoleskea radicata var. pallida</i> <i>Racomitrium pygmaeum</i> <i>Schistidium crassipilum</i> <i>Tripterocladium leucocladulum</i>	Olympic brachydontium moss Holzinger's brachythecium moss tall-clustered thread-moss grimmia moss Donn's grimmia black grimmia Nevada homalothecium moss alpine hygrohypnum moss Pylais' orthotrichum moss Cardot's pohlia moss pseudoleskea moss pygmy racomitrium moss thickpoint grimmia tripterocladium moss	

¹ The alternative is also a species at risk: *Parnassius clodius ssp. claudianus*.

Species at risk **Confirmed** to occur in the RMOW: (cont.):

	<u>Scientific Name</u>	<u>Common Name</u>	<u>Notes</u>
<u>Liverworts</u>	<i>Haplomitrium hookeri</i>	liverwort	
	<i>Nardia breidlerii</i>	liverwort	
	<i>Nardia compressa</i>	liverwort	
	<i>Nardia geoscyphus</i>	liverwort	
	<i>Scapania curta</i>	liverwort	
	<i>Scapania obscura</i>	liverwort	
	<i>Scapania scandica</i> var. <i>scandica</i> or <i>dimorpha</i>	liverwort	
	<i>Tritomaria polita</i> ssp. <i>polita</i>	liverwort	
<u>Lichens</u>	<i>Ahtiana sphaerosporella</i>	mountain candlewax	
	<i>Alectoria imshaugii</i>	spiny witch's hair	
	<i>Allantoparmelia almqvistii</i>	lesser rock grub	
	<i>Arctoparmelia incurva</i>	finger ring	
	<i>Cladonia singularis</i>	wax candle pixie	
	<i>Fuscopannaria leucostictoides</i>	frosted crackers	
	<i>Hypogymnia canadensis</i>	canuckle bone	
	<i>Hypogymnia recurva</i>	recoiling bone	
	<i>Leptogium intermedium</i>	forty-five vinyl	
	<i>Letharia columbiana</i>	brown-eyed wolf	
	<i>Lobaria oregana</i>	lettuce lung	
	<i>Nodobryoria subdivergens</i>	alpine redhead	
	<i>Physcia dubia</i>	grinning rosette	
	<i>Pseudocyphellaria anthraspis</i>	reticulate specklebelly	
	<i>Stereocaulon glareosum</i>	alpine soil foam	
	<i>Umbilicaria decussata</i>	electric rocktripe	
	<i>Umbilicaria krascheninnikovii</i>	lesser salted rocktripe	
	<i>Umbilicaria lambii</i>	windward rocktripe	
	<i>Vahliella californica</i>	sun snaps	

Species at risk **Likely** to occur in the RMOW but not yet documented:

	<u>Scientific Name</u>	<u>Common Name</u>	<u>Notes</u>
<u>Snails</u>	<i>Pristiloma arcticum</i>	Northern Tightcoil	Tentative ID, needs conf.
<u>Liverworts</u>	<i>Jungermannia atrovirens</i>	liverwort	
	<i>Marchantia alpestris</i>	liverwort	Conf. at Russet Lake
<u>Mosses</u>	<i>Imbybryum alpinum</i>	alpine thread-moss	Tentative ID, needs conf.
	<i>Bryum schleicheri</i>	Schleicher's thread-moss	Tentative ID, needs conf.
	<i>Racomitrium affine?</i>	lesser fringe-moss	Tentative ID, needs conf.
	<i>Tortula leucostoma</i>	desmatodon moss	
<u>Lichens</u>	<i>Leptogium californicum</i>	midlife vinyl	
	<i>Peltigera gowardii</i>	northwest waterfan	
	<i>Psoroma tenue</i> var. <i>boreale</i>	tundra tarts	
<u>Sedges</u>	<i>Carex praeceptorum</i>	teacher's sedge	One record, Callaghan Lk.

Species at risk that are **Possible** in the RMOW but not yet documented (including **Data Deficient**):

	<u>Scientific Name</u>	<u>Common Name</u>	<u>Notes</u>
Bees	<i>Bombus occidentalis</i> ssp. <i>occidentalis</i>	Western Bumble Bee	
Birds	<i>Megascops kennicottii kennicottii</i>	Western Screech-Owl, kennicottii ssp.	Added 2017.
Bivalves	<i>Sphaerium striatinum</i>	Striated Fingernailclam	Data Deficient
Butterflies	<i>Parnassius clodius</i> ssp. <i>claudianus</i>	Clodius Parnassian, claudianus ssp.	
Dragonflies	<i>Tanypteryx hageni</i>	Black Petaltail	Added 2017.
Gastropods	<i>Physella propinqua</i>	Rocky Mountain Physa	Data Deficient
	<i>Physella virginea</i>	Sunset Physa	Data Deficient
Mammal	<i>Cervus elaphus roosevelti</i>	Roosevelt Elk	
	<i>Corynorhinus townsendii</i>	Townsend's Big-eared Bat	
	<i>Pekania pennanti</i>	Fisher	
Lichen	<i>Leptogium polycarpum</i>	peacock vinyl	
	<i>Stereocaulon symphycheilum</i>	two-toned foam	
Liverworts	<i>Frullania hattoriana</i>	liverwort	
Mosses	<i>Andreaea heinemannii</i>	Heinemann's andreaea moss	
	<i>Atrichum tenellum</i>	slender smoothcap moss	
	<i>Bryum calobryoides</i>	bryum moss	
	<i>Grimmia anomala</i>	grimmia dry rock moss	
	<i>Pseudoleskea incurvata</i> var. <i>tenuetis</i>	brown leskea moss	
	<i>Pohlia andalusica</i>	Roth's thread-moss	
	<i>Pohlia tundrae</i>	tundra pohlia moss	
	<i>Trematodon asanoi</i>	Boas' long-necked moss	
Herbs	<i>Erythranthe [=Mimulus] breweri</i>	Brewer's monkey-flower	
	<i>Stellaria obtusa</i>	blunt-sepaled starwort	
Moonworts	<i>Botrychium crenulatum</i>	dainty moonwort	
	<i>Botrychium simplex</i> var. <i>compositum</i>	least moonwort	
	<i>Botrychium spathulatum</i>	spoon-shaped moonwort	

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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 2016a²). 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 increase the efficiency of conservation efforts since they could then focus only 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 strengths and current 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 comprehensive data at the municipal level and therefore can return results for the RMOW area that include both false positives and false negatives.

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.³ That dataset includes 354 detailed and georeferenced records of species at risk which were submitted to the Conservation Data Centre⁴ (CDC) as part of this 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 2017. 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 2017 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 a preliminary summary of legislation, guidelines, and best management practices that: (a) the RMOW is required to follow, or (b) that would aid conservation efforts in the RMOW.
5. Submit to the BC Conservation Data Centre (CDC) all species at risk documented since 2004 by the Whistler Biodiversity Project (Brett 2007, 2015, 2017).

There were minor changes to the list in 2017 including three additions, one deletion, and two status changes. No species at risk were documented for the first time in the RMOW in 2017.

Readers' Note:

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

² https://www.whistler.ca/sites/default/files/2017/Oct/related/22976/2016_species_at_risk_in_the_rmow_final.pdf.

³ 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.

⁴ BC Species and Ecosystem Explorer (CDC 2017). URL: <http://a100.gov.bc.ca/pub/eswp/>.

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 2017), the Migratory Birds Convention Act (MBCA 2017), conservation threat assessments by the BC Conservation Data Centre (Red and Blue listings in particular; CDC 2017), the Identified Wildlife Management Strategy (BC MOE 2017a), 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 2017).

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, 2002)	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>Endangered: facing imminent extirpation or extinction [definition prior to May 2003]⁵;</p> <p>Threatened: species likely to become endangered if nothing is done to reverse factors leading to its extirpation or extinction [definition accepted December 2008];</p> <p>Species of Concern: species that may become threatened or endangered because of a combination of biological characteristics and identified threats.</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.	<p>Red: Any species or ecosystem that is at risk of being lost (extirpated, endangered or threatened)</p> <p>Blue: Any species or ecosystem that is of special concern.</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 (GWM), and Higher Level Plans	Yellow: Any species or ecosystem that is at risk of being lost.
	Ministry of Water, Land and Air Protection	Forest and Range Practices Act	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.

⁵ Endangered and Threatened rankings are now based on quantitative thresholds defined in 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.

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 SCCP⁶ 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:

In B.C., species and ecological communities are assigned to one of three lists, based on their provincial Conservation Status Rank. Red-listed species and ecological communities are Extirpated, Endangered, or Threatened in British Columbia. Blue-listed species and ecological communities are of Special Concern (formerly Vulnerable) and Yellow-listed species and ecological communities are secure.⁷

“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 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 COSEWIC website.⁸ These data are nonetheless incomplete due to the scale of effort needed to document species at risk. Municipalities nonetheless must evaluate risks and generally rely on what government data is available, sometimes with additional information provided by local naturalist groups. The RMOW is now 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; 2017).
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 (C. Dale, pers. comm.), and EFlora and EFauna (Klinkenberg 2017a, 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 some beetles (Section 2). Many of the species in these groups are currently unranked but threats to them will presumably be assessed as resources allow

⁶ P. Zevit, pers. comm.

⁷ http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre/explore-cdc-data/species-and-ecosystems-explorer/faq#red_blue_and_yellow.

⁸ <https://www.canada.ca/en/environment-climate-change/services/committee-status-endangered-wildlife.html>

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. Limited information about such other groups such as vascular plants and amphibians were also available, but were not accessible and/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 with Ken Racey and, later, his son-in-law and namesake of the UBC Cowan Tetrapod Collection, Ian McTaggart-Cowan (e.g., Racey and McTaggart Cowan 1935). The Whistler Naturalists and its predecessors (before 1998) are the main source of recent 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.

In 2005, the vast majority of species groups remained mostly unknown, 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; 2017). 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; 2017).

Starting in 2007, Whistler BioBlitz established itself as an essential source of new knowledge about local species.⁹ 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 almost 1,300 species to the total list in just 11 years. The Whistler BioBlitz 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,¹⁰ 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 2017). 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.

⁹ www.whistlerbioblitz.ca.

¹⁰ 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.

