Proposed Regional Park at Cape Roger Curtis

Ecological Background Information

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Executive Summary

In 2022, Metro Vancouver announced a conditional purchase of 97 hectares of land for a proposed regional park at Cape Roger Curtis on Bowen Island. This report provides an Ecological overview of the site and park proposal. The report includes descriptions of climate, geology, topography and soils taken manly from previous reports, as well as a section on hydrology based on past and recent survey information. The section on Forest Ecology is based on surveys conducted by Diamond Head Consulting for property owners in 2005 and for the Bowen Island Conservancy (BIC) in 2021, as well as updated forest inventory information undertaken by Regional Parks in 2022/23. This section was also informed by Terrestrial Ecosystem Mapping (TEM) for the site, which was updated by Regional Parks in 2022.

The Unique and Significant Site Features section draws information from a variety of sources as well as from background research and site visits conducted by Regional Parks staff forestry, biology and planning professionals. This section also draws on valuable information collected by the BIC and naturalists such as Terry Taylor, who surveyed the site over many decades. Information on intertidal site features was sourced from a Parks Canada report as well as more recent information provided in the BIC Marine Atlas and the Átl'ka7tsem/Howe Sound marine conservation map made by the David Suzuki Foundation and Ocean Wise Coastal Ocean Research Institute.

Recent TEM mapping and the author's own research informed the sections on Ecological Communities at Risk and Species at Risk. Background Information on biodiversity comes from reports created by consulting biologists for the property owners, the BIC Cape Roger Curtis Biophysical Summary, and supplemented with publicly available data from iNaturalist, eBird, and iMAP, and site visits.

The last three sections provide context for the current and potential management opportunities at the site, including a description of existing protected areas and research and environmental monitoring opportunities.

The view southeast from the proposed regional park at Cape Roger Curtis

Acknowledgments

Much of the information used to produce this report was collected over many years by volunteer and consulting biologists, non-profit and government agencies, and individuals who cared for the site. The work of the Bowen Island Conservancy and Islands Trust to document the important natural values in this area and outline management options for adjacent protected areas is invaluable.

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1.0 INTRODUCTION

1.1. General Information

The proposed park at Cape Roger Curtis is 97 hectares of land that had previously been prepped for development into 24 lots with roads and servicing. The park would be adjacent to Crown land, which includes the headwaters of Huszar Creek and Fairy Fen Nature Reserve; it would also neighbour the Wild Coast Nature Refuge. The area is part of the newly designated Átl'ka7tsem/Howe Sound UNESCO biosphere reserve which extends from Squamish to the Sunshine Coast. It would connect to nearby municipal nature trails and public beaches.

This area is part of the coastal dry forests of BC which constitutes less than 1% of the Province's land area but contains the highest number of endangered species in the Province. These areas are found along southern Vancouver Island, small parts of Metro Vancouver, and other areas in the rain shadow of the Salish Sea.

These extremely endangered ecosystems are one of the most underrepresented in BC's protected areas system.

The view west from the subject area

1.2. Site History

Skwxwu7mesh (Squamish) used Nex̲wlélex̲wem (Bowen Island) for deer and duck hunting, seasonal clam gathering and marine hunting of seals, sea lions and whales. During the 1930s, the owners logged much of the privately held 640 acres at Cape Roger Curtis to pay the property taxes every year. As early as 1921, the Vancouver Natural History Society recommended the preservation of Cape Roger Curtis due to its unique ecosystem and rare plants. From the 1970s on, the site had 'No Trespassing' signs and fences installed, but local residents continued to recreate on the lands and beaches in the area.

In the early 2000s, Cape Roger Curtis Trust Society was created to advocate for the protection of the land. Despite this, in 2004 the land was sold to the current owners - Cape Roger Curtis Joint Venture (renamed The Cape on Bowen Development Company). In 2008/09, the Bowen Island Municipal Council rejected proposed plans for a large housing development at the Cape that was well above the 224-unit designation in the Official Community Plan. The owners chose to proceed with obtaining approval from the Subdivision Approving Officer (a statutory position) for a subdivision under the existing Land Use Bylaw that allowed the creation of 59 10-acre lots. Roads and servicing were established to support development.

In 2019, the Bowen Island Conservancy acquired 3 of the waterfront lots and established a 13-hectare (32-acre) waterfront conservation area "Wildcoast Wild Coast Nature Refuge" (Bowen Island Conservancy, 2022).

In 2022, Metro Vancouver announced a conditional land purchase agreement with the owners that could establish a new 97-ha regional park.

2.0 ECOLOGICAL DESCRIPTION

Bowen Island lies within the Georgia Lowland Ecosection of the Georgia Depression Ecoprovince, but has many characteristics of the Pacific Coast Mountains. The Georgia Depression Ecoprovince is among the most impacted of all ecoprovinces in British Columbia with only 2.8% of its land remaining intact. Almost all of this intact land base (2.7%) is already in protected areas (Parks Canada, 2010)

Bowen Island is part of the Very Dry Maritime subzone of the Coastal Western Hemlock Zone (CWHxm1). The CWHxm1 has limited distribution along the coast of British Columbia. In the Metro Vancouver area, coastal CWHxm1 areas are limited to the southern shores of Bowen, the extreme southwest lowland of West Vancouver, including Lighthouse Park, and a belt running through Point Grey, including much of Pacific Spirit [Regional] Park (Parks Canada, 2010).

Metro Vancouver Regional District's Sensitive Ecosystem Inventory (SEI) Mapping for the site shows it as mainly mature forest, with areas of riparian, woodland, and herbaceous along the coast (Figure 1). The relative conservation value of these lands was designated as "Very High" by Parks Canada (2010) in relation to the lands of the Gulf Islands National Park Reserve.

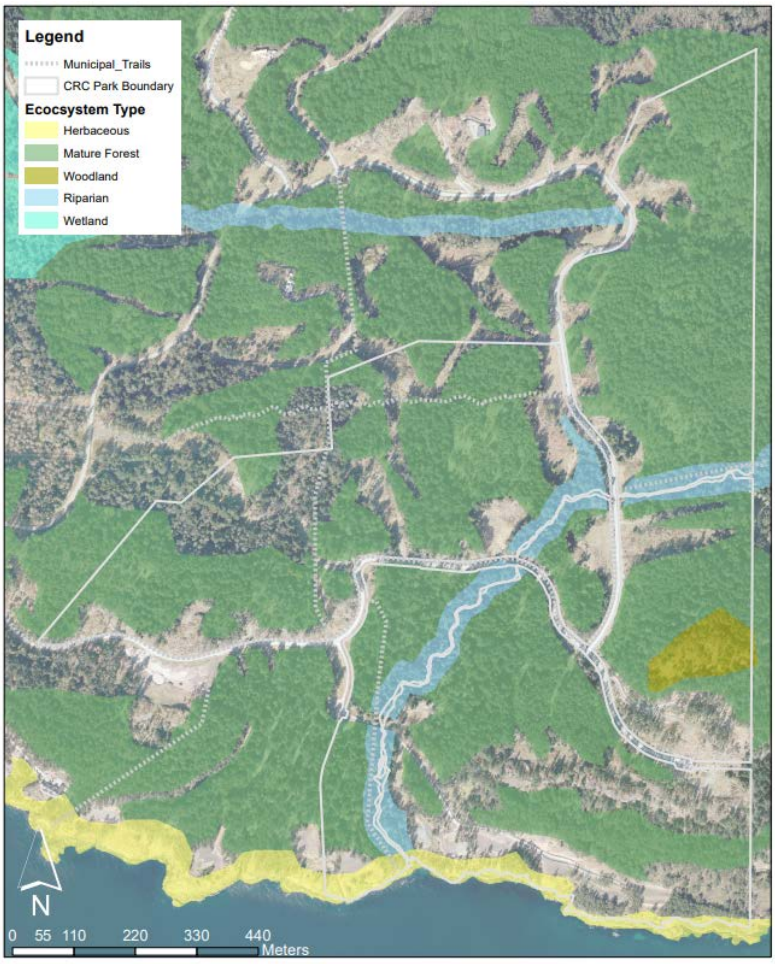


Figure 1: Sensitive Ecosystem Inventory mapping for the proposed regional park at Cape Roger Curtis.

2.1. Climate

Like the southern gulf islands, the area around Cape Roger Curtis is in the rain shadow of the Vancouver Island mountains. Although the climate is less pronounced than in the Gulf Islands, the flora is similar (Taylor, 2005). The climate has warm, dry summers and moist, mild winters with relatively little snowfall. Growing seasons are long, with seasonal drought common, especially in recent years (Metro Vancouver, 2021)

Precipitation averages 1506 mm per year, of which approximately 3.3% falls as snow (Whitehead, 2011). The site is moderately exposed to the south-easterly and westerly winds from the Strait of Georgia, which tend to bring the strongest storms and precipitation (Whitehead, 2011).

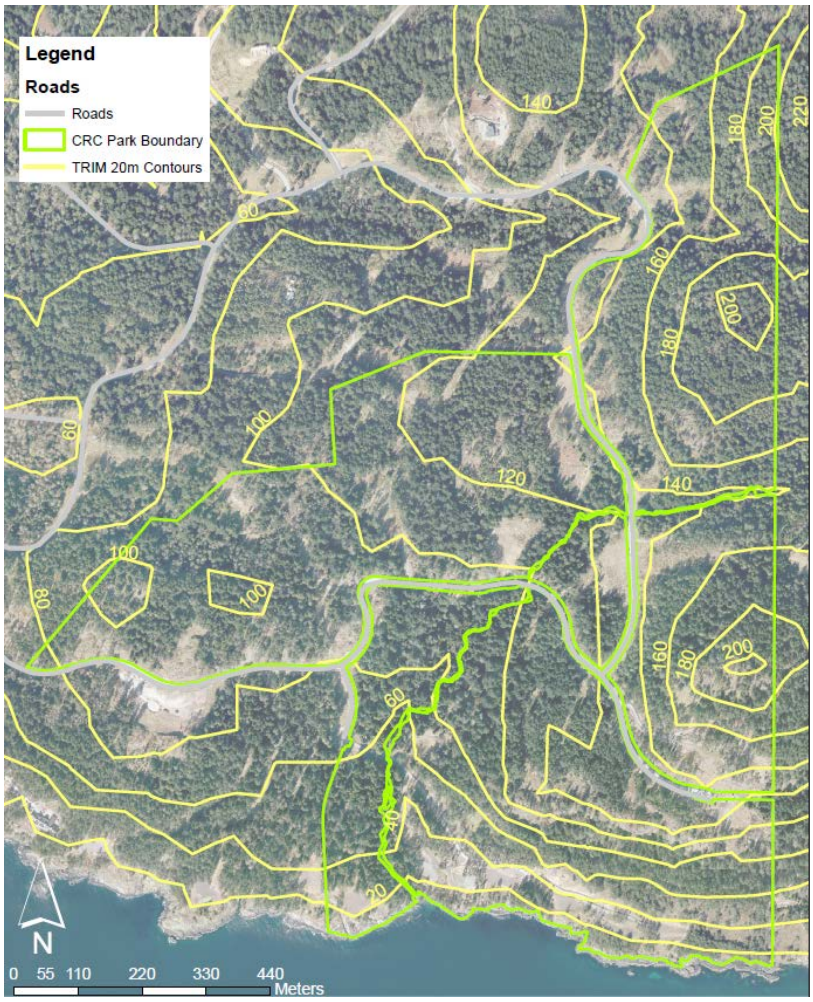


Figure 2: Contour map of proposed Regional Park at Cape Roger Curtis

2.2. Geology

The island emerged from the massive glacier that filled Howe Sound about 14,000 years ago (Parks Canada, 2010). The surficial deposits of glacial till and outwash that now cover the bedrock base of the valleys and side slopes are a direct result of the last ice age. The Strait of Georgia de-glaciated relatively quickly and became ice-free about 11,500 years ago (Parks Canada, 2010). The bedrock on Bowen Island is known as the Bowen Island Formation, the oldest in the Georgia Basin. They are younger and less metamorphosed than those found in the groups between Indian Arm and Buntzen Lake and Horseshoe Bay and Caulfield Cove. Rock is Volcanic and Sedimentary (Bowen Island Conservancy, 2007).

Most of the area around Cape Roger Curtis is Bedrock, with some areas of Fluvial Deposits along watercourses (Bowen Island Conservancy, 2007). Exposed bedrock surfaces, where visible, tend to be smooth and rounded by glaciation (Whitehead, 2011). There is a small amount of Morainal Deposits in the northeast portion of the property (Bowen Island Conservancy, 2007).

2.3. Topography and Soils

Both slopes and aspects vary considerably throughout the subject 97-hectare site. Portions of the area are relatively level, while much ranges between 20-40% with some areas with slopes in excess of 90% (Lasuta and Assoc., 2023). The site ranges in elevation from sea level to 200 meters in the northwest corner of the property (see Figure 2). The shoreline is steep and rocky with bedrock bluffs with a generally

gently sloping south slope, although defined ridges and knolls create a highly variable terrain (Metro Vancouver, 2021).