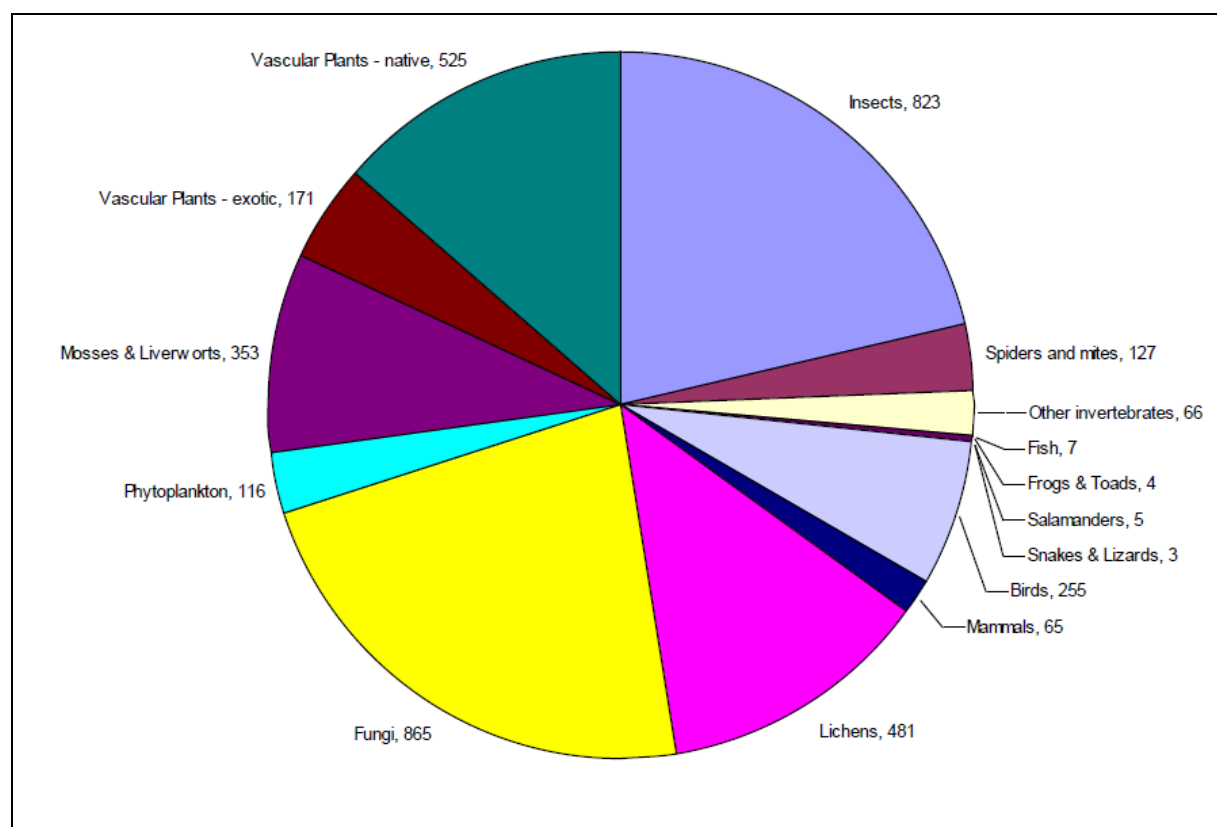


FIGURE 1.2: Number of species in Figure 1.1 by group (Brett 2016b).

The other important source of species data has been databases from various collections, notably, the UBC Herbarium¹¹ (lichens, vascular plants, bryophytes, algae, and fungi), the UBC Cowan Tetrapod Collection,¹² and the Royal BC Museum.¹³ 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, data from many collections been increasingly posted online and locating and downloading data has become increasingly easy, especially since about 2012. It is likely that even more historic records will become available in the future from these and similar collections.

The RMOW is therefore 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.

¹¹ <http://www.biodiversity.ubc.ca/museum/herbarium/database.html>.

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

¹³ <http://search-collections.royalbcmuseum.bc.ca/>.

2.0 Changes Since 2016

2.1 Internal Changes to the 2016 List

Action	Scientific Name	Common Name	RMOW Status	Description
Addition	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Confirmed (breeding in the RMOW)	COSEWIC (2016) uplisted this bird's threat rating to Special Concern in November 2016. It remains unlisted in BC.
Addition	<i>Megascops kennicottii kennicottii</i>	Western Screech Owl	Possible (breeding not confirmed)	Consultations with Karl Ricker and Brent Matsuda led to this addition. This bird is known to breed in Pemberton and it is possible it could also occur in the RMOW.
Addition	<i>Tanypteryx hageni</i>	Black Petaltail	Possible	This dragonfly should have been included in 2016 but wasn't transferred from the master list. It is Possible (even Likely) in Whistler (D. Marven and D. Knopp pers. comm.).
Status Change	<i>Imbriobryum alpinum</i>	Alpine thread moss	Likely (from Confirmed)	Downgraded from Confirmed to Likely since the one tentative record from 2011 BioBlitz has yet to be confirmed.
Status Change	<i>Carex praeceptorum</i>	Teacher's sedge	Likely (from Possible)	This sedge was upgraded from Possible to Likely based on a single record from Callaghan Lake in 1977. There is similar habitat in other high elevation locations in the RMOW.
Status Change	<i>Cicuta maculata</i> var. <i>maculata</i>	Spotted cowbane	Not Possible (from Possible)	This plant was included in Green et al. (2005) but the CDC includes only ssp. <i>angustifolium</i> . The latter is not at risk (Yellow).

2.2 Changes in Risk Assessment and Nomenclature

Federal

The Federal government has proposed uplistings for two local species, Grizzly Bear (Western Population) and Wolverine¹⁴ completed uplisting of another, Barn Swallow¹⁵ (Table 2.1). All three were included as species at risk in the 2016 report. Western Screech Owl was added in 2017 as a Potential species at risk in the RMOW. It was uplisted under SARA Special Concern to Threatened earlier in 2017.¹⁶

TABLE 2.1: Federal uplistings to animals at risk that occur or may occur (Western Screech Owl) in the RMOW.

Group	Scientific Name	Common Name	Current Status	Proposed Status
Mammal	<i>Ursus arctos</i>	Grizzly Bear, western population	None	Special concern
Mammal	<i>Gulo gulo</i>	Wolverine	None	Special concern
Bird	<i>Hirundo rustica</i>	Barn Swallow	None	Threatened

¹⁴ <http://gazette.gc.ca/rp-pr/p1/2017/2017-12-16/html/reg2-eng.html>, dated December 16, 2017.

¹⁵ <http://gazette.gc.ca/rp-pr/p2/2017/2017-11-15/html/sor-dors229-eng.html>, dated November 15, 2017.

¹⁶ http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/orders/g2-15012.pdf, dated June 15, 2016.

Two species, Western Grebe and Bank Swallow, are also included in proposed list changes. Although they are sometimes recorded in the RMOW, they do not breed here (Ricker et al. 2014; Ricker pers. comm.) and therefore are not included as RMOW species at risk. The rareness of one moss species, Roell's Brotherella (*Brotherella roellii*), led SARA to uplist it to Endangered in 2017. This species is also not included as a RMOW species at risk since it is unlikely to occur in the area (S. Joya and O. Lee, pers. comm.).

Two changes were made at the federal (but not provincial) level to common names for two local species: Grizzly Bear and Western Toad. The former is now referred to as "Grizzly Bear, western population." The latter is now referred to as Western Toad, non-calling population. Both changes are to distinguish different populations within Canada.

Provincial

The CDC did not change any listings or nomenclature for local plants at risk. The CDC did, however change ranks and listings for four animals at risk that occur in the RMOW and one that may occur (Western Screech Owl; Table 2.2¹⁷). Coastal Tailed Frog and Western Toad are no longer considered at risk in BC (though COSEWIC still considers both as at risk). The CDC has slightly increased their risk assessment of three species (Northern Red-legged Frog, Great Blue Heron, and Western Screech Owl) but not enough to change their listings.

TABLE 2.2: Changes to BC ranks and lists (in bold). Note that lower numbers in the rankings indicate higher risk, for example S3S4 represents a slightly higher risk than S4.

<u>Scientific Name</u>	<u>English Name</u>	<u>2016 Rank</u>	<u>2016 BC List</u>	<u>2017 Rank</u>	<u>2017 BC List</u>	<u>Change Date</u>
<i>Ascaphus truei</i>	Coastal Tailed Frog	S3S4	Blue	S4	Yellow	2016-12-31
<i>Anaxyrus boreas</i>	Western Toad	S3S4	Blue	S4	Yellow	2016-12-31
<i>Rana aurora</i>	Northern Red-legged Frog	S3S4	Blue	S3	Blue	2016-12-31
<i>Ardea herodias herodias</i>	Great Blue Heron ssp. <i>herodias</i>	S3B,S4N	Blue	S3?	Blue	2017-05-15
<i>Megascops kennicottii kennicottii</i>	Western Screech-Owl ssp. <i>kennicottii</i>	S3	Blue	S2S3	Blue	2017-05-16

The CDC provided the following rationales for the changes above:

English Name	Change Comments
Coastal Tailed Frog	Since the last rank assessment, we obtained new information from the 2011 COSEWIC report and an expert threats assessment. New locations are being found as a result of Edna [Environmental DNA] analysis.
Western Toad	Since the last rank assessment, we obtained new information from the 2012 COSEWIC report and an expert threats assessment. Threats are lower than previously determined.
Northern Red-legged Frog	Since the last rank assessment, we obtained new information from the 2011 COSEWIC report and an expert threats assessment. Threats are higher than previously determined.
Great Blue Heron	Previously we had reported out on both the non-breeding and breeding ranks, however both ranks are the same.
Western Screech-Owl	There has been a decrease in the numbers and range of this subspecies based on current surveys. This is also the first time that a complete, current threat calculator was completed for this subspecies. ¹⁸

¹⁷ <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre/explore-cdc-data/conservation-data-centre-updates>

¹⁸ https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/conservation-data-centre/data-changes/2017_animal_rank_review_changes.pdf

2.3 New Species Groups Added by the CDC

The CDC now has over 5,000 species of insects on their tracking list, many of which have been added in the past year (Table 2.3).¹⁹ Very few newly added species have yet been assessed. One species previously assessed, Western Bumblebee (*Bombus occidentalis*), remains on the 2017 RMOW list as a Possible resident.

TABLE 2.3. Insect species on the CDC tracking list as of December 2017.

<u>New Insect</u>	<u>Species</u>	<u>BC List (i.e. Yellow, Blue, or Red)</u>
Ants	104	No Status (i.e., not on the list yet).
Bees	429	Only bumblebees (<i>Bombus</i> spp.) have been assessed. One is Possible in the RMOW (<i>B. occidentalis</i>).
Beetles	3,887	No status for all but tiger beetles (all of which are Unlikely in the RMOW).
Caddisflies	324	No Status.
Lacewings	79	No Status.
Mayflies	98	No Status.
Stoneflies	146	No Status.
True Flies: Bee Flies	70	No Status.
True Flies: Blackflies	81	No Status.
True Flies: Mosquitoes	46	No Status.
True Flies: Horse Flies and Deer Flies	64	No Status.
True Flies: Robberflies	12	No Status except for one species not found in the RMOW.
Wasps	66	No Status.
Total	5,406	

¹⁹ <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre/explore-cdc-data/conservation-data-centre-updates>

3.0 Updated List of Species at Risk in the RMOW

3.1 Methods

The 2016 report presented the first comprehensive list of species at risk in the RMOW which I compiled from the following sources:

- The CDC and COSEWIC online resources, including provincial and federal reports (e.g., management plans and recovery strategies, Section 5).
- Occurrence and habitat data (in Whistler and beyond) compiled by the Whistler Biodiversity Project.
- Additional local data from other sources, especially for mammals, birds, and fish.
- Other online databases (notably, Klinkenberg 2017a, b; FNA 2017).
- Numerous publications cited in the references.
- Consultation with many experts, notably those listed in the acknowledgements (page ii).

I used these sources and my local experience to assess the habitat requirements and local status of 150 species at risk into tabular format (now 151 species in 2017; Appendix 2). These tables formed the basis for classifying the list of species at risk in the RMOW by their likelihood of being resident in the RMOW (Table 3.1; Table 3.5²⁰). Expanded knowledge about local species at risk and their habitats will no doubt improve the accuracy of these tables and lists in the future. The information presented here is another step towards identifying knowledge gaps and prioritizing future research and planning.

There are still many knowledge gaps that will hopefully be addressed in the near future so that conservation planning can be made more effective. This document helps provide guidance towards identifying priority actions to fill those gaps.

TABLE 3.1: Definition of classes used.

<u>Resident in RMOW</u>	<u>Definition</u>
Yes (Confirmed, Resident)	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. Other species documented in the RMOW (especially birds but also some large mammals) do not have a significant need for habitat within RMOW boundaries and have been excluded from this category.
Yes - Foraging	Forages in the RMOW (Black Swifts, which nest outside the RMOW but forage inside). Reliance on RMOW habitat unknown.
Yes – Intermittent	May breed in the RMOW but not every year (Green Heron).
Yes – Migratory	Passes through the RMOW during migration. Reliance on RMOW habitat unknown (Surf Scoter).
Yes – Seasonal	Significant local presence during non-winter months but not yet confirmed to breed locally (Great Blue Heron).
Likely	Species at risk not yet confirmed in the RMOW with >75% (approximately) likelihood to be found in targetted 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.
Possible	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.
Possible (DD)	Data Deficient: There is not enough information about the habitat requirements of some species at risk to ascertain whether they are possible in the RMOW. This group includes three invertebrate species: two Physa snails and Striated Fingernailclam. For the purposes of this report, species in this class are considered Possible. "Uncertain" is another term used synonymously with Data Deficient.
Unlikely	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).
No/Not Present	Species that, given current data, have no chance of occurring in the RMOW. If species in this category are eventually found in the RMOW they would represent very large range extensions and/or evidence that past habitat data was incorrect. This group also includes species that are impossible in the RMOW, for example, marine, estuarine, and seaside species.

²⁰ Updated from the earlier version presented as Table 4.5 in the 2016 report.

The 80 species at risk classed as Confirmed or Likely in the RMOW at the end of 2017 (Table 3.2) is more than twice that returned by CDC searches (Table 4.2 in the 2016 report). Almost all the species not returned by CDC searches have been documented by the Whistler Biodiversity Project or Whistler BioBlitz. The species not yet documented by the CDC represent false negatives. Others classed as No/Not Possible in the RMOW (Table 3.2) include species classed erroneously by the CDC as having a high probability of occurrence in the RMOW. These species are false positives. Until the CDC incorporates data submitted with this report, the lists presented in this report should take precedence.

TABLE 3.2: Total number of species-at-risk resident in the RMOW.

<u>RMOW Residency</u>	<u>2016</u>	<u>2017</u>
Confirmed	69	70
Likely	9	10
Possible	23	23
Data Deficient	3	3
Unlikely	33	33
No/Not Possible	12	13
	149	152

In summary, just over half (51%) of the species at risk described in this report are Confirmed or Likely in the RMOW (Table 3.3). A further 18% are Possible and therefore potentially worth searching for in future surveys, especially if of particular interest to the RMOW. Almost one-third (30%), however, should be eliminated from future consideration as species at risk in the RMOW because they are Unlikely or Not Possible in the area.²¹

TABLE 3.3: Summary of Table 3.2.

<u>RMOW Residency</u>	<u>2017</u>
Confirmed or Likely	78 (51%)
Possible (including Data Deficient)	27 (18%)
Unlikely or Not Possible	46 (30%)

Only 19 of the 70 species confirmed to date in the RMOW are vertebrates (Table 3.4). This result is a reminder that vertebrates represent a small fraction of total biodiversity. Vertebrates represent less than 10% of all species documented to date in the RMOW (Figure 1.2) and this figure will decrease in the future as more invertebrates, fungi, lichens, etc. are documented.

TABLE 3.4: Summary of species at risk that are Confirmed residents, Likely, or Possible in the RMOW, by species group.

<u>Group 1</u>	<u>Group 2</u>	<u>Yes</u>	<u>Likely</u>	<u>Poss./Unc.</u>	<u>Total</u>
Vertebrates	Amphibians	3	0	0	3
	Birds	10	0	1	11
	Fishes	1	0	0	1
	Mammals	5	0	3	8
Invertebrates	Insects	2	0	3	5
	Snails & Clams	0	1	3	4
Plants	Vascular	7	1	5	13
	Mosses	15	3	8	26
	Liverworts	8	2	1	11
Lichens	Lichens	19	3	2	24
	Total	70	10	26	106

²¹ Excluding Unlikely species from targeted searches does not mean they could not occur here but rather that future surveying effort would be better directed towards other species.

TABLE 3.5a: Confirmed species at risk in the RMOW. Key: E (Endangered), T (Threatened), SC (Special Concern), DD (Data Deficient), Int. (Intermittent, i.e., not every year), Forage (confirmed foraging but not breeding), Seas. (resident only part of the year); Mig. (migrates through). The denning/nesting data applies only to wide-ranging species (large mammals, bats, and birds). Bold indicates 2017 addition.

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	Conf. in RMOW?	Impt. Habitat in RMOW?	Den / nest in RMOW?	Resident in RMOW?
Invertebrate	Butterfly	<i>Callophrys eryphon ssp. sheltonensis</i>	Western Pine Elfin, sheltonensis ssp.	Blue			Yes	Yes		Yes
Invertebrate	Butterfly	<i>Parnassius clodius ssp. pseudogallatinus</i>	Clodius Parnassian, pseudogallatinus ssp.	Blue			Yes? (Tent. ID)	Yes?		Yes (Tent. ID)
Vertebrate	Amphibian	<i>Anaxyrus boreas</i>	Western Toad	Yellow		SC/SC	Yes	Yes		Yes
Vertebrate	Amphibian	<i>Ascaphus truei</i>	Coastal Tailed Frog	Yellow	Yes	SC/SC	Yes	Yes		Yes
Vertebrate	Amphibian	<i>Rana aurora</i>	Northern Red-legged Frog	Blue	Yes	SC/SC	Yes	Yes		Yes
Vertebrate	Bird	<i>Accipiter gentilis ssp. laingi</i>	Northern Goshawk, laingi ssp.	Red	Yes	T/T	Yes	Yes		Yes
Vertebrate	Bird	<i>Ardea herodias ssp. fannini</i>	Great Blue Heron, fannini ssp.	Blue	Yes	SC/SC	Yes	Yes?	Unlikely	Yes (Seas.)
Vertebrate	Bird	<i>Butorides virescens</i>	Green Heron	Blue			Yes	Yes - Int.	Int.	Yes (Int.)
Vertebrate	Bird	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Yellow		SC/	Yes	Yes	Yes	Yes
Vertebrate	Bird	<i>Chordeiles minor</i>	Common Nighthawk	Yellow		T/T	Yes	Yes	Likely	Yes
Vertebrate	Bird	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Blue		T/T	Yes	Yes	Yes	Yes
Vertebrate	Bird	<i>Cypseloides niger</i>	Black Swift	Blue		E	Yes	Yes - Forage	Possible	Yes (Forage)
Vertebrate	Bird	<i>Hirundo rustica**</i>	Barn Swallow**	Blue		T/T	Yes	Yes	Yes	Yes
Vertebrate	Bird	<i>Melanitta perspicillata</i>	Surf Scoter	Blue			Yes	Yes	No	Yes (Mig.)
Vertebrate	Bird	<i>Patagioenas fasciata</i>	Band-tailed Pigeon	Blue		SC/SC	Yes	Yes	Yes?	Yes
Vertebrate	Fish	<i>Salvelinus confluentus - coastal</i>	Bull Trout - Coastal Lineage	Blue	Yes	SC/	Yes	Yes		Yes
Vertebrate	Mammal	<i>Gulo gulo luscus*</i>	Wolverine, luscus ssp.*	Blue	Yes	SC/SC	Yes	Yes	Likely	Yes
Vertebrate	Mammal	<i>Myotis keenii</i>	Keen's Myotis	Blue	Yes	DD/SC	Yes	Yes	V. Likely	Yes
Vertebrate	Mammal	<i>Myotis lucifugus</i>	Little Brown Myotis	Yellow		E/E	Yes	Yes	Yes	Yes
Vertebrate	Mammal	<i>Oreamnos americanus</i>	Mountain Goat	Blue			Yes	Yes	Likely	Yes
Vertebrate	Mammal	<i>Ursus arctos*</i>	Grizzly Bear*	Blue	Yes	SC/SC	Yes	Yes	Yes	Yes
Lichen	Lichen	<i>Ahtiana sphaerosporella</i>	mountain candlewax	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Alectoria imshaugii</i>	spiny witch's hair	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Allantoparmelia almquistii</i>	lesser rock grub	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Arctoparmelia incurva</i>	finger ring	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Cladonia singularis</i>	wax candle pixie	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Fuscopannaria leucostictoides</i>	frosted crackers	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Hypogymnia canadensis</i>	canuckle bone	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Hypogymnia recurva</i>	recoiling bone	Red			Yes	Yes		Yes
Lichen	Lichen	<i>Leptogium intermedium</i>	forty-five vinyl	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Letharia columbiana</i>	brown-eyed wolf	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Lobaria oregana</i>	lettuce lung	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Nadobryoria subdivergens</i>	alpine redhead	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Physcia dubia</i>	grinning rosette	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Pseudocyphellaria anthraxis</i>	reticulate specklebelly	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Stereocaulon glareosum</i>	alpine soil foam	Blue			Yes	Yes		Yes

* Proposed to be listed under SARA Schedule 1 in December 2017 [add reference]. Currently these species have No Status.

** Barn Swallows were listed in November 2017 under SARA as Threatened.

TABLE 3.5a (cont.): Confirmed species at risk in the RMOW. Key: E (Endangered), T (Threatened), SC (Special Concern), DD (Data Deficient), Int. (Intermittent, i.e., not every year), Forage (confirmed foraging but not breeding), Seas. (resident only part of the year); Mig. (migrates through). The denning/nesting data applies only to wide-ranging species (large mammals, bats, and birds).