Soils consist of 5-10 cm of organic soil overlying sandy loams with a component of gravel or cobbles over the underlying glacial till. The surface humus layers range in depth from 3cm to 20cm and include mors where decomposition is slow to moders on richer sites (Metro Vancouver, 2021). Rock outcrops have minimal soil in depressions and a cover of moss, lichens and herbs on the exposed ridges and domes (Lasuta and Assoc., 2023).

2.4. Hydrology

Huszar Creek generally runs through the western edge of the property and discharges on the beach on the south side. It drains Fairy Fen, a nature reserve some 500 meters to the northeast of the eastern edge of the proposed park. A smaller watercourse, Burke Creek, flows seasonally from an ephemeral wetland located in the northeast corner of the property. Bennet Land Surveyors determined the High Water Mark for Burke and Huszar Creeks (PGL, 2009a) and this was the basis for the riparian covenant that exists for the site. The average channel width for Burke was 2.2m, and Huszar was 4.7m. No fish have been found in any watercourses (Bowen Island Conservancy, 2007). The large vernal wetland at the northeastern end of the property (in lot 36) is the headwaters of Burke Creek and has been found to be a red-legged frog breeding site (PGL, 2009b).

Figure 3 shows a comprehensive inventory of all hydrological features, including natural features such as streams, wetlands, ponds, pools, and seepage sites, as well as constructed features such as ditches. LiDAR was used to generate DEM/DSM layers for the park. These are highly accurate terrain maps that were used to locate potential hydrological features. Two professional biologists from DHC completed a field review to identify all water features in February 2023. ArcGIS Field Maps was used to map and collect characteristics for all water features. This includes instream and bank characteristics. Streams were separated into distinct reaches based on these characteristics. The stream inventory includes the following:

- 6 Class B reaches,
- 31 Class C reaches,
- 64 ditches and
- 11 wetlands/ponds.

Class B watercourses are those which do not provide fish habitat but are a source of food and nutrients to fish habitat downstream. Class C watercourses are not considered to provide food or nutrients to fish habitats downstream but can still be important sources of water (Diamond Head, 2023).

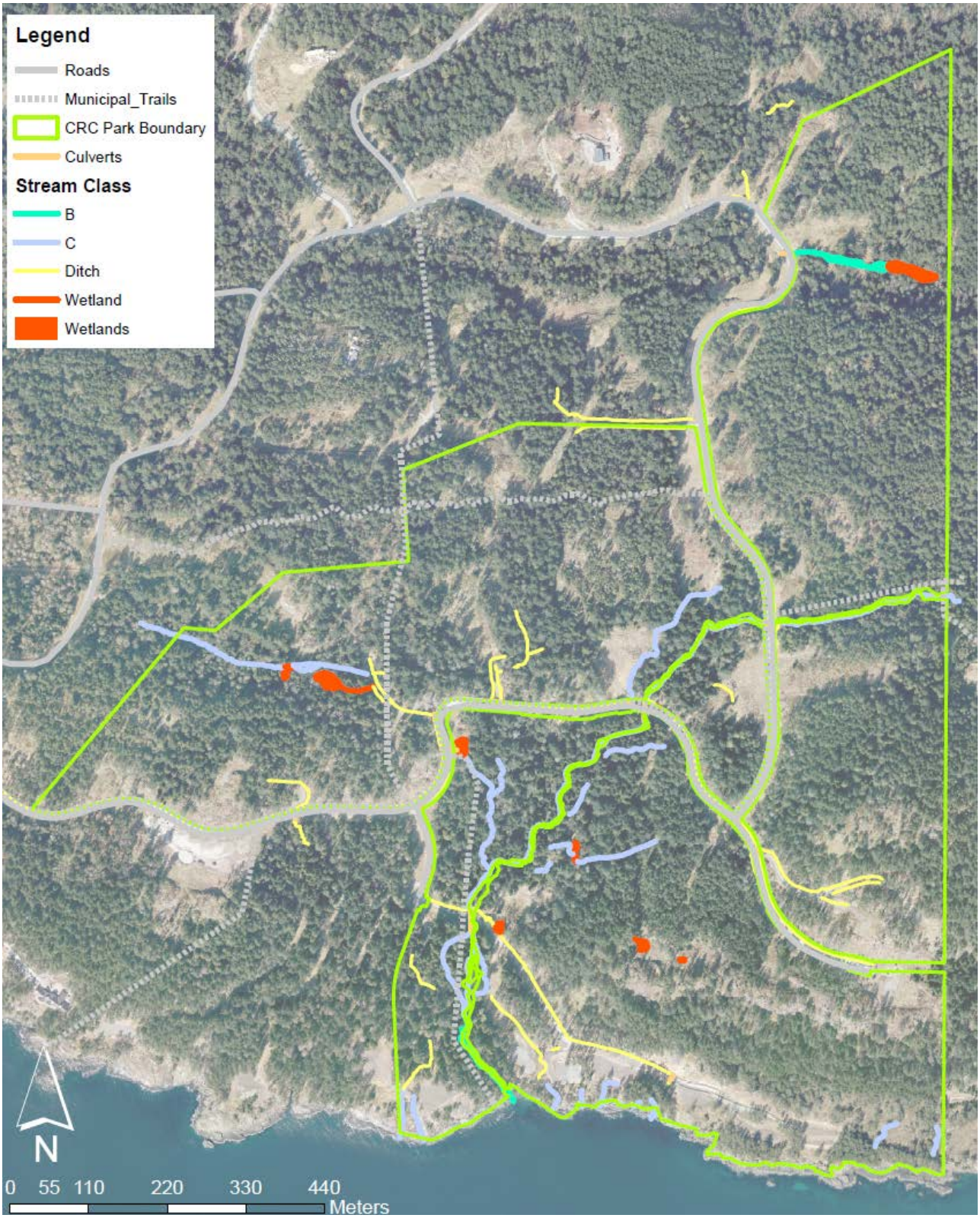


Figure 3: Hydrology information for the proposed regional park at Cape Roger Curtis.

3.0 FOREST ECOLOGY

3.1. Forest Characteristics

The forest stands at the proposed regional park area range from fairly uniform to the open and marginally treed areas along the coastline and on interior rock outcrops (Lasuta and Assoc., 2023). The project area contains plant communities associated with the drier site series of the CWHxm1, with riparian corridors and low-lying sites featuring higher moisture regimes and richer soils.

In general, the stocking density of mature trees ranges from 300-900 stems per hectare (Diamond Head, 2021) with the size of mature trees varying depending on the productivity of the site. On dry and poor sites, the average trees are 40 centimetres in diameter at breast height and 25 meters tall. On rich sites, they average 50 cm in diameter at breast height and 35 m in height (Diamond Head, 2021).

A healthy western redcedar with salal understory indicating a wetter soil regime

The tree ages range across the site, with the oldest trees being 120-140 years old. There are some remnant trees from the previous stand that are greater than 200 years old, including some smaller diameter trees that have been growing very slowly along the rocky marine foreshore (Diamond Head, 2005).

The most common species include Douglas-fir (Pseudotsuga menziesii) with intermixed western hemlock (Tsuga heterophylla), western redcedar (Thuja plicata), grand fir (Abies grandis), bigleaf maple (Acer macrophyllum) and red alder (Alnus rubra) (Metro Vancouver, 2021). Drier rocky sites include arbutus (Arbutus menziesii), Seaside Juniper (Juniperus maritima), and shore pine (Pinus contorta).

The understory is dominated by Salal (Gaultheria shallon) in most drier areas. Dull Oregon grape (Mahonia nervosa), sword fern (Polystichum munitum) and red huckleberry (Vaccinium parvifolium) are also common throughout. The driest sites with rock outcrops feature little shrub growth and instead support a diversity of mosses and lichens. Where lichens, mosses, and some herbs dominate many areas of exposed rock, there is also a diversity of grasses, ferns, and shrubs in upland forest openings where soils have accumulated. There is less understory diversity where

forest crown closure limits light (Metro Vancouver, 2021). A full plant list can be found in Appendix A.

3.2. Habitat Types

Recent Terrestrial Ecosystem Mapping (TEM) undertaken by Metro Vancouver in 2022 has provided an update on the habitat types found at the site. The CWHxm1 site associations and other habitat types are shown in Figure 4 below.

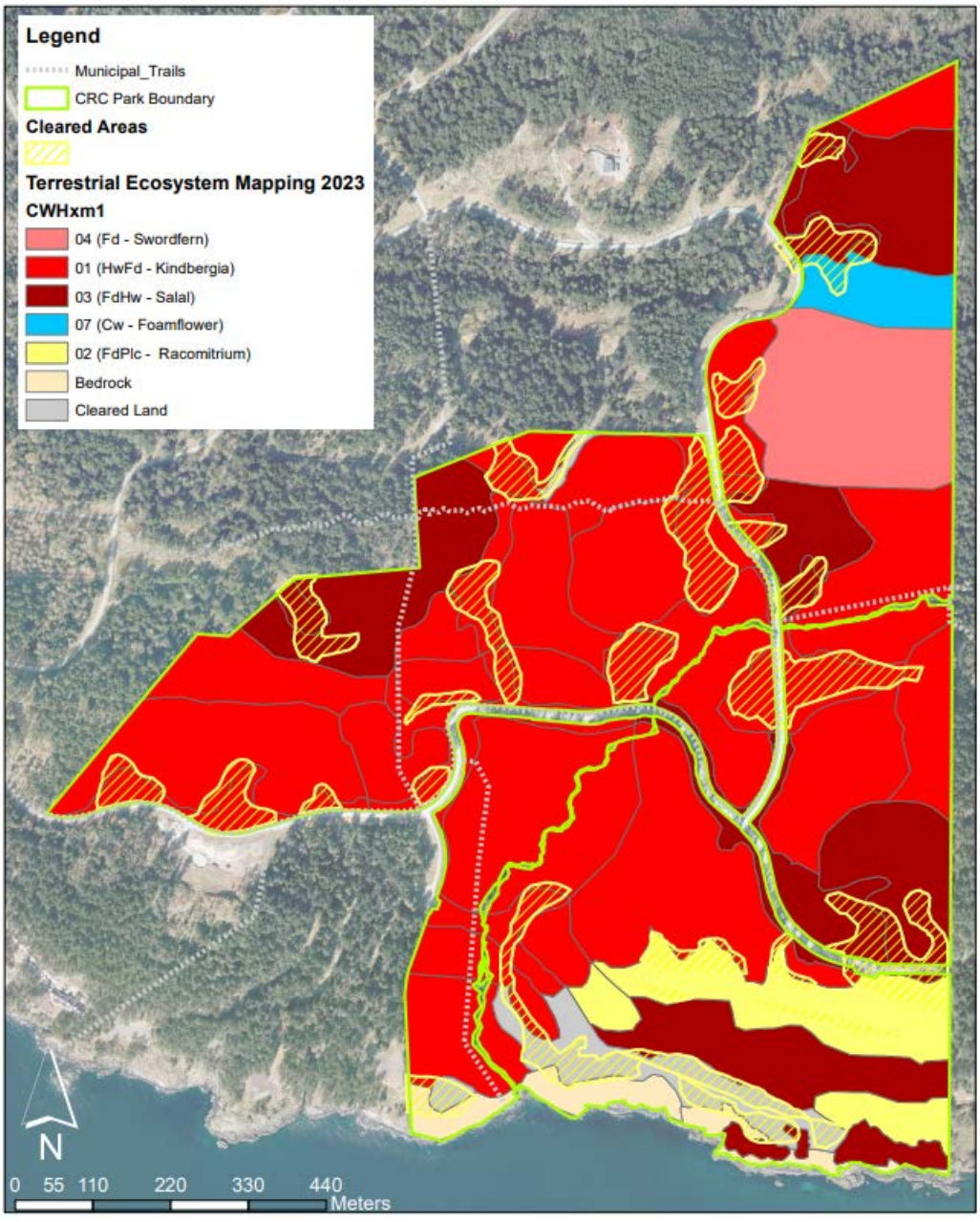


Figure 4: Terrestrial Ecosystem Mapping (TEM) undertaken by Metro Vancouver in 2022, showing CWHxm1 site associations and other habitat types.

3.3. Forest Health

Recent site surveys found that the Douglas fir on site was generally of good form, and although evidence of seasonal drought in recent years could be seen and there were a few dead trees observed along roads or above the road easement blast cut where soil erosion and edge exposure were likely factors. No root rot pockets *(Phellinus weirii*) were observed in the stand (Lasuta and Assoc., 2023).

Western redcedar on the site exhibited stress and dieback seen commonly in the Pacific Northwest as more frequent and extended periods of drought have occurred in recent years due to climate change (Buhl, 2022). A forest health aerial survey conducted in regional parks in 2019 found that 49 ha of Crippen Regional Park's forest, about 22% of the park area, was affected by drought stress (Figure 5) (Blackwell, 2019). This is a lower occurrence than some regional parks where more than 80% of the redcedar are dying (David Sheffield, pers. comm.).