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	Conf. in RMOW?	Impt. Habitat in RMOW?	Den / nest in RMOW?	Resident in RMOW?
Lichen	Lichen	<i>Umbilicaria decussata</i>	electric rocktripe	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Umbilicaria krascheninnikovii</i>	lesser salted rocktripe	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Umbilicaria lambii</i>	windward rocktripe	Blue			Yes	Yes		Yes
Lichen	Lichen	<i>Vahliella californica</i>	sun snaps	Red			Yes	Yes		Yes
Nonvasc. Plant	Liverwort	<i>Haplomitrium hookeri</i>	liverwort	Blue			Yes	Yes		Yes
Nonvasc. Plant	Liverwort	<i>Nardia breidlerii</i>	liverwort	Blue			Yes	Yes		Yes
Nonvasc. Plant	Liverwort	<i>Nardia compressa</i>	liverwort	Blue			Yes	Yes		Yes
Nonvasc. Plant	Liverwort	<i>Nardia geoscyphus</i>	liverwort	Blue			Yes	Yes		Yes
Nonvasc. Plant	Liverwort	<i>Scapania curta</i>	liverwort	Blue			Yes	Yes		Yes
Nonvasc. Plant	Liverwort	<i>Scapania obscura</i>	liverwort	Blue			Yes	Yes		Yes
Nonvasc. Plant	Liverwort	<i>Scapania scandica</i> var. <i>scandica</i> or <i>dimorpha</i>	liverwort	Blue			Yes	Yes		Yes
Nonvasc. Plant	Liverwort	<i>Tritomaria polita</i> ssp. <i>polita</i>	liverwort	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Brachydontium olympicum</i>	Olympic brachydontium moss	Red			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Brachythecium holzingeri</i>	Holzinger's brachythecium moss	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Bryum pallescens</i>	tall-clustered thread-moss	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Grimmia caespiticia</i>	grimmia moss	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Grimmia donniana</i>	Donn's grimmia	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Grimmia incurva</i>	black grimmia	Red			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Homalothecium nevadense</i>	Nevada homalothecium moss	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Hygrohypnum alpinum</i>	alpine hygrohypnum moss	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Orthotrichum pylaisii</i>	Pylais' orthotrichum moss	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Pohlia cardotii</i>	Cardot's pohlia moss	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Pseudoleskea radicata</i> var. <i>pallida</i>	pseudoleskea moss	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Racomitrium pygmaeum</i>	pygmy racomitrium moss	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Schistidium crassipilum</i>	thickpoint grimmia	Blue			Yes	Yes		Yes
Nonvasc. Plant	Moss	<i>Tripterocladium leucocladulum</i>	tripterocladium moss	Blue			Yes	Yes		Yes
Vascular Plant	Fern	<i>Cryptogramma cascadiensis</i>	Cascade parsley fern	Blue			Yes	Yes		Yes
Vascular Plant	Grass	<i>Muhlenbergia racemosa</i>	satin grass	Red			Yes	Yes		Yes
Vascular Plant	Herb	<i>Draba stenopetala</i>	star-flowered draba	Blue			Yes	Yes		Yes
Vascular Plant	Herb	<i>Pyrola elliptica</i>	shinleaf wintergreen	Blue			Yes	Yes		Yes
Vascular Plant	Herb	<i>Utricularia ochroleuca</i>	ochroleucous bladderwort	Blue			Yes	Yes		Yes
Vascular Plant	Moonwort	<i>Botrychium ascendens</i>	upswept moonwort	Blue			Yes	Yes		Yes
Vascular Plant	Tree	<i>Pinus albicaulis</i>	whitebark pine	Blue		E/E	Yes	Yes		Yes

TABLE 3.5b Species at risk that are **Likely** to be in the RMOW but not yet confirmed. Key: E (Endangered), T (Threatened), SC (Special Concern), DD (Data Deficient). The denning/nesting data applies only to wide-ranging species (large mammals, bats, and birds).

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	Conf. in RMOW?	Impt. Habitat in RMOW?	Den / nest in RMOW?	Resident in RMOW?
Invertebrate	Gastropod	<i>Pristiloma arcticum</i>	Northern Tightcoil	Blue			Likely/Yes?	Likely/Yes?		Likely
Lichen	Lichen	<i>Leptogium californicum</i>	midlife vinyl	Blue			No	Likely		Likely
Lichen	Lichen	<i>Peltigera gowardii</i>	northwest waterfan	Red		SC/	No	Likely		Likely
Lichen	Lichen	<i>Psoroma tenue var. boreale</i>	tundra tarts	Red			No	Likely		Likely
Nonvasc. Plant	Moss	<i>Imbriobryum alpinum</i>	alpine thread-moss	Red			Yes	Yes		Yes
Nonvasc. Plant	Liverwort	<i>Jungermannia atrovirens</i>	liverwort	Blue			No	Likely		Likely
Nonvasc. Plant	Liverwort	<i>Marchantia alpestris</i>	liverwort	Blue			No	Likely		Likely
Nonvasc. Plant	Moss	<i>Bryum schleicheri</i>	Schleicher's thread-moss	Blue			Tent. ID	Likely		Likely
Nonvasc. Plant	Moss	<i>Racomitrium affine?</i>	lesser fringe-moss	Blue			Tent. ID	Likely		Likely
Nonvasc. Plant	Moss	<i>Tortula leucostoma</i>	desmatodon moss	Blue			No	Likely		Likely
Vascular Plant	Sedge	<i>Carex praeceptorum</i>	teacher's sedge	Red			Nearby	Likely		Likely

TABLE 3.5c: Species at risk that are **Possible** in the RMOW but not yet documented. Key: E (Endangered), T (Threatened), SC (Special Concern), DD (Data Deficient). The denning/nesting data applies only to wide-ranging species (large mammals, bats, and birds). Additions since 2016 are in bold.

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	Conf. in RMOW?	Impt. Habitat in RMOW?	Den / nest in RMOW?	Resident in RMOW?
Invertebrate	Bee	<i>Bombus occidentalis ssp. occidentalis</i>	Western Bumble Bee	Blue		T/	No	Possible		Possible
Invertebrate	Bivalve	<i>Sphaerium striatinum</i>	Striated Fingernailclam	Blue			No	Possible		Possible (DD)
Invertebrate	Butterfly	<i>Parnassius clodius ssp. claudianus</i>	Clodius Parnassian, claudianus ssp.	Blue			Possible ID	Possible		Possible
Invertebrate	Dragonfly	<i>Tanypteryx hageni</i>	Black Petaltail	Blue			No	Possible		Possible
Invertebrate	Gastropod	<i>Physella propinqua</i>	Rocky Mountain Physa	Blue			No	Possible		Possible (DD)
Invertebrate	Gastropod	<i>Physella virginea</i>	Sunset Physa	Blue			No	Possible		Possible (DD)
Vertebrate	Bird	<i>Megascops kennicottii kennicottii</i>	Western Screech-Owl, kennicottii ssp.	Blue		T/T	Infrequent	Possible	Possible	Possible
Vertebrate	Mammal	<i>Cervus elaphus roosevelti</i>	Roosevelt Elk	Blue			Yes	Possible	Possible	Possible
Vertebrate	Mammal	<i>Corynorhinus townsendii</i>	Townsend's Big-eared Bat	Blue			No	Possible	Possible	Possible
Vertebrate	Mammal	<i>Pekania pennanti</i>	Fisher	Blue	Yes		Historic	Possible	Possible	Possible
Lichen	Lichen	<i>Leptogium polycarpum</i>	peacock vinyl	Red		SC/	No	Possible		Possible
Lichen	Lichen	<i>Stereocaulon symphycheilum</i>	two-toned foam	Red			No	Possible		Possible
Nonvasc. Plant	Liverwort	<i>Frullania hattoriana</i>	liverwort	Blue			No	Possible		Possible
Nonvasc. Plant	Moss	<i>Andreaea heinemannii</i>	Heinemann's andreaea moss	Red			No	Possible		Possible
Nonvasc. Plant	Moss	<i>Atrichum tenellum</i>	slender smoothcap moss	Red			No	Possible		Possible
Nonvasc. Plant	Moss	<i>Bryum calobryoides</i>	bryum moss	Red			No	Possible		Possible
Nonvasc. Plant	Moss	<i>Grimmia anomala</i>	grimmia dry rock moss	Blue			No	Possible		Possible
Nonvasc. Plant	Moss	<i>Pseudoleskea incurvata var. tenuetis</i>	brown leskea moss	Red			Possible ID	Possible		Possible
Nonvasc. Plant	Moss	<i>Pohlia andalusica</i>	Roth's thread-moss	Red			No	Possible		Possible
Nonvasc. Plant	Moss	<i>Pohlia tundrae</i>	tundra pohlia moss	Red			No	Possible		Possible
Nonvasc. Plant	Moss	<i>Trematodon asanoi</i>	Boas' long-necked moss	Blue			No	Possible		Possible
Vascular Plant	Herb	<i>Erythranthe [=Mimulus] breweri</i>	Brewer's monkey-flower	Blue			No	Possible		Possible
Vascular Plant	Herb	<i>Stellaria obtusa</i>	blunt-sepaed starwort	Blue			No	Possible		Possible
Vascular Plant	Moonwort	<i>Botrychium crenulatum</i>	dainty moonwort	Blue			No	Possible		Possible
Vascular Plant	Moonwort	<i>Botrychium simplex var. compositum</i>	least moonwort	Blue			No	Possible		Possible
Vascular Plant	Moonwort	<i>Botrychium spathulatum</i>	spoon-shaped moonwort	Blue			No	Possible		Possible

TABLE 3.5d: Species at risk that are **Unlikely** in the RMOW. Key: E (Endangered), T (Threatened), SC (Special Concern), DD (Data Deficient). The denning/nesting data applies only to wide-ranging species (large mammals, bats, and birds). Additions since 2016 are in bold.

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	Conf. in RMOW?	Impt. Habitat in RMOW?	Den / nest in RMOW?	Resident in RMOW?
Invertebrate	Beetle	<i>Cicindela hirticollis</i>	Hairy-necked Tiger Beetle	Blue			No	Unlikely		Unlikely
Invertebrate	Dragonfly	<i>Argia vivida</i>	Vivid Dancer	Blue		SC/	No	Unlikely		Unlikely
Invertebrate	Dragonfly	<i>Ophiogomphus occidentis</i>	Sinuous Snaketail	Blue			No	Unlikely		Unlikely
Invertebrate	Gastropod	<i>Galba bulimoides</i>	Prairie Fossaria	Blue			No	Unlikely		Unlikely
Invertebrate	Gastropod	<i>Galba dalli</i>	Dusky Fossaria	Blue			No	Unlikely		Unlikely
Invertebrate	Gastropod	<i>Gyraulus crista</i>	Star Gyro	Blue			No	Unlikely		Unlikely
Vertebrate	Bird	<i>Brachyramphus marmoratus</i>	Marbled Murrelet	Blue	Yes	T/T	No	Unlikely	Unlikely	Unlikely
Vertebrate	Bird	<i>Euphagus carolinus</i>	Rusty Blackbird	Blue		SC/SC	No	No	V. Unlikely	Unlikely
Vertebrate	Bird	<i>Falco peregrinus anatum</i>	Peregrine Falcon, anatum ssp.	No Status		SC/SC	Yes	Int.	Unlikely	Unlikely
Vertebrate	Bird	<i>Strix occidentalis</i> (ssp. <i>caurina</i>)	Spotted Owl	Red	Yes	E/E	Historic	Historic	Unlikely	Unlikely
Vertebrate	Fish	<i>Oncorhynchus clarkii clarkii</i>	Coastal Cutthroat Trout	Blue			Historic	Uncertain		Unlikely?
Vertebrate	Mammal	<i>Sorex bendirii</i>	Pacific Water Shrew	Red	Yes	E/E	No	Unlikely	Unlikely	Unlikely
Vertebrate	Reptile	<i>Charina bottae</i>	Northern Rubber Boa	Yellow		SC/SC	No	Unlikely		Unlikely
Vertebrate	Reptile	<i>Coluber constrictor</i> (ssp. <i>mormon</i>)	North American Racer	Blue	Yes	T/SC	No	Unlikely		Unlikely
Vertebrate	Reptile	<i>Contia tenuis</i>	Sharp-tailed Snake	Red		E/E	No	No		Unlikely
Lichen	Lichen	<i>Pseudocyphellaria rainierensis</i>	old growth specklebelly	Blue		SC/SC	No	Unlikely		Unlikely
Nonvasc. Plant	Moss	<i>Andreaea sinuosa</i>	small-spored rock-moss	Red			No	Unlikely		Unlikely
Nonvasc. Plant	Moss	<i>Atrichum flavisetum</i>	moss	Blue			No	Unlikely		Unlikely
Nonvasc. Plant	Moss	<i>Brotherella roellii</i>	Roell's brotherella	Red		E/E*	No	Unlikely		Unlikely
Nonvasc. Plant	Moss	<i>Callicladium haldanianum</i>	callicladium moss	Blue			No	Unlikely		Unlikely
Nonvasc. Plant	Moss	<i>Polytrichastrum sexangulare</i> var. <i>vulcanicum</i>	moss	Red			No	Unlikely		Unlikely
Nonvasc. Plant	Peat Moss	<i>Sphagnum contortum</i>	twisted peat-moss	Blue			No	Unlikely		Unlikely
Vascular Plant	Fern	<i>Dryopteris marginalis</i>	marginal wood fern	Red			No	Unlikely		Unlikely
Vascular Plant	Herb	<i>Allium amplexans</i>	slimleaf onion	Blue			No	Unlikely		Unlikely
Vascular Plant	Herb	<i>Allium geyeri</i> var. <i>tenerum</i>	Geyer's onion	Blue			No	Unlikely		Unlikely
Vascular Plant	Herb	<i>Bidens amplissima</i>	Vancouver Island beggarticks	Blue		SC/SC	No	Unlikely		Unlikely
Vascular Plant	Herb	<i>Boechera paupercula</i>	tiny suncress	Red			No	Unlikely		Unlikely
Vascular Plant	Herb	<i>Castilleja rupicola</i>	cliff paintbrush	Blue		T/T	No	Unlikely		Unlikely
Vascular Plant	Herb	<i>Claytonia washingtoniana</i>	Washington springbeauty	Red			No	Unlikely		Unlikely
Vascular Plant	Herb	<i>Draba lactea</i>	milky draba	Blue			Tent. ID	Tent. ID		Unlikely
Vascular Plant	Herb	<i>Gentianella tenella</i> ssp. <i>tenella</i>	slender gentian	Red			No	Unlikely		Unlikely
Vascular Plant	Sedge	<i>Carex hystericina</i>	porcupine sedge	Blue			No	Unlikely		Unlikely
Vascular Plant	Sedge	<i>Schoenoplectus americanus</i>	American bulrush	Red			No	Unlikely		Unlikely

* Proposed to be uplisted under Schedule 1 in December 2017 from No Status to Endangered.

TABLE 3.5e: 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), DD (Data Deficient). The denning/nesting data applies only to wide-ranging species (large mammals, bats, and birds).

Group 1	Group 2	Species	Common Name	BC List	BC ID Wildlife	COSEWIC / SARA	Conf. in RMOW?	Impt. Habitat in RMOW?	Den / nest in RMOW?	Resident in RMOW?
Invertebrate	Bivalve	<i>Ostrea conchaphila</i>	Olympia Oyster	Blue		SC/SC	No	No		No
Invertebrate	Butterfly	<i>Epargyreus clarus ssp. californicus</i>	Silver-spotted Skipper, californicus ssp.	Red			No	No		No
Invertebrate	Butterfly	<i>Erynnis propertius</i>	Propertius Duskywing	Red			No	No		No
Invertebrate	Butterfly	<i>Euphyes vestris (ssp. vestris)</i>	Dun Skipper	Red		T/T	No	No		No
Invertebrate	Gastropod	<i>Haliotis kamtschatkana</i>	Northern Abalone	Red		E/E	No	No		No
Vertebrate	Bird	<i>Asio flammeus</i>	Short-eared Owl	Blue	Yes	SC/SC	No	No	V. Unlikely	No
Vertebrate	Bird	<i>Botaurus lentiginosus</i>	American bittern	Blue			No	No	No	No
Vertebrate	Bird	<i>Melanerpes lewis pop. 1</i>	Lewis's Woodpecker	Red	Yes	T/T	No	No	No	No
Vertebrate	Fish	<i>Acipenser medirostris</i>	Green Sturgeon	Red		SC/SC	No	No		No
Vertebrate	Fish	<i>Oncorhynchus kisutch</i>	Coho Salmon	Yellow		T/	No	No		No
Vertebrate	Fish	<i>Thaleichthys pacificus</i>	Eulachon	Blue		E/	No	No		No
Vascular Plant	Herb	<i>Oenothera pallida ssp. pallida</i>	pale evening-primrose	Red			No	No		No
Vascular Plant	Herb	<i>Sidalcea hendersonii</i>	Henderson's checker-mallow	Blue			No	No		No

4.0 Ecosystems At Risk

The CDC also assesses and ranks possible threats to “ecological communities,” synonymous in this usage with “ecosystems.”²² 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 (CDC 2017) includes the following search terms (Table 4.1; Figure 4.1):

1. Search Type: Ecological Communities, and;
2. Squamish Forest District (DSQ), and;
3. BGC Unit (CMAun, CMAunp, CWHds1, CWHms1, MHmm2, and MHmmp).

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 4.1). 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).

TABLE 4.1: 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.

<u>BGC Unit</u>	<u>BGC Class</u>	<u>Full Description</u>
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

Notes on the inclusion of CWHds1 and exclusion of ESSFmwp Variants

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 are included here for three reasons:

- (i) There are arguably sites within the southern end of the RMOW that could be classed as CWHds1 (pers. obs.);
- (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 high percentage of Red-listed ecosystems.

Although some previous mapping 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 MHmmp2. 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.). One of the main sources for this future work includes a number of plots in the Whistler area (Brett et al. 2001).

²² <http://a100.gov.bc.ca/pub/eswp/search.do>

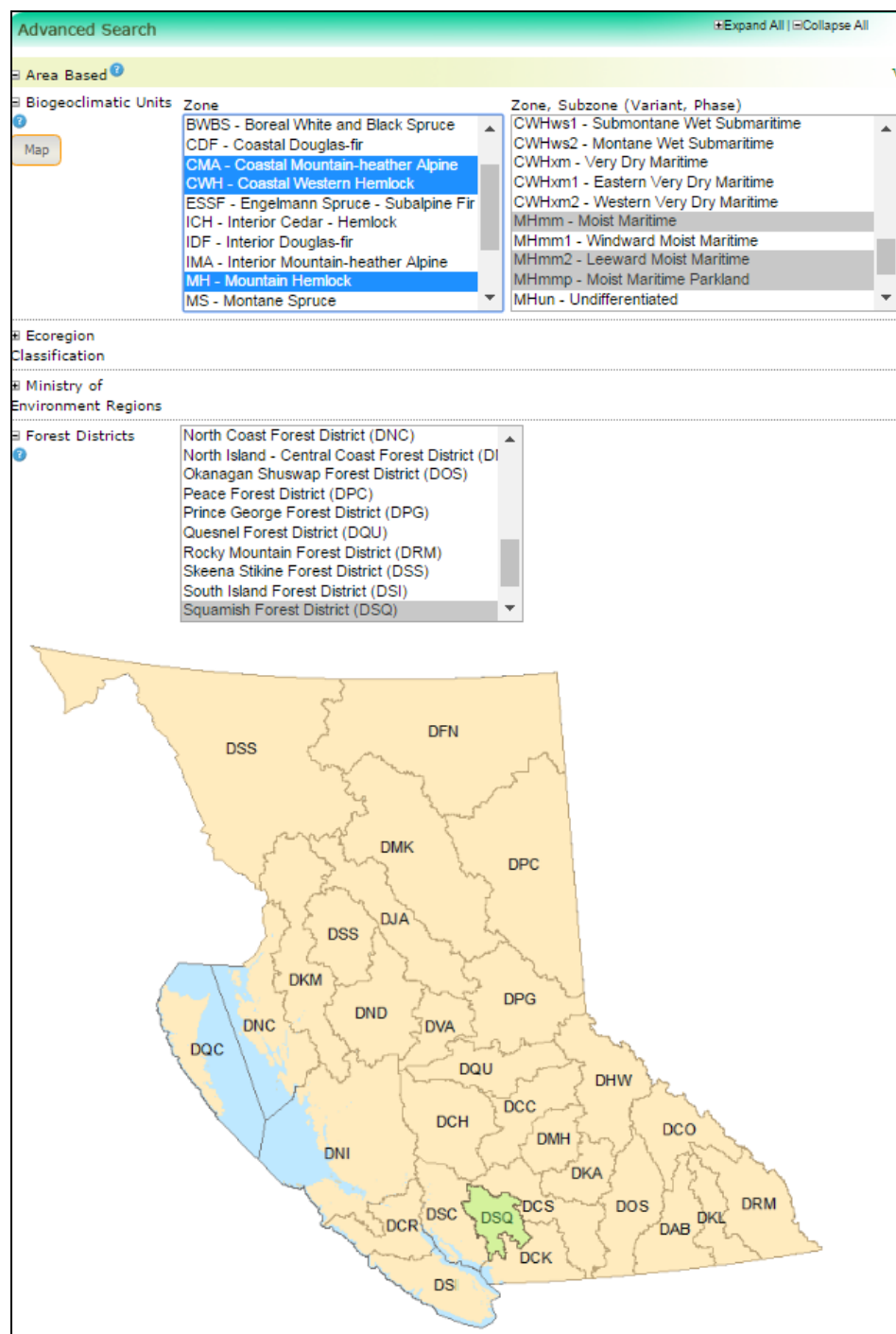


FIGURE 4.1: Screenshot from the Species and Ecosystem Explorer (CDC 2017) showing some of the search terms used to narrow results for ecological communities that occur in the Squamish Forest District.