Western hemlock is relatively rare on-site, with some relatively low levels of dwarf mistletoe (arceuthobium spp.) seen in the northwest corner of the property (Lasuta and Assoc., 2023). Lodgepole pine in the far western part of the property are in poor form with some die-off and breakage seen, likely a result of their age and exposed location on rock outcrops (Lasuta and Assoc., 2023). A significant number of large pine have recently succumbed to windfall at a rock bluff covenant area in the northwest corner of the property. Big leaf maple trees are suffering from the increased prevalence of brittle cinder fungus, which is being seen across the Pacific Northwest (Marin-Bruzos, 2018). It should be noted that big leaf maple are only a minor component of the forest stands here and shows the typical deterioration that comes with age and conifers encroaching on their living space (David Sheffield, pers. comm.).

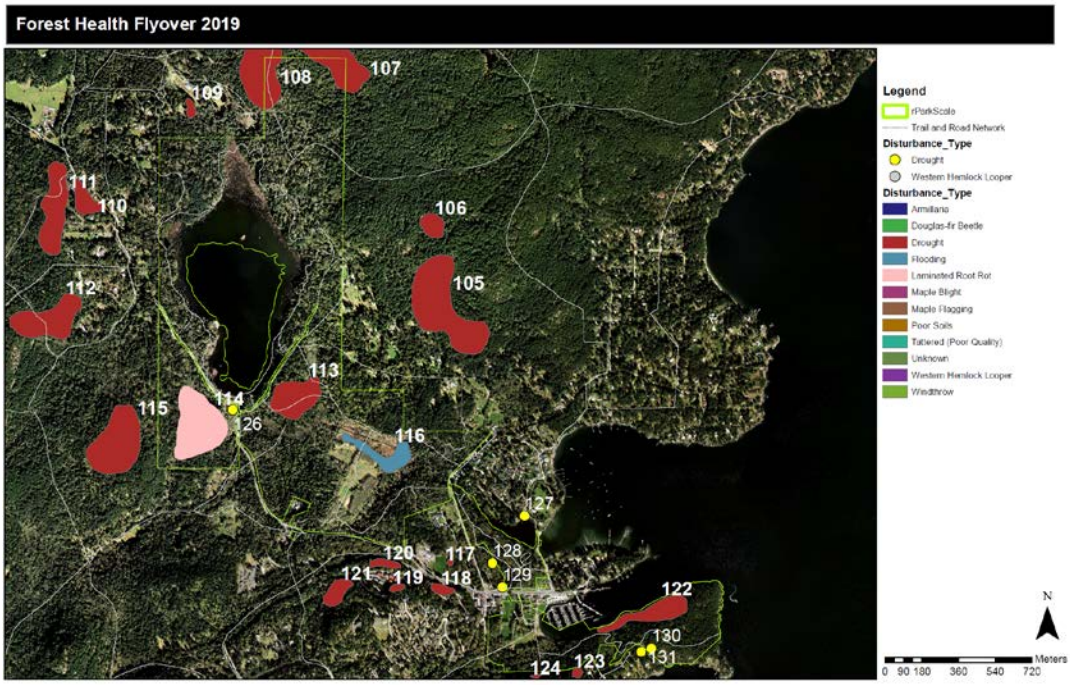


Figure 5: Forest Health Flyover results for Crippen Regional Park in 2019. The park was mostly affected by drought stress (49 ha), 2 ha was affected by flooding, and 6 ha was impacted by Laminated Root Rot impacting Douglas fir trees (Blackwell, 2019).

3.4. Timber Evaluation

A forest evaluation of the proposed park lands completed in early 2023 determined there was 58.82 ha of non-protected merchantable timber on site of two types (Lasuta and Assoc., 2023):

- Type 1 – Coastal Douglas fir – Dry Site: This forest stand is best described as a coniferous dry Douglas fir forest type ranging in age from 80 to 125 years. The stand tends to be quite uniform in density and tree size with few significant natural openings other than rock outcrops, most of which have been excluded. The height of the second-growth forest is between 18 meters and 34 meters. Site index indicates that this site is low to medium in nutrient and moisture.
- Type 2 – Coastal Douglas fir, Western Red Cedar/Western Hemlock: The forest cover type primarily consists of a maturing Douglas fir with a component of western redcedar and western hemlock. The age of this Forest Stand type ranges from 81 to 102 years. The height range of this stand type is 22 meters to 32 meters. This forest stand is best described as uneven-aged. Differences in tree size and height are primarily due to the range of microsites found in this forest type.

Using standardized foresty techniques, it was determined that the harvestable forest stand volume of those 58.82ha is 34,460m3, which equates to a gross estimate value of $5,617,690.00 (Lasuta and Assoc., 2023). Figure 6 shows the map of forest harvesting potential, showing excluded setbacks and covenants.

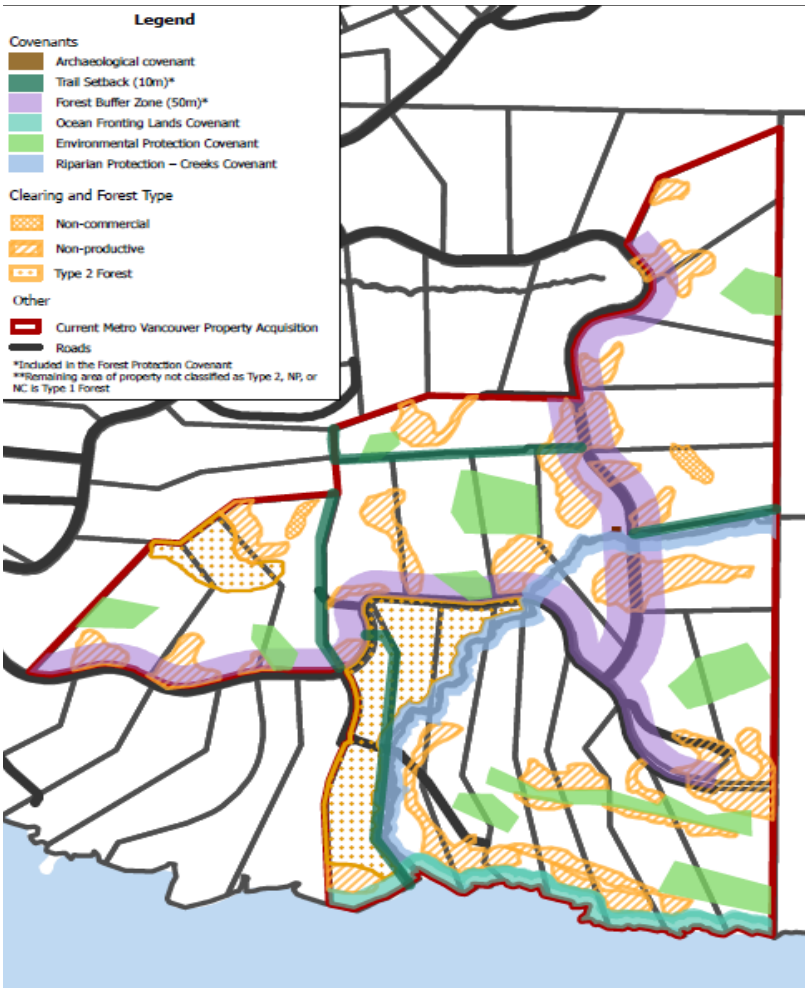


Figure 6: Map of forest harvesting potential showing excluded setbacks and covenants. Forest Stand Type 1, Forest Stand Type 2, Non-Productive (clearings), and Non-Commercial Cover (deciduous species).

4.0 UNIQUE AND SIGNIFICANT SITE FEATURES

4.1. Coastal Bluffs

The coastal bluff habitat at Cape Roger Curtis (CHWxm/02) is considered to be one of the richest on the east coast of the Strait of Georgia and certainly the "richest coastal site" in the Metro Vancouver region (Taylor, 2005). Its significance is further elevated due to the virtual low levels of exotic species (Taylor, 2005). The shoreline supports coastal bluff plant communities dominated by arbutus and ocean spray in association with a diverse array of flowers and mosses (Metro Vancouver, 2021).

The Wallace's selaginella/reindeer lichens ecological community indicate the highest value sites, which are found along the southern shoreline (Diamond Head, 2005) as well as in upland areas. These areas were protected as special 'covenant areas' designated by Bowen Island Municipality during a previous development application process. A large number of regionally significant plant species have been identified in these areas including:

One of the inland coastal bluff covenant areas

- One of the only known locations in the region for seaside juniper. Its range in the Georgia Basin-Puget Sound region is very restricted and is only known to occur in this region where some trees have been aged to in excess of 400 years (Parks Canada, 2010).

- Macoun's meadow-foam (*Limnanthes macounii*) is Provincially red-listed and covered under Schedule 1 of the federal Species at Risk Act and has been found along the southern rocky bluffs. It does not appear that any other "listed" plant species have been reported. (Taylor, 2005).

- Camas spp – a perennial with a large bulb to survive the rest of the year until spring blooms (Taylor, 2005). This species has a high cultural significance for coastal BC First Nations.

- Other species that are locally rare on this side of the Georgia Straight include blue toadflax, hairy honeysuckle, yerba Buena, slender plantain, slender sandwort, Menzies larkspur, Indians-dream fern, dwarf owl clover.

At the nearby Wild Coast Nature Refuge, this plant community covers most of the open bluffs. That refuge protected the areas deemed the most floristically rich and of the highest ecological quality, with less trampling disturbance and non-native species cover than many other occurrences on the coast (Bowen Island Conservancy, 2022).

These dry rocky ecosystems are particularly sensitive to disturbance, and some areas have been impacted by both the site development for residential use with road construction and home site preparation and, to a lesser degree, recreational use. In these areas, there is evidence of non-native grasses being introduced and out-competing the less vigorous native grasses (Lasuta and Assoc., 2023).

4.2. Open Woodlands and Old Growth Trees

The open woodlands of the Cape Roger Curtis area (CHWxm/05 and 07) were formed over coarse and fine-textured, glacial marine deposits which support very productive tree growth (Kinka, 2005). These areas support very productive stands of red alder, bigleaf maple, Douglas fir, western redcedar and grand fir. Some red alders exceed 35m, and some grand fir are over 45m in height and represent significant site features (Metro Vancouver, 2021).

The shoreline edge of this forest may be among the most ecologically significant stands of old-growth Douglas fir and other species on Bowen Island (Diamond Head, 2005). These trees have a very large diameter and survived the logging and subsequent burning of the site, as is evident by the fire scars on their trunks. It is difficult to determine the age of these trees as their trunks are too large to take core samples from, but it is estimated that they are between 200 and 300 years old (Diamond Head, 2005). These are some of the only old-growth trees in the CWHxm1 subzone in the lower mainland (along with Lighthouse Park and Pacific Spirit Regional Park) (Parks Canada, 2010).

4.3. Rich Intertidal Zones

On this corner of Bowen Island, the seabed drops steeply into the waters of the Georgia Strait; it is deep, close to shore. Bowen's marine environment is relatively typical of Howe Sound and the Strait of Georgia, recognizing that these waters are influenced by both cold waters from the fjord environment inland from Bowen and the Fraser River plume seaward of the island (Parks Canada, 2010). Bowen's underwater ecosystem is considered to be in relatively good condition, although there is a well-known history of the overharvesting of rockfish, lingcod and abalone, among other species (Parks Canada, 2010).

This area is recognized as a Priority Conservation Area (PAC) through the Átl'ka7tsem/Howe Sound marine conservation map (Beaty, 2019). This area was determined to be a marine biodiversity hot spots using computer modelling analysis (Marxan) and was recommended for enhanced protection and management (Beaty, 2019). This is mainly due to its importance for marine birds and harbour seals (see Figure 7).

Parks Canada (2010): In October 2009, a small pod of transient killer whales passed by Cape Roger Curtis and the southwest coast of Bowen Island hunting for seals. The Vancouver skyline shapes the distant background.