The results show eight Red-listed and 11 Blue-listed ecosystems in the Whistler area (Table 4.2). Two others have been excluded because they are not possible in the area. Rankings for all of the forested ecosystems (Site Series 01 through 12) remained unchanged in 2017. One non-forested was added since 2016 (details below).

TABLE 4.2: Ecosystems at risk in the Whistler area (CDC 2018; downloaded January 2, 2017). The table is sorted by Site Series from driest (/02) to wettest (from /07 through /Wm04). Colours show rankings on the BC list. The “ID Wildlife” column lists three plant communities designated as Identified Wildlife (BC MOE 2017a).

Site Series	Common Name	Scientific Name	BC List	ID Wildlife
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	
CWHds1/01	Western Hemlock - Douglas-fir / Electrified Cat's-tail Moss ds1	<i>Tsuga heterophylla</i> - <i>Pseudotsuga menziesii</i> / <i>Rhytidadelphus triquetrus</i> ds1	Red	Yes
CWHms1/01	Western Hemlock - Amabilis Fir / Step Moss	<i>Tsuga heterophylla</i> - <i>Abies amabilis</i> / <i>Hylocomium splendens</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	
CWHds1/09; CWHms1/08	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	
CWHds1/12; CWHms1/11	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	

Excluded:

CWHds1/00	Garry oak - bigleaf maple - cherries	<i>Quercus garryana</i> - <i>Acer macrophyllum</i> - <i>Prunus</i> spp.*	Red	
CWHds1	Dune Wildrye - Beach Pea	<i>Leymus mollis</i> ssp. <i>mollis</i> - <i>Lathyrus japonicus</i> **	Red	

* Garry Oak and this plant community do not occur near the RMOW.

** The *Lathyrus mollis* plant community is not possible in RMOW -- these are seaside communities.

Five of the Red-listed ecosystems are within the CWHds1 and therefore of more concern for parts of the Cheakamus Community Forest south of the RMOW (though closer examination may find some near the RMOW's southern boundary). A total of 10 out of 11 forested Site Series in the CWHds1 are either blue- or red-listed. In addition, three ecosystems (plant communities) are designated as Identified Wildlife in the CWHds1, including the zonal and therefore predominant Site Series (01).

All but one forested ecosystems at lower elevations within the RMOW proper (all in the CWHms1) are at risk. The only red-listed ecosystems are both floodplain sites: 07 (high bench), and 09 (low bench). They are found in riparian and alluvial (forested floodplain) sites as mapped by Green (2010). The other others are blue-listed. The only forested ecosystem not listed in both the CWHds1 and CWHms1 is Lodgepole Pine – Sphagnum, an ecosystem which occurs in semi-bog forests which have low timber value.

A second non-forested ecosystem was added to the list in 2017: Common Spike-Rush Herbaceous Vegetation ecosystem (Mackenzie and Moran 2004). I am unsure whether its appearance in 2017 search results represents an addition by the CDC or whether I missed it last year. I have seen similar ecosystems on shallow parts of the Alta Lake shoreline and at the Brandywine basalt flats (among other locations). The other non-forested ecosystem, Sitka willow - Pacific willow / skunk cabbage, is found in swamps that 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 et al.) did not map non-forested ecosystems as described by Mackenzie and Moran.²³ They did, however, describe and map their own plant communities. Green's "Nuphar" site unit²⁴ appears to be the closest match to the MacKenzie and Moran's Common Spike-Rush community. Green's Alder/Willow – Skunk Cabbage site unit²⁵ appears to be a very close match to the CDC's Sitka willow - Pacific willow / skunk cabbage community.

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 targetted 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 Bjork 2016).

²³ As noted below, non-forested ecosystems have only recently been classified and recognized in BC.

²⁴ Which is based on Klinka et al.'s (1997) *Nuphar polysepalum*: *Eleocharis palustris* subassociation.

²⁵ Coded as "DrWi-Skunk Cabbage."

5.0 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.²⁶ 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.²⁷ 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 Government²⁸ 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 also publishes non-binding guidelines on a variety of local species (titled as Best Management Practices or Develop With Care).²⁹ These guidelines and the documents listed in Table 6.1 should be references for future conservation efforts in the RMOW.

²⁶ The BC recovery planning process is best summarized in BC MOE (2016b).

²⁷ <http://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/species-ecosystems-at-risk/recovery-planning/recovery-planning-documents/recovery-planning-documents>

²⁸ Ibid.

²⁹ <http://www.env.gov.bc.ca/wld/BMP/bmpintro.html#second>

TABLE 5.1: Planning documents available from the BC or Canadian Government for species at risk in the RMOW. Additions since the 2016 report are shown with the publication date in bold.

Common Name (Scientific Name)	Most recent approved planning document(s); online links
Coastal Tailed Frog (<i>Ascaphus truei</i>)	BC Management Plan (BC MOE 2015b): Management plan for the Coastal Tailed Frog (<i>Ascaphus truei</i>) in British Columbia (PDF, 1.4MB)
Common Nighthawk (<i>Chordeiles minor</i>)	Federal Recovery Strategy (Env. Canada 2016): Recovery Strategy for the Common Nighthawk (<i>Chordeiles minor</i>) in Canada (PDF)
Evening Grosbeak (<i>Coccothraustes vespertinus</i>)	Federal assessment and status report (COSEWIC 2016 file:///C:/Users/Snowline/Documents/2017%20SAR%20and%20EMP%20species%20matrix/Regulation%20-%20Recovery%20Plans%20BC%20and%20Canada/Evening%20Grosbeak%20Coccothraustes%20vesperinus%20Assessment%20and%20Status%20Report%20COSEWIC%202017.pdf Proposed Federal Management Plan (Environment Canada 2016c): https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/mp_great_blue_heron_fannini_e_proposed.pdf
Great Blue Heron (<i>Ardea herodias</i> ssp. <i>fannini</i>)	Proposed Federal Management Plan (Environment Canada 2016c): https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/mp_great_blue_heron_fannini_e_proposed.pdf
Grizzly Bear (<i>Ursus arctos</i>):	Federal assessment and status report (COSEWIC 2013c): http://www.registrelep-sararegistry.gc.ca/document/default_e.cfm?documentID=2459 North Cascades Grizzly Bear Recovery Team (2004): http://www.env.gov.bc.ca/wld/documents/recovery/ncgbrt_final.pdf
Little Brown Bat (<i>Myotis lucifugus</i>)	Proposed Federal Recovery Strategy (Env. Canada 2015): https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_LittleBrownMyotisNorthernMyotisTricoloredBat_e_proposed.pdf
Marbled Murrelet (<i>Brachyramphus marmoratus</i>)	Federal Recovery Strategy (Env. Canada 2014a): Recovery Strategy for the Marbled Murrelet (<i>Brachyramphus marmoratus</i>) in Canada Developing a BC Implementation Plan (MFLNRO 2015b): 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
Mountain Goat (<i>Oreamnos americanus</i>)	BC Management Plan (Mountain Goat Management Team 2010): Management Plan for the Mountain Goat (<i>Oreamnos americanus</i>) in British Columbia (PDF)
Northern Goshawk, <i>laingi</i> ssp. (<i>Accipiter gentilis</i> ssp. <i>laingi</i>)	Developing a BC Implementation Plan (MFLNRO 2015a): 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 BC Management Plan (BC MFLNRO 2013): Management Plan for the Northern Goshawk, <i>laingi</i> subspecies (<i>Accipiter gentilis laingi</i>) in British Columbia (PDF) BC Recovery Strategy (BC MOE 2008): Recovery Strategy for the Northern Goshawk, <i>laingi</i> subspecies (<i>Accipiter gentilis laingi</i>) in British Columbia (PDF)
Northern Red-legged Frog (<i>Rana aurora</i>)	BC Management Plan (BC MOE 2014b): Management Plan for the Northern Red-legged Frog (<i>Rana aurora</i>) in British Columbia (PDF, 1.3MB)
Northern Spotted Owl (<i>Strix occidentalis</i> ssp. <i>caurina</i>)	Federal Recovery Strategy (2006; In: Chutter et al. 2004): http://www.sararegistry.gc.ca/virtual_sara/files/plans/rs_spotted_owl_caurina_1006_e.pdf
Northwest (Western) Waterfan (<i>Peltigera gowardii</i>)	BC Management Plan (BC MOE 2015a): http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10291 Federal Status Assessment (COSEWIC 2013): https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Western%20Waterfan_2013_e.pdf
Olive-sided Flycatcher (<i>Contopus cooperi</i>)	Proposed Federal Management Plan (Environment Canada 2016c): http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_olive-sided%20flycatcher_e_final.pdf
Old-growth Specklebelly (<i>Pseudocypbellaria rainierensis</i>)	Federal management plan (COSEWIC 2017): http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=1440C3BA-1

	Management plan for oldgrowth specklebelly (<i>Pseudocyphellaria rainierensis</i>) in British Columbia (BC MOE 2015c). http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=10231 .
Pacific Water Shrew (<i>Sorex bendirii</i>)	Federal Recovery Strategy (Environment Canada 2014): http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_pacific_water_shrew_e_final.pdf BC Recovery Strategy (Pacific Water Shrew Recovery Team, 2009): http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=6612
Western Bumblebee (<i>Bombus occidentalis</i>)	Federal assessment and status report (COSEWIC 2014a): http://www.sararegistry.gc.ca/virtual_sara/files/cosewic/sr_Western%20Bumble%20Bee_2014_e.pdf
Western Toad (<i>Anaxyrus boreas</i>)	SARA recovery strategy (ECCC 2016): http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=C6EB6568-1 BC Management Plan (PWTWG 2014): Management Plan for the Western Toad (<i>Anaxyrus boreas</i>) in British Columbia (PDF, 1.3MB) Proposed Federal Management Plan (Environment and Climate Change Canada 2016): http://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/mp-western-toad-e-proposed.pdf .
Whitebark Pine (<i>Pinus albicaulis</i>)	SARA recovery strategy (ECCC 2017): http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=C6EB6568-1
Wolverine (<i>Gulo gulo luscus</i>)	Federal assessment and status report (COSEWIC 2014b): http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=206

6.0 Recommendations

Recommended next steps include the following:

1. Surveys to determine which habitats are important to local species at risk. These should include the use of seasonal, migratory, breeding (denning and nesting), overwintering, and critical summer habitats (for animals).
2. Targetted surveys for species ranked as Confirmed or Likely. These surveys would help clarify habitats (per above) but also provide better information about presence (or not) and abundance.
3. Species should be ranked by conservation priority (i.e., by threat, local significance, role as a keystone species, etc.), and local conservation strategies should be pursued.
4. Conservation guidelines such as Best Management Practices should be adopted or modified for local use.
5. Conservation options through municipal bylaws should be pursued.
6. Further work on ecosystems at risk is needed to: (a) map their locations, if not already available; and (b) prepare strategies to protect and, if necessary, restore them (i.e., a recovery plan).
7. This report and lists should be updated on a regular basis to incorporate new data and changes in Provincial and Federal threat rankings.