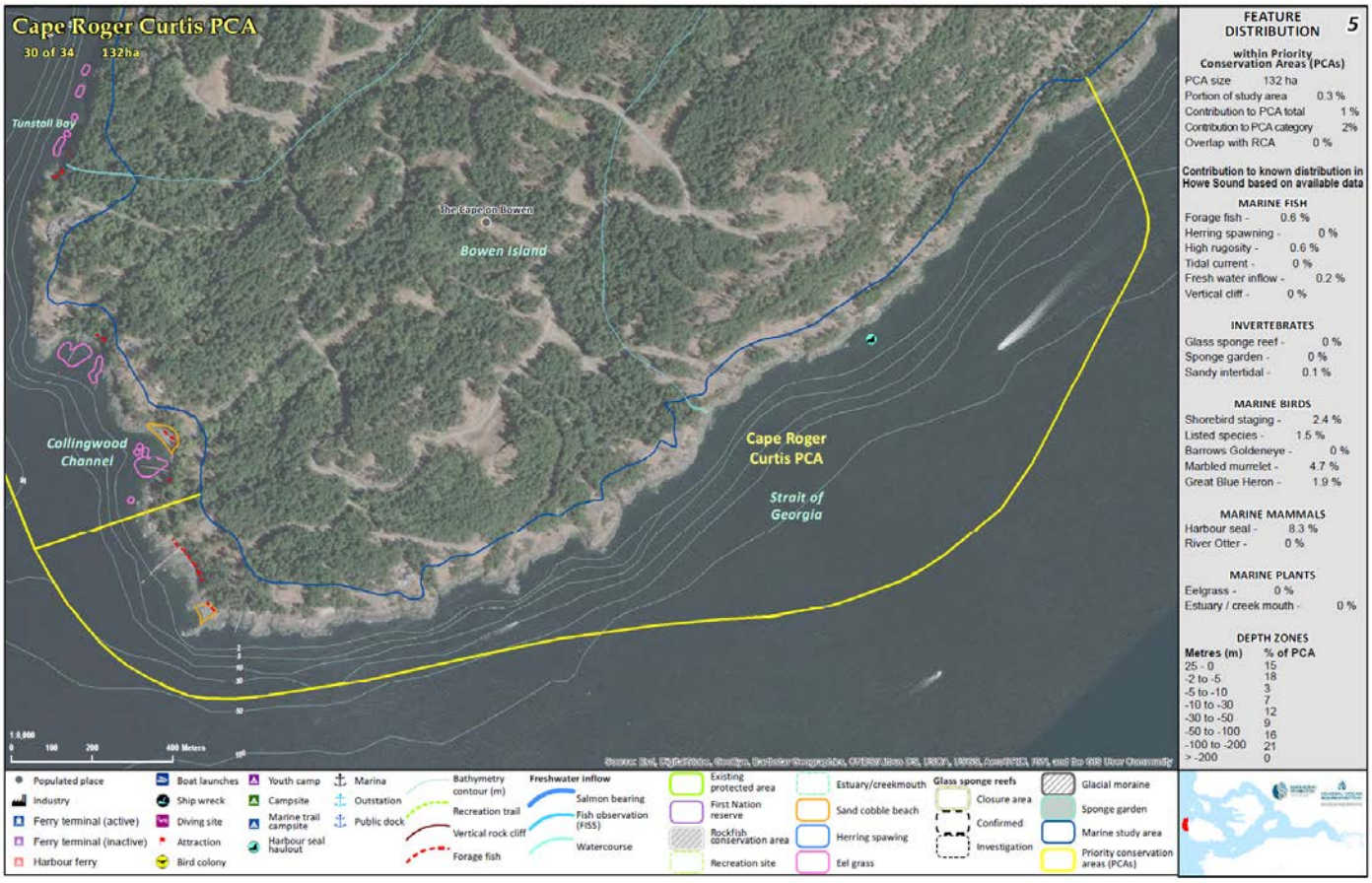


Figure 7: Cape Roger Curtis Priority Conservation Area shown on the Átl'ka7tsem/Howe Sound marine conservation map (Beaty, 2019)

5.0 ECOLOGICAL COMMUNITIES AT RISK

The BC Conservation Data Centre records rare ecological communities based on the TEM site associations. Ecosystems classified as site series 01 (western hemlock - Douglas-fir / Oregon beaked-moss) and 03 (Douglas-fir - western hemlock/salal Dry Maritime) are common at the site and are considered red-listed. There is one polygon classified as site series 04 (Douglas-fir / sword fern) which is red-listed, and one site classified as 07 (western redcedar / three-leaved foamflower Very Dry Maritime), which is blue-listed.

Sites classified as site series 02 (Douglas-fir – Shore pine / Racomitrium) are considered yellow listed, although they are still quite sensitive and locally rare. Figure 8 shows the red, blue and yellow listed ecosystems on the site as well as their structural stage. About 85% of the site is classified as either red or blue-listed ecosystems, but since areas of the site have been cleared for development, some are only at the herb or shrub layer (14%).

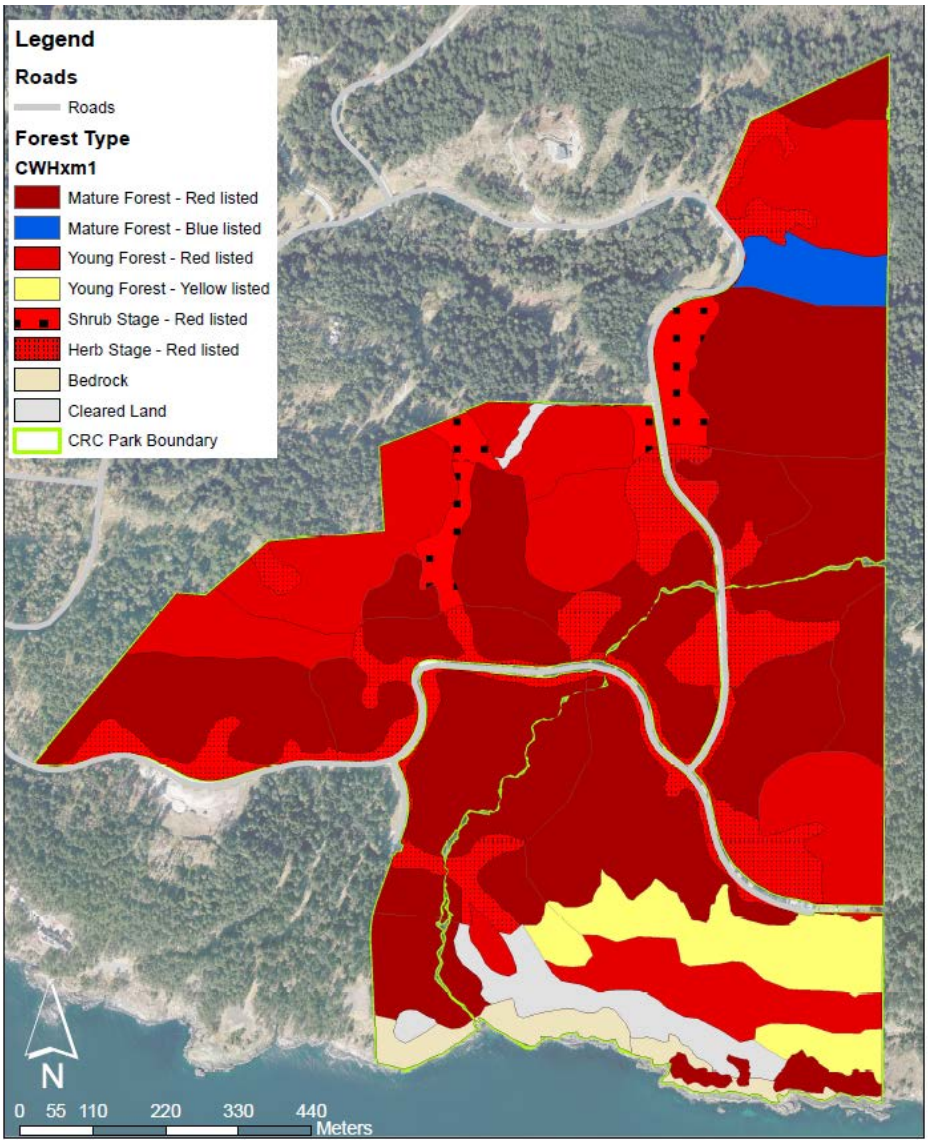


Figure 8: Map of ecological communities at risk on the site displayed with the colour listing (red, blue, yellow) and using their structural stage.

6.0 BIODIVERSITY

6.1. Species at Risk

There are 42 known or possible species at risk (SAR) at the proposed park at Cape Roger Curtis (See Appendix B for a detailed list). This list was developed by searching the BC Species and Ecosystems explorer for all possible species in this area and then refining that list based on other available data sources and species records (eBird, CDC iMap, iNaturalist, and surveys of the area) as well as looking at general habitat suitability at the site. The breakdown of those species by taxonomic group and their place on the BC red or blue listed status is shown in Figure 9.

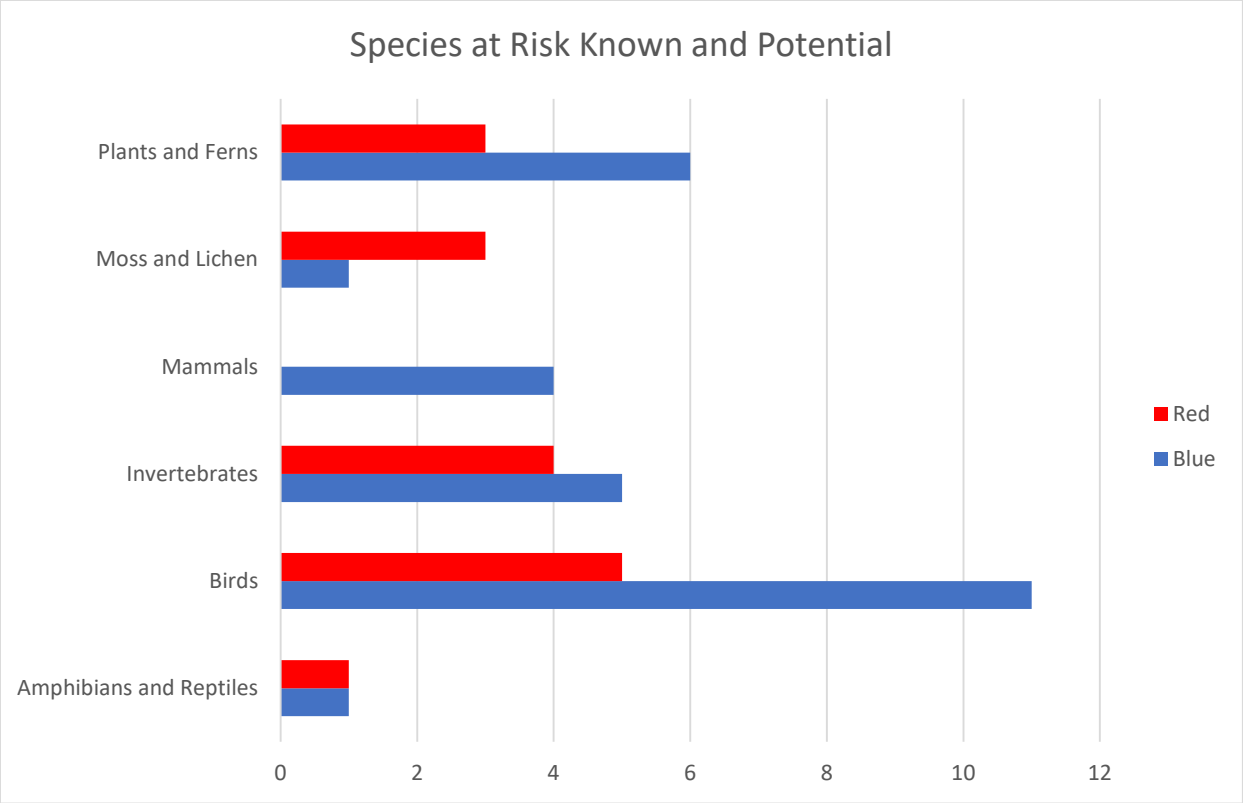


Figure 9: Known or possible species at risk at the proposed park at Cape Roger Curtis by taxonomic group and BC red or blue listed status.

6.2. Mammals

The forest and shrub communities provide habitat to support a diversity of small mammals, including voles, shrews, and mice. Medium and large-sized mammals confirmed to inhabit this area include raccoon (Procyon lotor), Douglas squirrel (Tamiascriurus douglasii), black-tailed deer (Odocoileus hemionus), mink, and short-tailed weasel (Mustela ermine). Skunks (Mephitis mephitis) are also present on the island. Black bears (Ursus americanus) and cougars (Puma

concolor) have not been known to reside long-term on the island but have been sighted occasionally.

Bat species using the site are not confirmed but likely include: Yuma Myotis (Myotis yumanensis), Californian Myotis (Myotis californicus), Long-legged Myotis (Myotis volans), Little Brown Myotis (Myotis lucifugus), Hoary Bat (Lasiurus cinereus), Silver-haired Bat (Lasionycteris noctivagans), Big Brown Bat (Eptesicus fuscus), and Long-eared Myotis (Myotis evotis). Townsend's Big-eared Bat (Corynorhinus townsendii), Fringed Myotis (Myotis thysanodes), and Mexican Free-tailed Bat (Tadarida brasiliensis) may occur but are unlikely.

An acoustic bat monitor was deployed in Crippen Regional Park on Bowen Island in March 2022 after bats were observed by a park employee. Results of the acoustics analysis were conducted by a local bat expert, and the results are shown in Table 1.

Big brown bat	1
Big brown bat / silver-haired bat	3
California myotis	55
Myotis spp.	24
Silver-haired bat	1

Table 1: Results of acoustic bat monitoring at Crippen Regional Park in March 2022.

Long-eared myotis were recently confirmed on nearby Gambier Island.

6.3. Birds

The site provides a habitat for a wide variety of both resident and migratory birds. A diversity of habitat features is present to support nesting, foraging, and roosting. Earlier inventories of the area confirmed a total of 114 species (PGL, 2009b) and a recent eBird search turned up 141 (see Appendix C for current list).

Coastal Waterbirds: This area is now to be particularly rich in marine birds (See section "Rich Intertidal Zone" above for more info). These marine waters are also frequented by two red-listed fish-eating birds, the double-crested cormorant (*Nannopterum auritum)* and marbled murrelet

(*Brachyramphus marmoratus*), as well as the blue-listed great blue heron and occasional rhinoceros auklet (*Cerorhinca monocerata*) (Bowen Island Conservancy 2007).