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Appendix 1: Species and Ecosystems at Risk Definitions³⁰

Term	Definition
Federal Definitions ⁸ (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 ⁹	
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.

⁸ Government of Canada Environment Canada. 2014. <http://www.sararegistry.gc.ca/about/glossary/default_e.cfm>

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

³⁰ Bedore 2014, p. 8 and SCCP 2016, used with permission of the SCCP (P. Zevit, pers. comm.).

Appendix 2: Habitat Requirements of Species at Risk in Whistler

The tables below were originally presented in the 2016 report and are reprinted here with some updates and revisions. The following introduction is modified from the 2016 report:

The status of species at risk to the end of 2017 and the resulting lists (Section 3) are based on a very detailed compilation of records in Whistler and beyond, as well as consultations with a wide range of experts. The first of these sources helped confirm 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.³¹

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, Uncertain, 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 A2.4.

Confirmed species at risk for the RMOW are included as Table A2.1. Species that will probably be found in future surveys are listed in Table A2.2 as Likely. Species that could possibly occur in the RMOW (Possible) or whose likelihood could not yet be determined (Possible – Data Deficient) are included as Table A2.2. Species that are improbable (Unlikely) or whose range excludes habitats available in Whistler (Not Possible) are included as Table A2.4.

³¹ Note that this group includes two bird species that use habitat but do not breed in Whistler. Great Blue Herons are relatively common in Whistler during the summer and therefore rely on local habitat even if they only breed elsewhere. Surf Scoters pass through Whistler during migration and may, briefly, require specific habitat.

TABLE A2.1: 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)
Butterfly	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)	
Butterfly	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.	
Amphibian	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).	
Amphibian	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).	
Amphibian	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.	
Bird	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)	
Bird	Barn Swallow (<i>Hirundo rustica</i>)	BAFA;BG;BWBS;CDF;CWH;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)	
Bird	Black Swift (<i>Cypseloides niger</i>)	BAFA;BG;CDF;CMA;CWH ;ESSF;ICH;IDF;IMA;MH;MS;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.)	
Bird	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 (Marven et al. 2015) and at Brandywine basalt flats (BioBlitz 2012).	Ground nester on open sites (Campbell et al. 1990b).
Bird	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.)	
Bird	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.)	

TABLE A2.1: (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)
Bird	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 Mason et al, in prep.), many aerial sightings (Ricker et al. 2014; Whistler BioBlitz)	
Bird	Olive-sided Flycatcher (<i>Contopus cooperi</i>)	BWBS;CDF;CWH;ESSF;IC H;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.)	
Bird	Surf Scoter (<i>Melanitta perspicillata</i>)	BG;BWBS;CDF;CWH;ICH;IDF;MS;PP;SBPS;SBS;SWB	Seen on lakes & ponds during migration (Ricker et al.. 2014; K. Ricker pers. comm.); no chance of breeding here (Campbell et al. 1990a).	Winters on coast and breeds in NE BC (Campbell et al. 1990a); Listed as year-round resident, non-breeding species in the Squamish Forest District CDC (CDC 2017).
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 (Betty Rebellato 2005)	
Mammal	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.).	
Mammal	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.).
Mammal	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.	
Mammal	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?	
Mammal	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.)	
Lichen	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).
Lichen	alpine soil foam (<i>Stereocaulon glareosum</i>)	no data	Blackcomb alpine in wet soil (Brett 2007)	Sandy, gravelly soil at all elevations (Goward et al. 1994).

TABLE A2.1: (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)
Lichen	brown-eyed wolf (<i>Letharia columbiana</i>)	no data	Whistler Mt. alpine on conifer bark (Brett 2007).	On conifer bark and wood at mid to high elevations (Goward et al. 1994).
Lichen	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).
Lichen	electric rocktripe (<i>Umbilicaria decussata</i>)	no data	On granitic rock in exposed alpine sites (Brett 2015); only other BC record from J. Pojar, 1975, Spatsizi Plateau (C. Bjork, pers. comm.).	
Lichen	finger ring (<i>Arctoparmelia incurva</i>)	no data	Blackcomb Mt. Xhiggy's Meadow 2007 record is possibly the first in the Coast Mts. (Brett 2007).	"Infrequent over acid rock in open inland sites" (Goward 1994).
Lichen	forty-five vinyl (<i>Leptogium intermedium</i>)	no data	On large cottonwoods (Brett 2007); this epiphytic form is rarer, old-growth dependent; possibly new to science (C. Bjork, pers. comm.).	
Lichen	frosted crackers (<i>Fuscopannaria leucostictoides</i>)	no data	On large black cottonwood (Brett 2007) on barks and twigs in open, old forests (Goward 1994; C. Bjork, pers. comm.).	
Lichen	grinning rosette (<i>Physcia dubia</i>)	no data	Blueberry Hill schist cliff (Brett 2007).	On base rich rock in open sites (Goward 1994).
Lichen	lesser rock grub (<i>Allantoparmelia almqvistii</i>)	no data	On acid rock at subalpine and alpine elevations (Brett 2007; Goward 1994)	
Lichen	lesser salted rocktripe (<i>Umbilicaria krascheninnikovii</i>)	no data	On acidic rock in exposed alpine sites (Brett 2015; Goward 1994)	
Lichen	lettuce lung (<i>Lobaria oregana</i>)	no data	On conifers in old forests (Brett 2007); old-growth dependent (Goward 1994; C. Bjork, pers. comm.)	
Lichen	mountain candlewax (<i>Ahtiana sphaerosporella</i>)	no data	Frequent on whitebark pine; may decline significantly as that species declines (C. Bjork, pers. comm.)	
Lichen	recoiling bone (<i>Hypogymnia recurva</i>)	no data	Brandywine PP area on branches of lodgepole pine (Brett 2015); newly described in 2010 (Goward et al. 2010)	
Lichen	reticulate specklebelly (<i>Pseudocyphellaria anthraxis</i>)	no data	On large cottonwoods in the valley bottom (Brett 2007; 2015)	On trees, especially conifers at lower elevations (Goward 1994); old-growth dependent (C. Bjork, pers. comm.).
Lichen	spiny witch's hair (<i>Alectoria imshaugii</i>)	no data	One record from Brandywine PP (Brett 2007)	Infrequent on low elevation conifers (Brett 2007; Goward 1994, McCune and Geiser 2009).
Lichen	sun snaps (<i>Vahliella californica</i>)	no data	On chloritic schist, Blueberry Hill cliffs (Brett 2015)	
Lichen	wax candle pixie (<i>Cladonia singularis</i>)	no data	Brandywine Park area and Russet Lake records shows a wide habitat amplitude (Brett 2015; 2016)	Not as rare as previously thought so could be downlisted (C. Bjork, pers. comm.).
Lichen	windward rocktripe (<i>Umbilicaria lambii</i>)	no data	On acidic rock in exposed alpine sites (Brett 2015; Goward 1994)	
Liverwort	liverwort (<i>Haplomitrium hookeri</i>)	no data	Humus and soil in the alpine (Brett 2015; Schofield 2002)	
Liverwort	liverwort (<i>Nardia breidlerii</i>)	no data	Wet soil at high elevations (Brett 2015; FNA 2016)	

TABLE A2.1: (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)
Liverwort	liverwort (<i>Nardia compressa</i>)	no data	Over wet rocks along streams and peaty bogs, alpine and Brandywine PP (Brett 2017; FNA 2016)	
Liverwort	liverwort (<i>Nardia geoscyphus</i>)	no data	On dry rocks or damp rocks in streams, alpine (Brett 2015)	
Liverwort	liverwort (<i>Scapania curta</i>)	no data	On rock in the alpine (Brett 2015) no other data found	
Liverwort	liverwort (<i>Scapania obscura</i>)	no data	Peaty soil on late snowmelt sites in the alpine (Brett 2015; Wagner 2008)	
Liverwort	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 2017b) but only the former is included at all by CDC (2016). The four specimens are from diverse habitats from low to subalpine elevations (Brett 2017).	No other habitat or range information yet located.
Liverwort	liverwort (<i>Tritomaria polita</i> ssp. <i>polita</i>)	no data	Various substrates in the alpine (Brett 2017)	
Moss	alpine hygrophypnum moss (<i>Hygrophypnum alpinum</i>)	BAFA;CWH;ESSF;ICH;IDF; SWB	On emergent rocks in subalpine to alpine creeks (Brett 2015; FNA 2016)	
Moss	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) muelhlenbeckii</i> (S. Joya, pers. comm.).	Rock and soil over rock at all elevations (FNA 2016).
Moss	black grimmia (<i>Grimmia incurva</i>)	CMA	Damp acidic rock at high elevations (Brett 2015; FNA 2016)	
Moss	Cardot's pohlia moss (<i>Pohlia cardotii</i>)	CMA;CWH;IMA;MH	Moist, seepy sites, predominantly alpine (Brett 2015)	
Moss	Donn's grimmia (<i>Grimmia donniana</i>)	no data	On exposed, dry acidic rock at high elevations (Brett 2015; FNA 2016)	
Moss	grimmia moss (<i>Grimmia caespiticia</i>)	no data	On exposed, dry acidic rock at high elevations (Brett 2015; FNA 2016)	
Moss	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 2016)	
Moss	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 2016)	
Moss	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 2017b; S. Joya, pers. comm.) makes this a significant record	Moist, acidic boulders mainly in the alpine (FNA 2016).
Moss	pseudoleskea moss (<i>Pseudoleskea radicata</i> var. <i>pallida</i>)	no data	On rock and mineral soil in the alpine (Brett 2015; FNA 2016)	
Moss	pygmy racomitrium moss (<i>Racomitrium pygmaeum</i>)	BAFA;ESSF;MH	Dry, acidic soil near treeline (Brett 2015; FNA 2016)	