Nesting Bald Eagles: There is one bald eagle (*Haliaeetus leucocephalus*) nest at the proposed site. Bald eagle nests are afforded year-round protection under the Wildlife Act (1996) and require 200m quiet buffers and 100m vegetated buffers to comply with the Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (2013). See Figure 10 for a map of the approximate nest location and buffer distances.

Great blue herons: Like bald eagles, the nests of these birds are also afforded year-round protection and buffer distances, and Bowen Island Municipality also has a special Heron Policy. No heron nests have been observed to date at the site, although they have been found elsewhere on the island. Intertidal areas provides an important feeding habitat for these birds. A heron nesting in the Stanley Park colony was observed travelling as far as Bowen Island to feed.

Nesting Owls: Western screech-owl (*Megascops kennicottii kennicottii*) surveys were conducted at the site in May 2007 and 2008 using standard call playback surveys (PGL, 2009a) (PGL, 2009b). None were detected. Barred owls (*Strix varia*) seem common and may have displaced Western screech-owl the in this area. One or two great grey owls (Strix nebulosa) overwintered at the Cape property in 2021/2022, but none were observed the following winter, 2022/2023.

Woodpeckers: This site has rich woodpecker habitat. Pileated woodpeckers (*Dryocopus pileatus*) and their nests have been observed nearby. These nests are afforded year-round protection under the Migratory Birds Convention Act (1994).

Migratory Breeding Birds: The occupied nests of these birds are protected by the Migratory Birds Convention Act (1994). Bird inventory point counts were conducted in 2008 with 41 species identified over two days in July (PGL, 2009b). A full species list of breeding birds at the site as well as their relative abundance can be found in Appendix D.

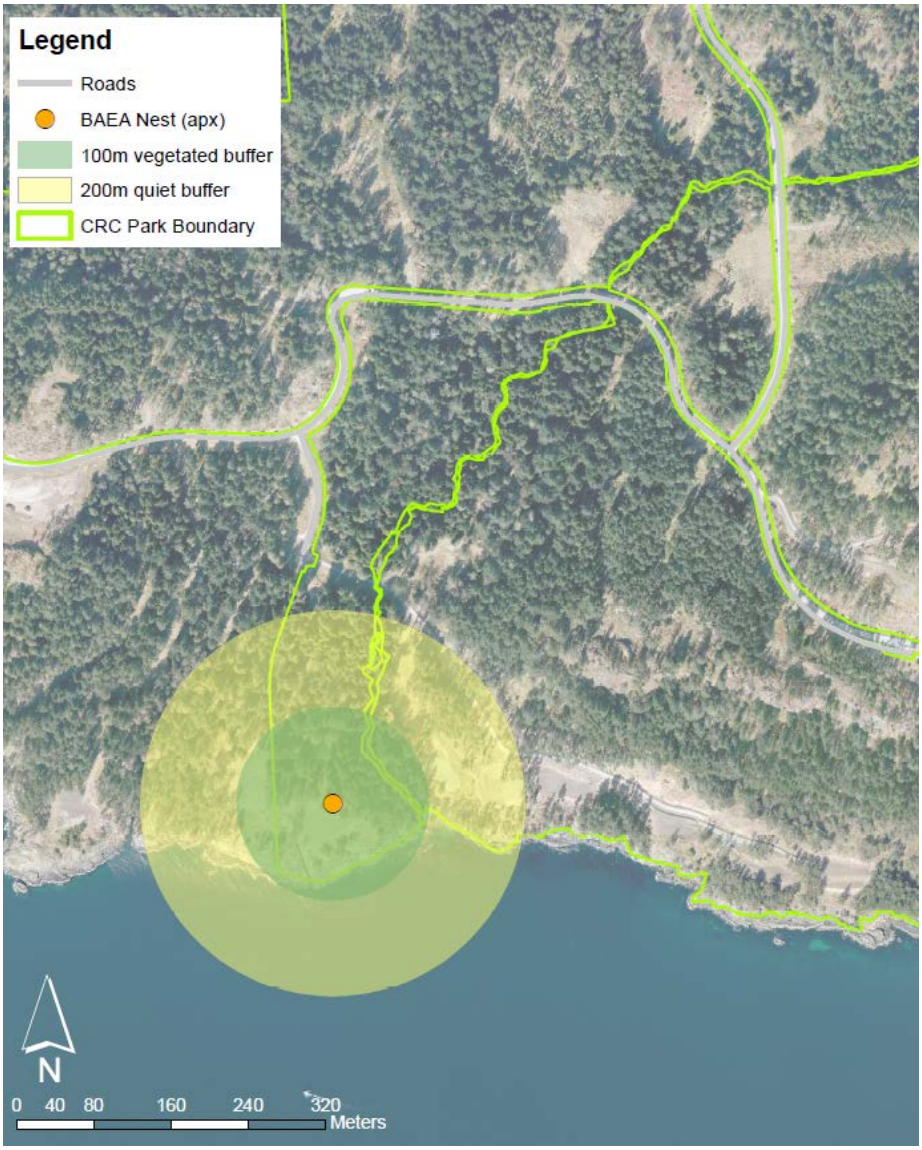


Figure 10: Approximate bald eagle nest location and buffer distances.

6.4. Amphibians

Amphibians that inhabit the study area may include salamanders, newts and frogs. These can be found anywhere on the site. Pond breeding species will be found adjacent to watercourses or in moister areas of the site during seasonal migration. These species rely on water for breeding and as larvae but spend most of their adult lives in terrestrial environments.

Numerous amphibian breeding surveys were conducted at the site in May/July 2007 and 2008 in the site's ephemeral ponds and streams (PGL, 2009a). Red-legged frogs (Rana aurora aurora) were found in Burke and Huszar Creeks (PGL, 2009b). Pacific Tree frogs (Pseudacris regilla) have been found throughout the site.

Pond-breeding northwestern salamanders (Ambystoma gracile) and terrestrial ensatina salamanders (Ensatina eschscholtzii) have been observed at the site as documented through research-grade iNaturalist sightings. Other salamanders and net are found on the island but have not yet been documented at the site (Loik, 2022).

Ensatina salamanders (*Ensatina eschscholtzii*) have been observed at the site and documented through iNaturalist.

6.5. Reptiles

There are many dry and rocky areas across the study area suitable for reptiles such as garter snakes or northwestern alligator lizard (*Elgaria coerulea principis*). These species are commonly associated with rocky outcrops and colluvial deposits, which are found across the study area.

The garter snake that has been observed on Bowen island and may be present at the site are the northwestern garter snake (*Thamnophis ordinoides*), Western Terrestrial Garter Snake (*T. elegans)*, common garter (*T. sirtalis*), and its Puget garter snake (*T.s.pickeringii*) subspecies.

Reptile surveys conducted at the Cape in May/July 2007 resulted in Northwestern garter snake observations (PGL, 2009a). There is one research-grade northwestern garter snake observation from 2022 at the proposed park location on iNaturalist and one sighting of an alligator lizard just north of the lighthouse. All three species of garter snake were found by the author at nearby Dorman Point in 2021/2022.

6.6. Terrestrial and Aquatic Invertebrates

Although they make up the greatest part of biodiversity, we usually know the least about the invertebrates in our environment. This is true for most regional parks and other protected areas in BC. However, the prevalence of iNaturalist sightings in the last decades has made more data available on these and local naturalists, researchers and the public have all been contributing to these open data sources.

So far, approximately 46 species have been identified through iNaturalist at the site (see Appendix E). Two invertebrate species at risk that have been identified on Bowen Island in recent years are the autumn meadowhawk (*Sympetrum vicinum*) and blue dasher (*Pachydiplax longipennis*) which are associated with the island's permanent water bodies. There is a record of the red-listed Common Wood-nymph (*Cercyonis pegala incana*) from 1933 near Snug Cove.

Butterfly surveys were conducted in May/July 2007 (PGL, 2009a), but the resulting data have not yet been located (Appendix 8 of the PGL report that went to Bowen Island Municipality).

6.7. Marine Species

The water column in the outer waters around Bowen Island is much less stratified due to the lower influence of the Fraser River discharges, and salinity gradually increases toward the Strait of Georgia (Parks Canada, 2010). The shoreline types and biological features of the area around Cape Roger Curtis are captured in the map in Figure 11 found in Bowen Island marine atlas (Gilday et al., 2020).

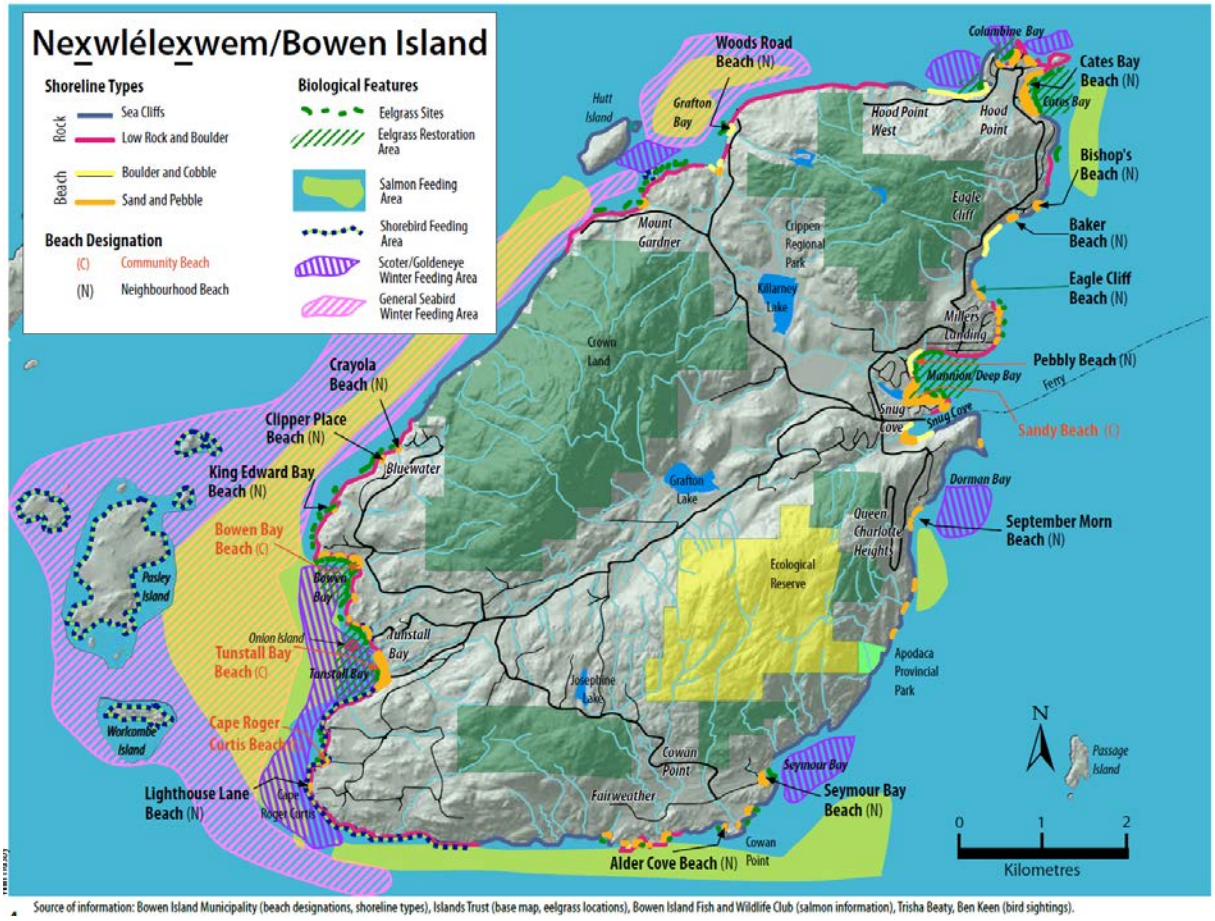


Figure 11: Shoreline types, beach designations and biological features of Bowen island.

Cape Roger Curtis is known for its beds of eelgrass and blue mussels, which, in turn, attract numerous seabirds, particularly surf scoters (*Melanitta perspicillata*) and Barrows goldeneye (*Bucephala islandica*). Coastal seabird surveys have observed up to 35 species of marine or shoreline birds using the area, including flocks of up to 3,000 surfs scoters at one time.

Surf scoter flocks of up to 3,000 have been documented at Cape Roger Curtis.

Harbour seals (*Phoca vitulina)* are abundant here, and California sea lions (*Zalophus californianus*), and Steller sea lions (*Eumetopias jubatus*) can be seen feeding on schools of anchovy or travelling past. Mink (*Mustela vison*) and river otters (*Lontra canadensis*) use intertidal areas extensively. Both resident and transient killer whales *(Orcinus orca)* are observed in the waters around Bowen Island, particularly on the south and west shores, and humpback whales *(Megaptera novaeangliae)* sightings at the Cape have been increasing in recent years.

There are identified harbour seal haulouts in the Cape Roger Curtis area.