TABLE A2.1: (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)
Moss	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 2016)	
Moss	tall-clustered thread-moss (<i>Bryum pallescens</i>)	no data	One record from thin soil over boulder in stream at 1219m (Brett 2015)	
Moss	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 (2016).
Moss	tripterocladium moss (<i>Tripterocladium leucocladulum</i>)	CWH;IDF;MH	On dry rocks at lower elevations, e.g., Brandywine Park (north?; Brett 2015)	
Fern	Cascade parsley fern (<i>Cryptogramma cascadenis</i>)	CMA, ESSFvc; ESSFvcp; IMA	One 2016 record from Whistler Mt., and likely in other rocky sites above treeline (Brett 2017)	
Grass	satin grass (<i>Muhlenbergia racemosa</i>)	BGxh; IDfxh	One site confirmed in from Wildlife Refuge wetland (Brett 2007)	
Herb	ochroleucous bladderwort (<i>Utricularia ochroleuca</i>)	BWBSdk;CDFmm;ESSFmv ICHmw	One record from Wildlife Refuge wetland (Brett 2007)	
Herb	shinleaf wintergreen (<i>Pyrola elliptica</i>)	BWBSmw; CWHvm; ESSFmw; ICHmw; IDFww; IDfxm; MHmm; MSxk; SBSdw; OSBSmh	Dry forest; two records from Brandywine Park area (Brett 2015)	
Herb	star-flowered draba (<i>Draba stenopetala</i>)	BAFA;CMA	One 1917 record from "Mt. Whistler" (UBC Herbarium in Brett 2015); could be present though ID for any <i>Draba</i> sp. is difficult.	Mainly alpine, Mt. Edziza + Cascades (Klinkenberg 2017b).
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 2017b).
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.)
Lichen	midlife vinyl (<i>Leptogium californicum</i>)	no data	Brandywine PP area on Acer macrophyllum (just outside RMOW? Brett 2015)	On mossy rock (Goward 1994).
Lichen	northwest waterfan (<i>Peltigera gowardii</i>)	no data	Not yet documented in RMOW (Brett 2017)	2 records s. of Whistler (Black Tusk and Brew Lake) in streams <1m wide near treeline (COSEWIC 2013; BC MOE 2015a)
Lichen	tundra tarts (<i>Psoroma tenue</i> var. <i>boreale</i>)	no data	Not yet documented in RMOW (Brett 2017)	One 2011 record from Brew Lake (UBC via Brett 2015); common in wet snowbeds at high elevations and prob. should be downlisted (C. Bjork, pers. comm.)
Liverwort	liverwort (<i>Jungermannia atrovirens</i>)	no data	Not yet documented in RMOW (Brett 2017)	On emergent rock, upper edge of Brandywine Falls (Brett 2015) on damp calcareous rocks (http://rbg-web2.rbge.org.uk/bbs/Activities/liverworts/Jungermannia%20atrovirens.pdf).
Liverwort	liverwort (<i>Marchantia alpestris</i>)	no data	Not yet documented in RMOW (Brett 2017) but almost certain.	Russet Lake; margins of snowmelt streams and high elevation ponds/lakes (Brett and Bjork 2016). Often misidentified as <i>M. polymorpha</i> (C. Bjork, pers. comm.).
Moss	desmatodon moss (<i>Tortula leucostoma</i>)	BAFA;MH;SWB	Not yet documented in RMOW (Brett 2017) though likely.	Dry soil in alpine heath at Russet Lake (UBC Herbarium in Brett 2015)
Moss	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 2016).
Moss	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 2016).

TABLE A2.3: 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 ssp. 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 2017b).
Bird	Evening Grosbeak (<i>Coccothraustes vespertinus</i>)	All non-alpine throughout BC.	Breeds in Whistler and is seen fairly commonly in CWH and MH forests and developed areas (Ricker et al. 2014).	
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 2017).
Butterfly	Clodius Parnassian (<i>Parnassius clodius ssp. claudianus</i>)	CDF;CMA;CWH;MH	The one record (Brett 2015) is likely ssp. pseudogallatinus (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).
Gastropod	Rocky Mountain Physa (<i>Physella propinqua</i>)	BAFA;CDF;CMA;CWH;ESSF;IDF;IMA;MH;MS;SBPS;SBS	Not documented in Whistler (Brett 2017) unknown likelihood in Whistler due to taxonomic/ID difficulties (R. Forsyth, pers. comm.)	Wet areas; the few records are not close to Whistler (CDC 2017); 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.
Gastropod	Sunset Physa (<i>Physella virginea</i>)	BAFA;BG;CDF;CMA;CWH;ESSF;ICH;IDF;IMA;MH;MS;SBPS;SBS	Not documented in Whistler (Brett 2017) unknown likelihood in Whistler due to taxonomic/ID difficulties (R. Forsyth, pers. comm.)	Wet areas; the few records are not close to Whistler (CDC 2017); 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.
Mammal	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 2017).
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 2017). The relocation of elk into the Squamish Valley was part of an effort to re-establish them in their former range.
Mammal	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.).
Lichen	peacock vinyl (<i>Leptogium polycarpum</i>)	no data	Not yet documented in RMOW (Brett 2017) but C. Bjork (pers. comm.) suggests it's worth looking for.	One record from Acer macrophyllum in talus just south of Brandywine Falls; also on Alnus rubra and in spray zones (COSEWIC 2011).
Lichen	two-toned foam (<i>Stereocaulon symphycheilum</i>)	no data	Not yet documented in RMOW (Brett 2017) but very possible in RMOW (C. Bjork, pers. comm.)	One record from basalt cliffs at outlet of Garibaldi Lk. (C. Bjork in Brett 2015).

Liverwort	liverwort (<i>Frullania hattoriana</i>)	no data	Not yet documented in RMOW (Brett 2017). 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).
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TABLE A2.3 (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)
Moss	Boas' long-necked moss (<i>Trematodon asanoi</i>)	MHmm	Not yet documented in RMOW (Brett 2017); possible in RMOW (O. Lee, pers. comm.)	Closest record at Table Mt. (UBC Herbarium 2016); moist, exposed soil on late snowmelt sites (Christy 2007).
Moss	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 2016).
Moss	bryum moss (<i>Bryum calobryoides</i>)	ESSF;MH	Not yet documented in RMOW (Brett 2017); possible in RMOW (O. Lee, pers. comm.).	On humus/rock at Little Diamond Head (UBC Herbarium 2016); calcareous damp soil to high elevations (FNA 2016).
Moss	grimmia dry rock moss (<i>Grimmia anomala</i>)	CWH;MH	Not yet documented in RMOW (Brett 2017); possible in RMOW (O. Lee, pers. comm.).	Exposed, damp soils at mid and high elevations (FNA 2016); closest record is from 1974 on Brew Lk. trail from Brandywine (Brett 2015).
Moss	Heinemann's andreaea moss (<i>Andreaea heinemannii</i>)	MH	Not yet documented in RMOW (Brett 2017); possible in Whistler (S. Joya and O. Lee, pers. comm.).	On rock in alpine sites (CDC 2017); on acidic rock at low to moderate elevations (FNA 2016); one 1983 record from Alice Ridge Trail to Diamond Head is closest (Klinkenberg 2017b).
Moss	Roth's thread-moss (<i>Pohlia andalusica</i>)	CMA	Not yet documented in RMOW (Brett 2017).	Acidic, disturbed soil to high elevations (FNA 2016); closest record from Garibaldi Neve (UBC Herbarium 2016).
Moss	slender smoothcap moss (<i>Atrichum tenellum</i>)	BAFA;ESSF	Not yet documented in RMOW (Brett 2017). possible in RMOW (O. Lee, pers. comm.).	Mainly an interior species; the lowland Squamish record could be a mis-ID (S. Joya, pers. comm.).
Moss	tundra pohlia moss (<i>Pohlia tundrae</i>)	MH	Not yet documented in RMOW (Brett 2017); possible in RMOW (O. Lee, pers. comm.).	On humus and alpine tundra (FNA 2016); closest record from Sentinel Glacier foreland (UBC Herbarium 2016).
Herb	blunt-sepaed starwort (<i>Stellaria obtusa</i>)	CWHms;ESSFdk;ESSFwc;ESSFwcp;ESSFwk;ICHdw;ICHwk;IDFdm;IDFw;IDFxh	Not yet documented in RMOW (Brett 2017); often overlooked and may be here (C. Bjork, pers. comm.).	Moist to wet, open sites mainly east of Coast Mts.; closest record at Meagher Cr. (Klinkenberg 2017b).
Herb	Brewer's monkey-flower (<i>Erythranthe</i> [= <i>Mimulus</i>] <i>breweri</i>)	ESSFdcp;ESSFwc;ESSFv;ICHdw;ICHmk;ICHmw;ICHxw;IDFdm;IDFw	Not yet documented in RMOW (Brett 2017); possible in Whistler (C. Bjork, pers. comm.).	Moist sites at various elevations; closest record at Meagher Cr. (Klinkenberg 2017a); more common than previously though (C. Bjork, pers. comm.).
Herb	spotted cowbane (<i>Cicuta maculata</i> var. <i>maculata</i>)	no data	Not yet documented in RMOW (Brett 2017); possible in Whistler on moist sites (C. Bjork, pers. comm.; Klinkenberg 2017b) though check additional notes re taxonomy.	<i>Cicuta</i> taxonomy is a mess (C. Bjork, pers. comm.). NB: this ssp. seems to have been delisted with only <i>C. m.</i> var. <i>angustifolia</i> now listed (CDC 2017); EFlora lists as Red with the closest occurrence in the Upper Lillooet Valley (Klinkenberg 2017b).
Moonwort	dainty moonwort (<i>Botrychium crenulatum</i>)	BWBSmw;ESSFdk;ICHwk	Not yet documented in RMOW (Brett 2017); "pops up" in unexpected places (C. Bjork, pers. comm.), i.e., possible in Whistler.	Mainly montane in SE and NE BC, one 1917 record from Empetrum Ridge (Klinkenberg 2017b).
Moonwort	least moonwort (<i>Botrychium simplex</i> var. <i>compositum</i>)	BWBSmw;CDFmm;CWHds;CWHxm;ESSFvc;ICHmw;ICHvk;ICHwk;IDFxh;MSdk;SBPSxc	Not yet documented in RMOW (Brett 2017); "pops up" in unexpected places (C. Bjork, pers. comm.), i.e., possible in Whistler.	Coastal lowland, 1 record from Pemberton (Klinkenberg 2017b).

TABLE A2.3 (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)
Moonwort	spoon-shaped moonwort (<i>Botrychium spathulatum</i>)	BWBSmw;ESSFwm;ESS Fwmp;MSdk	Not yet documented in RMOW (Brett 2017); "pops up" in unexpected places (C. Bjork, pers. comm.), i.e., possible in Whistler.	Mainly eastern BC, one 1941 record from Empetrum Ridge (Klinkenberg 2017b).
Sedge	teacher's sedge (<i>Carex praeceptorum</i>)	no data	One record from a bog at Callaghan Lake (Brett 2017). Many sedge experts with the WBP have been in similar habitats since (e.g., H. Roemer, A. Ceska, and C. Bjork). 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.

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