In addition to the birds and mammals already discussed in the sections above, a variety of other intertidal species have been recorded through iNaturalist for the site including Green and yellow shore crab, dungeness crab, green sea urchin, plumose anemone, and various kelp.

6.8. Invasive Species

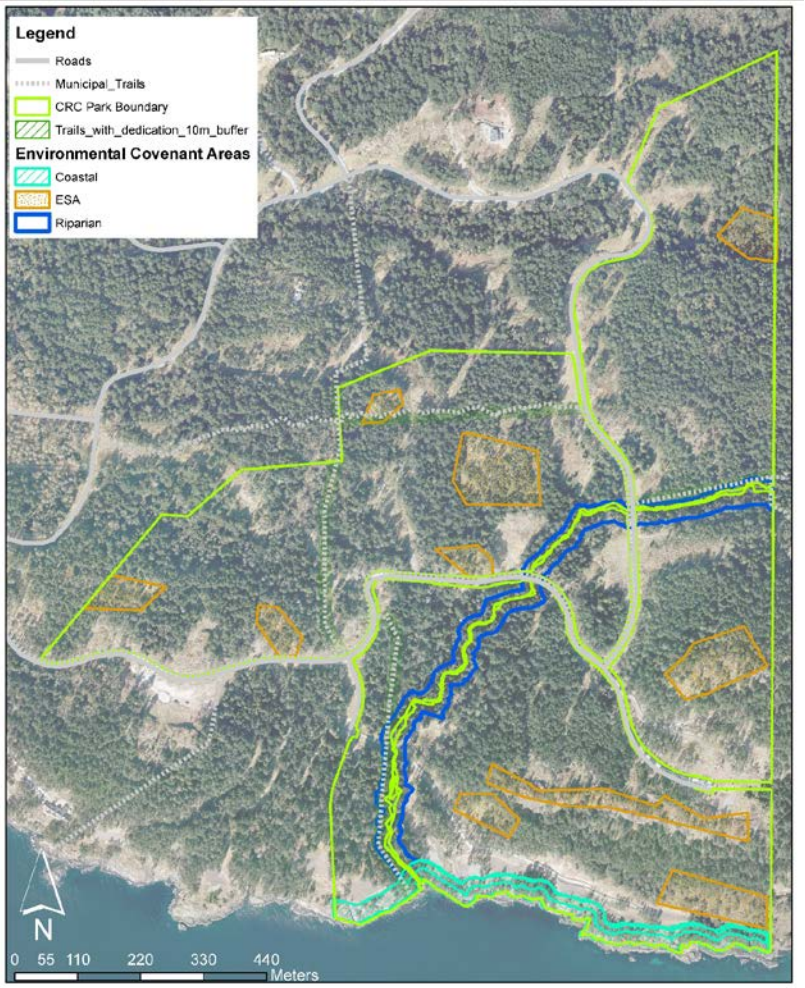
Invasive species are non-native flora or fauna that can be highly destructive, competitive and difficult to control. At least 21 invasive plants have been documented on site (Appendix A) and those most potentially detrimental to the sensitive plant communities include Scotch broom (*Cytisus scoparius),* Butterfly bush *(Buddleja davidii*), and Cutleaf Blackberry *(Rubus laciniatus).*

7.0 EXISTING MANAGEMENT AREAS

Bowen Island Municipality has placed protective covenants over areas of Cape Roger Curtis during the earlier development application processes for the site. There are Archeological, Riparian, Ocean Fronting and Environmental covenant areas, as well as more recent "Forest Protection Areas" (see Figure 12).

Ocean Fronting Lands Covenants require a 30m setback from the 'natural boundary' of the sea, which generally refers to the visible highwater mark and protects the sensitive coastal bluff plant community (PGL, 2009b). The bylaw contains caveats to reduce this setback under specific circumstances (Diamond Head, 2020).

Environmental Protection Covenants were added to protect sensitive rock bluff habitats as well as the large ephemeral wetland on site. These areas were designed with protecting rare plant communities in mind and referenced the 2004-2007 plant surveys that were done to support the earlier development proposals (PGL, 2009a). The cleared building locations were all made outside of these areas.



Riparian Protection Creeks Covenants restrict any development within 30m from a watercourse and no closer than 15m from its top of bank except in accordance with the conditions of the development permit (Diamond Head, 2020). These areas encompass and expand on the traditional Streamside Protection and Environment Area (SPEA) (PGL, 2009a). The only permitted reason for the removal of trees within the Riparian FMZ is for risk mitigation and the stems should be wildlifed if possible.

Figure 12: Map of Riparian, Ocean Fronting and Environmental covenant areas.

Forest Protection Areas require a minimum density of 300 mature stems per/hectare and are located (Diamond Head, 2021) (Figure 13):

- within 10 metres of a stream or wetland,
- 50 meters of public roads, and
- within 10 metres of public trails.

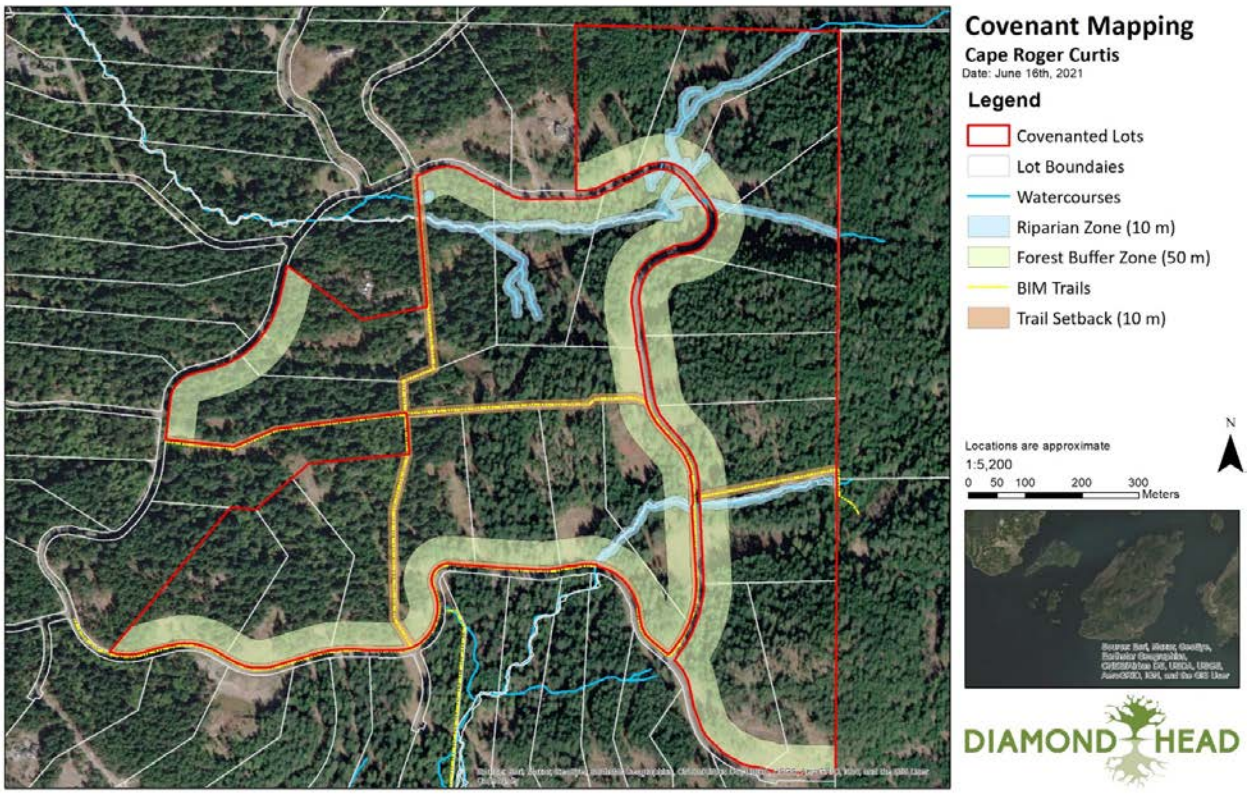


Figure 13: Forest Protection Areas at Cape Roger Curtis (Diamond Head, 2021).

8.0 NATURAL RESOURCE MANAGEMENT IN REGIONAL PARKS

The Regional Parks Plan (2022) (Metro Vancouver, 2022) is Metro Vancouver's management plan for the regional parks system. It guides work to protect natural areas and connect people to nature, progressing towards the vision of a resilient network of regional parks and greenways that continues to provide important climate, health, and other benefits to park visitors and the wider region. The plan identifies how key challenges such as a growing population, clime change, and social inequity will be met and provides an action plan to address priorities over the next decade. The complete document can be found online.

The Natural Resource Management Framework (Metro Vancouver, 2020) provides strategic direction for managing the natural resources within regional parks. It outlines the principles, goals and strategies of the natural resource management program to ensure system-wide consistency in resource management efforts and resource allocations. The framework is a tool for transparent and consistent decision-making and is informed by other higher-level policy and planning documents such as the Board Strategic Plan, Climate 2050, and the Ecological Health Framework. The Natural Resource Management Framework contains three goals that guide the program:

1. Ensure ecosystem health and long-term resiliency to conserve diverse biological communities and their associated habitats.
2. Provide opportunities for the public to connect with natural areas while conserving the integrity and resilience of ecosystems.
3. Provide opportunities for public involvement in natural resource management through partnerships and stewardship activities.

The Natural Resource Management program is guided by four principles:

- **Ecosystem-based Management** - a conceptual and strategic basis for natural resource management by taking a holistic view of the natural environment. It ensures that land use decisions consider the complex interactions and dynamic nature of ecosystems and are not limited to park administrative boundaries.
- **Adaptive Management -** a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs.
- **Precautionary Principle** - where a proposed action has a higher likelihood of creating a negative impact, a greater degree of research and scientific rigour will be applied before proceeding.
- **Collaboration** - diverse land uses and the presence of common resource management issues provide an opportunity to develop relationships and partnerships to achieve comprehensive solutions.

The framework can be found online. Operational guidelines have also been produced as an internal companion document to provide additional detail and guidance for staff to undertake strategies outlined in this framework.

9.0 ENVIRONMENTAL OVERVIEW OF THE PROPOSED REGIONAL PARK AT CAPE ROGER CURTIS

In early 2023, Metro Vancouver made a rezoning and Official Community Plan (OCP) amendment application to Bowen Island Municipality (BIM).

The land use is currently zoned as rural residential and has been prepared for residential development with minimum lot sizes of 4.0 hectares for one dwelling and one accessory dwelling use per lot (48 total over 24 lots). The current zoning will also accommodate accessory uses, including stables, kennels, agriculture, horticulture, mobile sawmill, mini-storage and secondary suites. This land use already permits overnight use, as it allows for overnight residential guest accommodation (120 days each year) and permits up to five bed and breakfast rooms per dwelling as part of the home occupation.

The rezoning and OCP amendment would change the primary use of the land to regional parkland allowing the 97 hectares of a regionally important ecosystem to be protected in perpetuity. This land use designation (Passive Park 1) will allow for the creation of a regional park complete with conservation areas, day-use amenities such as trails, picnic areas, and viewpoints, as well as supervised overnight use.

Protection for a Sensitive Ecosystem

A sensitive ecosystem is defined as 'one that is at-risk or ecologically fragile in the provincial landscape.' The Sensitive Ecosystem Inventory (SEI) mapping includes both sensitive ecosystems (e.g. wetlands, old forests) and important modified ecosystems (e.g. young forests, old field) which have been human-modified but still have significant ecological value (Meidinger, Clark, & Adamoski, 2014).

Nearly 66% of the proposed regional park (64 ha) is considered a sensitive or important modified ecosystem based on the SEI mapping undertaken by Metro Vancouver in 2014.

Metro Vancouver updated the Terrestrial Ecosystem Mapping (TEM) for the site (in 2022) and have found that a high proportion of the site (85% with 71% in a more natural, forested stage) is classified as a red or blue-listed ecological communities at risk by the BC Conservation Data center (BC CDC). Red-listed ecosystems are at risk of being lost (extirpated, endangered or threatened) and blue-listed ecosystems are of special concern. The subzones/variants in the Fraser River valley (CDFmm, CWHxm1, CWHdm) characterize the drier and warmer climates of the coast where most development has occurred. The proposed park site is entirely CWHxm1 Eastern Very Dry Maritime CWH, and only 14% of these ecosystems are currently in a natural/semi-natural state in Metro Vancouver (Meidinger, 2020).

A recent forest inventory of the site (Lasuta and Assoc., 2023) found that 58.85 ha of merchantable timber outside of the forest buffer zones and covenant areas is still unprotected. The conversion of these lands to a regional park would protect nearly 70 ha of valuable forest habitat that is being used by birds, including owls, eagles, songbirds, reptiles, amphibians, bats, and other mammals.

As a park, these lands would be protected and stewarded over time. Regional park staff inventory forest stands for invasive species and conducts regular forest health surveys. Forest management plans are developed. Invasive species removal and other restoration efforts, along with wildfire mitigation and protection, are an important part of land management. Staff also undertake hazard tree assessments for public safety and mitigate risks through careful planning.

Through previous development proposal processes, protective covenants were established throughout the site for the most sensitive dry rocky outcrops, oceanfront, wetland, streams and riparian areas. However, this only amounts to 15.41ha or 16% of the site. Should the site be used for residential development as currently zoned, areas outside the covenants would be subject to clearing, disturbance and development. As part of a park, these areas would instead be kept free of invasive plants and animals, fenced, signed, or otherwise protected from access by people and pets, monitored for ecosystem health, and managed accordingly.

Ultimately rare and fragile ecosystems would be protected as 'Environmentally Sensitive Areas (ESA)" within the proposed regional park. ESAs are a common designation in regional parks and are protected through design to restrict use by people/pets. They are monitored and managed by staff biologists and enhanced or restored if needed. Invasive plants are actively managed by regional park staff working closely with local experts and volunteers. These areas would also be signed and interpreted by park environmental educators to raise awareness about why they are off-limits. Compliance and environmental protection are enforced by park operations and ranger staff.

Proposed Land use

Metro Vancouver is proposing the inclusion of supervised, overnight tent camping facilities at the proposed park. Campsites would be located in areas previously cleared for development, with an overall small footprint within the broader park. Overnight options would be phased in over time to allow for adaptive management to ensure any impacts were mitigated.

Metro Vancouver has over 50 years of experience connecting people with sensitive natural areas (Metro Vancouver, 2022). Metro Vancouver has a variety of tools to use in planning, design, management, and enforcement to protect sensitive ecosystems while providing access to nature. Through good park management, park visitors can access nature with minimal impacts. The opportunity to learn, and be active in nature, can ultimately inspire a connection with the land and participation in stewardship.

The proposed overnight camping program is intended to be low-impact and located on previously disturbed sites. Any other facilities, such as pit toilets, parking, trails, and day-use areas will be planned with community input, ecological and technical studies and will be located on existing cleared areas and skid roads.

Significant areas that are serviced and were previously cleared for development will be restored in the proposed park. Since existing cleared areas, driveways, and skid roads would be used, there does not seem to be a need for any significant tree removal or ground disturbance to advance park development.

Natural resource management in regional parks is discussed in Section 8. A full list of the relevant goals, strategies and guidelines can be found in Appendix F.

To highlight some examples of these and show how they will be used to address environmental protection for the proposed park at Cape Roger Curtis are shown in Table 2 below:

Table 2: Some potential environmental concerns and the existing Metro Vancouver operational guideline(s) that would be implemented to address them.

Priority	**Existing Metro Vancouver operational guideline(s) for regional parks that would be implemented to address these concerns**
Avoiding environmental impact of campsites, trails, day use and parking areas	• Use analysis of the Sensitive Ecosystem Inventory, Conservation Value Mapping, and other relevant data to identify lands of high conservation value and environmentally sensitive areas to inform park management decisions. • Develop criteria to identify highly sensitive areas within parks that can be designated during planning processes as areas prioritized for protection and then managed exclusively for natural resource values with limited access. • Use barriers like dense shrub thickets or fences to protect designated habitat areas while retaining sightlines. • Plan and develop trails and facilities with strategies to minimize habitat fragmentation, avoid wildlife conflicts and protect sensitive areas and species at risk. • Avoid or mitigate negative impacts to park natural resources when developing park facilities. When impacts can't be avoided or mitigated, compensation should be considered in another area of the park. • Use environmentally friendly design, building practices, materials, and products whenever possible.

Priority	Existing Metro Vancouver operational guideline(s) for regional parks that would be implemented to address these concerns
	• Conduct environmental impact assessments and develop environmental management plans for new park development projects.
Avoiding impacts on wildlife associated with public access	• Carefully site park infrastructure to avoid or reduce habitat fragmentation. • Reduce the amount of trails in highly fragmented areas wherever possible. • Strive to protect or restore known wildlife travel corridors and consider these in park development or in collaboration with other jurisdictions. • Take special precautions to protect large veteran trees. • Protect natural soundscapes within parks wherever possible. • Protect the natural lightscapes in parks wherever possible and mitigate light pollution levels through the use of light abatement practices. • Use permanent or temporary closures of selected areas to reduce or eliminate undesirable human impacts to sensitive sites and wildlife.
Avoiding impacts to sensitive habitat areas such as rock bluffs, shorelines, and wetlands.	• Evaluate recreational impacts on parkland to ensure that the desired resource conservation and visitor experience objectives are being achieved. This may include developing desired condition objectives for popular trails or features within parks and monitoring for limits of acceptable change that, if reached, may require intervention. • Determine attributes to monitor as indicators of environmental change, such as trail width, number of unsanctioned trails, soil compaction, loss of vegetation, or prevalence of invasive plant species. • Minimize anthropogenic impacts on native species communities. • Manage invasive species that displace native species, impair ecosystem processes, reduce biodiversity and/or threaten human health and safety. • Conserve the soil resources of parks and manage erosion, physical removal, degradation or contamination of soil. • Promote soil health as a vital living component of the ecosystem.

Priority	Existing Metro Vancouver operational guideline(s) for regional parks that would be implemented to address these concerns
	• Identify and protect areas where ecological conditions are particularly sensitive to hydrological changes and encourage the retention or replacement of buffers around sensitive areas in order to protect flow regimes and water quality.
Protecting species at risk and their habitat	• Conserve natural habitat and ecological processes to support species at risk. • Prepare specific plant and animal management plans where necessary. • Share knowledge and work collaboratively to conserve important habitats, waterways and wildlife corridors to realize shared natural resource management goals inside as well as outside of the park. • Permit research in parks by partners, academic institutions and other agencies to broaden our understanding of park resources and inform management decisions.
working with nature to restore previously disturbed areas	• Consider habitat restoration projects that directly contribute to ecosystem health • Restore and enhance plant communities using native plants adapted to site conditions. • Assess forest health to understand how closely ecosystems match optimal conditions and what factors, if any, are pushing them off optimal pathways and determine whether intervention is warranted. • Increase naturalized areas within parks to provide additional habitat and reduce the level of service where appropriate. • Map and maintain a georeferenced inventory of restored areas in order to track and determine cumulative impacts. • Provide effective and meaningful opportunities for park staff, park partners, park associations, volunteers and the public to engage in park ecosystem restoration, enhancement, maintenance, inventory and research. • Help build the capacity of volunteers and partner organizations to assist in park natural resource management.

10.0 BIOPHYSICAL INVENTORY AND MONITORING PLAN FOR PROPOSED REGIONAL PARK AT CAPE ROGER CURTIS

To ensure that the goals of the natural resource management framework are being met, monitoring of outcomes is essential. Ecological indicators and other metrics will be used in this process. For instance, early detection of ecological change can uncover potential trends and provide time to implement adaptive management strategies that support conservation. Monitoring is also important to assess performance and progress with respect to Regional Parks' protect and connect mandate.

There is good quality information available for the proposed park site at Cape Roger Curtis. There are a few gaps that are needed to be filled for any immediate-term planning, but the following list outlines some priority information that will be helpful for entering into a detailed design phase:

1. Conservation Value Mapping using updated TEM data.

To determine the relative sensitivity of park ecosystems, a process is used that combines several data sources and quantifies conservation values for each ecosystem. This allows park managers and planners to easily see which areas of the park are the most sensitive to disturbance to avoid damaging sensitive ecosystems during park development. Conservation Value mapping is generated using TEM and SEI mapping along with information on ecosystems and species at risk. A Conservation Value map will be created for the proposed park site at Cape Roger Curtis using recently updated TEM and SEI mapping.

2. Species at Risk detailed assessments

Although there is good baseline work on this, including a recent desktop review and field reconnaissance as well as extensive survey information from 2009, more detailed and up-to-date species-at-risk assessments will help in planning. Figure 14 shows the distribution of knowledge about species at risk that are confirmed or possible on the site. While there is a good confirmation of species presence for mammals, birds, amphibians, and reptiles, there is less certainty about potential invertebrates, moss and lichen, and plants. In one site visit, Metro Vancouver staff already identified two new plant species at risk, not found in earlier studies. More surveys are planned to take place in spring/summer 2023. Invertebrate and bryophyte specialists would need to be hired to fill in these gaps in knowledge.

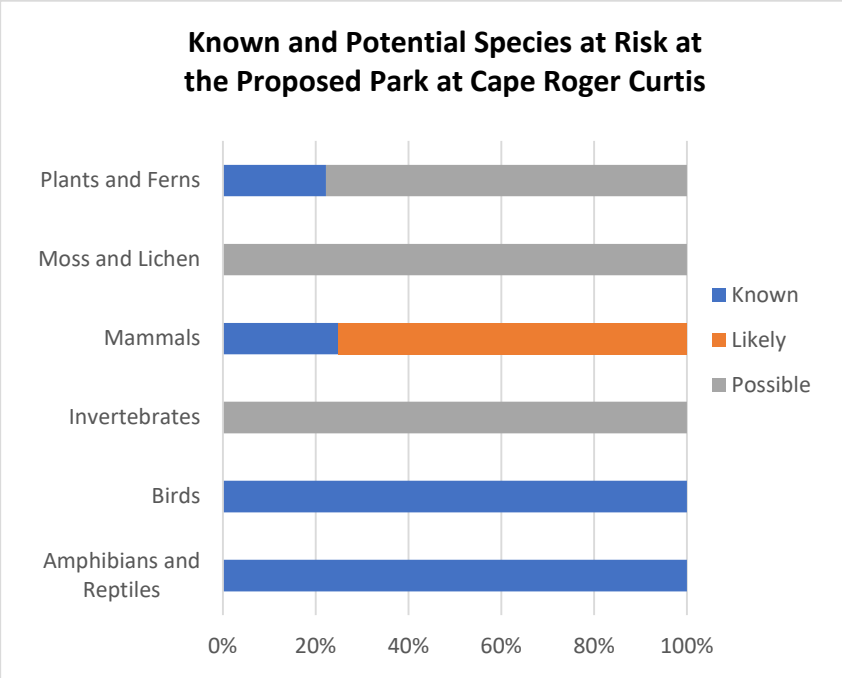


Figure 144: Current information available about different species at risk confirmed or possible on the site.

3. Forest Health Assessment.

This work is not urgent but would provide good baseline information for planning and forest management moving forwards. In 2019, regional parks staff initiated a forest health aerial survey of all regional parks (Blackwell, 2019). Consulting forestry professionals used BC standardized methodology while flying over parks by helicopter. The surveyors transfer what they see to high-resolution orthophotos and then digitize that information into a database. Some areas require follow-up ground surveys because the cause of some symptoms can't be identified from the air. They documented damaged trees by species and outlined the damage agents, whether biotic (pests, pathogens), abiotic (drought, flood, snow/ice, wind, fire) or other (poor soils, tattered). They also assigned each observation a damage agent severity rating (Trace to Very severe) and defoliation severity rating (Light – Severe). Regional Parks have been doing repeat flights over parks of concern and plan to conduct another full park flight in 2024.

4. More baseline studies for sensitive wildlife and habitat values

Although there is good baseline information on wildlife and habitat values at the site, more work is required to update these data and fill in gaps in knowledge, especially with regard to species that are not required to be surveyed for legislative requirements. Native species that are not 'at risk' in BC but are important to local ecosystem processes and functions are often under-studied.

These include terrestrial amphibians, common reptiles, invertebrates, bats, woodpeckers, and small mammals. Priority actions for the first phase of data gathering by parks Natural Resource Management staff will include the following:

- Nest surveys for raptors, herons, and woodpeckers – ongoing
- Wildlife camera studies for presence, relative abundance (when needed), habitat use, and trend monitoring for small to large mammals and birds.
- Wildflower / rare plant surveys
- Passive acoustic sampling for bats
- eDNA sampling of creeks and wetlands for aquatic species
- Encounter surveys for reptiles, otter latrines, potential hibernacula sites, wildlife trees, and any other potential special wildlife features
- Visual searches, trapping, and/or transects for pond-breeding amphibians
- Time-constrained searches, coverboard, and/or transect searches for plethodontid salamanders
- Point count surveys for nighthawks and breeding birds
- Wildlife Tree/Sign Surveys and/or call playback surveys for breeding woodpeckers

Some of the initial baseline data we have collected to date are shown in Figure 15.

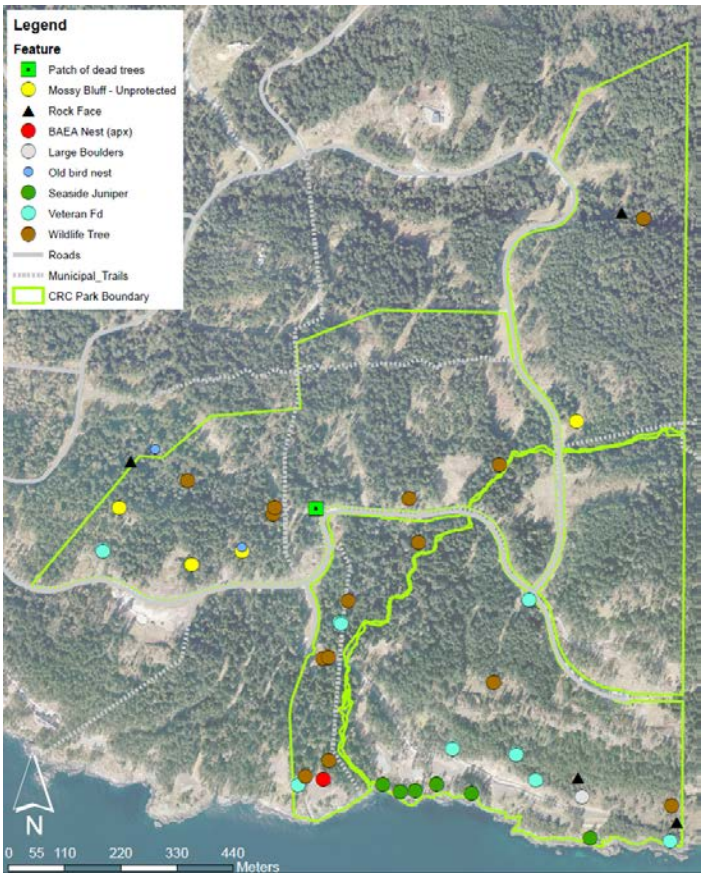


Figure 155: Map of special features mapped during initial site visits to the proposed regional park site in 2023.

5. Invasive Species Inventory

Metro Vancouver is committed to the management of invasive species as documented in the Ecological Health Framework (Metro Vancouver, 2018), the Natural Resource Management Framework (Metro Vancouver, 2020) and the Regional Parks Plan (Metro Vancouver, 2022). Regional Parks uses an integrated pest management approach and apply best management practices for their management. Invasive plant inventories of Regional Parks by staff or contractors follow standardized methods, and system-wide data are stored in a geodatabase.

Most of the invasive species' spatial data collected in parks come from biased surveys along trails. Specific areas where invasive plants are likely to occur are surveyed (e.g. trails, and boundaries with residential lots). Spatial data is recorded at invasive plant sites, and attribute data are added. For more comprehensive data, unbiased samples and/or inventories are undertaken off-trail in some circumstances. This data are used to assess the risk to sensitive ecosystems, manage treatments and monitor results. Priority areas for invasive plant inventory and treatments at the proposed park site would include sensitive and rare plant communities. Strategies for inventory and monitoring include:

- Identifying plant communities and ecosystems that are at the greatest risk of invasion
- Identifying potential pathways for the introduction and monitoring these areas regularly
- Identifying invasive species occurrences at the early stages of invasion for Early Detection and Rapid Response
- Maintaining a spatial geodatabase for all species targeted
- Monitoring changes in non-native plant populations to identify emerging invasions.
- Coordinating with other agencies to track population changes across the region
- Identifying risks to sensitive areas and establishing priorities for invasive plant management and habitat restoration

A larger patch of holly at the site. It seems deer are keeping some invasives species at a surpressed level.

11.0 REFERENCES

Diamond Head. (2023). *Watercourse Mapping at Cape Roger Curtis.* Maps and Memo prepared by Diamond Head Consulting Ltd.

BC Environment. (2006). *Alive and Inseparable: British Columbia's Coastal Environment 2006.* Victoria, British Columbia.: https://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=2893 .

Beaty, F. a. (2019). *Átl'ka7tsem/Howe Sound marine conservation map.* For the David Suzuki Foundation and Ocean Wise Coastal Ocean Research Institute. Found at: https://davidsuzuki.wpenginepowered.com/wp-content/uploads/2019/02/atlka7tsem-howe-sound-ecological-values-assessment.pdf.

Blackwell. (2019). *BA Blackwell and Associates Ltd. Forest Health Aerial Overview Survey.* Metro Vancouver publication.

Bowen Island Conservancy. (2007). *Cape Roger Curtis Biophysical Summary.* Found at: https://bowenislandconservancy.org/wp-content/uploads/2007/11/bic-crc_biophysical_summary_1-07.pdf.

Bowen Island Conservancy. (2022). *Management Plan Wild Coast Nature Refuge 2022-2027.* Found at: https://bowenislandconservancy.org/wp-content/uploads/2022/05/1-Wild-Coast-Nature-Refuge-Management-Plan-Final-small.pdf.

Buhl, C. M. (2022). *Western redcedar dieback.* USGS. Found at: https://storymaps.arcgis.com/stories/1405dab5f59246aa83849ec43f72b15a .

Diamond Head. (2005). *Diamond Head Consulting Ltd. Cape Roger Curtis Development Detailed Vegetation Assessment of Coastal Bluffs. Prepared for Pottinger Gaherty Environmental Consultants.* Internal for The Cape on Bowen Community Development Ltd.

Diamond Head. (2020). *Diamond Head Consulting Ltd. Preliminary Environmental Assessment Report for Cape Roger Curtis.* Internal for The Cape on Bowen Community Development.

Diamond Head. (2021). *Diamond Head Consulting Ltd. Forest Protection Covenant Report. Bowen Island Municipality Internal Report.* Found at: https://bowenisland.civicweb.net/document/248160/210726_Cape%20Roger%20Curtis%20Forest%20Management%20Covenan.pdf?handle=16D69006A6574432B403274645EEB77B .

Dr. Kilian Stehfest, pers. comm. (2022). *Conversation with Dr. Kilian Stehfest – Marine Conservation Specialist Suzuki Foundation Sept 27 10:15 – 11:00.*

Gilday et al. (2020). *Gilday, L., W. Husby, B. Turner. Exploring Bowen's Marine World: A Marine Atlas of Nexwlélexwem/Bowen Island.* Bowen Island Conservancy. Found at: https://bowenislandconservancy.org/our-work/bowen-island-marine-atlas-project/.

Kinka, K. (2005). *Ecological Assessment and Considerations Developing the Cape Roger Curtis Property.* Prepared for Pottinger Gaherty Environmental Consultants. Internal for The Cape on Bowen Community Development Ltd.

Lasuta and Assoc. (2023). *Bill Lasuta and Associates Ltd. Evaluation of Timber Growing on the Cape at Bowen Island Proposed Park Lands.* Metro Vancouver Regional Parks internal document.

Loik, L. (2022). *The Beasts of Bowen Island, Amphibian and Reptile Discovery Guide.* Bowen Island Conservancy.

Marin-Bruzos, M. (2018). *Forest fungal pathogen management – best practices for Regional Parks Project Report.* Metro Vancouver Regional Parks. Found at: https://www.researchgate.net/publication/327582044_Forest_fungal_pathogen_management_-_best_practices_for_Regional_Parks_Project_Report.

Meidinger. (2015). *Meidinger Ecological Consultants Ltd. Methodology for Assessing Ecological Sensitivity of Metro Vancouver Parks.* Metro Vancouver Regional Parks Internal Document.

Meidinger, D. (2020). *Meidinger Ecological Consultants Ltd. Conservation Importance of Ecosystems in Metro Vancouver Parks & Watersheds.* Internal report for Metro Vancouver.

Metro Vancouver. (2018). *Metro Vancouver Ecological Health Framework.* Found at: http://www.metrovancouver.org/services/regional-planning/PlanningPublications/EcologicalHealthFramework.pdf .

Metro Vancouver. (2020). *Natural Resource Management Framework.* Found at: http://www.metrovancouver.org/services/parks/ParksPublications/RegionalParks-NaturalResourceManagementFramework2020.pdf.

Metro Vancouver. (2021). *Cape Roger Curtis report.* Internal Document.

Metro Vancouver. (2022). *Regional Parks Plan.* Found at: https://view.publitas.com/metro-vancouver/21-284-prk_regional-park-plan-plan-2022-v19/page/1.

Parks Canada. (2010). *Preliminary Assessment of Select Properties on Bowen Island for their Inclusion in Gulf Islands National Park.* Found at: https://www.pc.gc.ca/progs/np-pn/cnpn-cnnp/bowen/~/media/progs/np-pn/cnpn-cnnp/bowen/pdf/PrelimConclusions-PrelimFindings-aug2011_e.as.

PGL. (2009a). *Pottinger Gaherty Environmental Consultants Ltd. Summary Environmental Report, Cape Roger Curtis Subdivision.* Internal for The Cape on Bowen Community Development Ltd.

PGL. (2009b). *Pottinger Gaherty Environmental Consultants Ltd. Ammendum to June 2009 Final Approval Package - Summary Environmental Report, Cape Roger Curtis Subdivision.* Internal for The Cape on Bowen Community Development Ltd.

Taylor, T. (2005). *The Plants and Birds of Cape Roger Curtis. Nature Vancouver Discovery Magazine, Spring.* Nature Vancouver Discovery Magazine, Spring. Found at: https://bowenislandconservancy.org/the-plants-and-birds-of-cape-roger-curtis.

Whitehead. (2011). *Whitehead Environmental Consultants. Fairy Fen Management Plan.* Prepared for Islands Trust Fund. Found at: https://bowenislandconservancy.org/files/FFNR_MP_Adopted.pdf.

APPENDIX A — CAPE ROGER CURTIS AREA MASTER PLANT LIST (2022)

Trees

Abies grandis: Grand fir
Alnus rubra: Red alder
Arbutus menziesii: Arbutus
~~Juniperus communis: common juniper~~
Juniperus maritima seaside juniper * (was classified as Juniperus scopulorum: Rocky Mountain juniper in 2005)
Pinus contorta var. contorta: Shore pine
Pseudotsuga menziesii: Douglas-fir
Thuja plicata: Western red cedar

Shrubs

Amelanchier alnifolia: Saskatoon
Arctostaphylos ura-ursi: Linnikinnick
Cotoneaster horizontalis: Rock cotoneaster
Gaultheria shallon: Salal
Holodiscus discolor: Ocean spray
Lonicera ciliosa: Orange (western trumpet) honeysuckle
Lonicera hispidula: Hairy (purple) honeysuckle
Mahonia aquifolium: Tall Oregon-grape *
Mahonia nervosa: Dull Oregon-grape
Philadelphus lewisii: Mock-orange *
Physocarpus capitatus: Pacific ninebark
Ribes sanguineum Red-flowering Currant
Rosa nutkana: Nootka rose
Rubus ursinus ssp. macropetalus: Trailing blackberry
Spiraea douglasii: Hardhack
Symphoricarpos albus: Common snowberry

Herbs

Achillea millefolium: Yarrow
Anaphalis margaritacea pearly everlasting
Aphanes arvensis (A. occidentalis): Field (western) parsley-piert
Barbarea orthoceras: Winter cress
Brodiaea coronaria Harvest brodiaea
Callitriche sp.: Water starwort
Campanula alaskana Alaskan bellflower
Campanula rotundifolia: Common harebell
Cardamine hirsuta hairy bittercress
Cerastium arvense: Field chickweed
Clinopodium douglasii Yerba buena
Collinsia parviflora: Small-flowered blue-eyed Mary
Daucus pusillus American wild carrot
Delphinium menziesii: Menzies' larkspur *
Eriophyllum lanatum common woolly sunflower
Eryophyllum lanatum var. lanatum Wooly eryophyllum
Erythranthe alsinoides wingstem monkeyflower
Erythranthe guttata seep monkeyflower
Fragaria vesca var. bracteata Wood strawberry
Fragaria virginiana var. platypetala Wild strawberry
Galium aparine: Bedstraw (cleavers)
Gamochaeta ustulata featherweed
Geranium molle: Dovefoot geranium
Gnaphalium sp.: Cudweed
Gratiola ebracteata Bractless hedge-hyssop
Grindelia integrifolia: Puget Sound (entire-leaved) gumweed
Hieracium albiflorum: White-flowered hawkweed
Linaria canadensis var. texana: Blue toadflax *
Lotus micranthus: Small-flowered lotus (deervetch)
Madia sativa Chilean tarweed
Mimulus alsinoides: Chickweed (annual) monkey-flower
Mimulus guttatus: Yellow monkey-flower
Minuartia tenella (Arenaria stricta): Slender sandwort *
Montia parvifolia: Small-leaved montia (miner's lettuce)
Myosotis discolor: Common (yellow and blue) forget-me-not
Nemophila parviflora small-flowered nemophila

Orthocarpus pusillus (Triphysaria pusilla): Dwarf owl-clover
Plantago elongata: Slender plantain *
Plectritis congesta shortspur seablush
Plectritis congesta: Sea blush
Polygonum douglasii (P. spergulariiforme): Spurry knotweed
Prunella vulgaris: Self-heal
Sabulina macra Slender Stitchwort
Sagina procumbens Procumbent Pearlwort
Satureja douglasii: Yerba buena *
Saxifraga ferruginea: Alaska (rusty) saxifrage
Scirpus microcarpus Panicled Bulrush
Sedum oreganum: Oregon stonecrop
Sedum spathulifolium: Broad-leaved stonecrop
Silene antirrhina Sleepy catchfly
Spiranthes romanzoffiana Hooded ladies' tresses orchid
Trientalis latifolia (T. boreaelis ssp.latifolia): Broad-leaved starflower
Trifolium variegatum: White-tipped clover *
Trifolium willdenowii (T. tridentatum): Tomcat clover
Triteleia hyacinthina: white triteleia
Urtica dioica stinging nettle
Veronica arvensis: Wall speedwell
Veronica peregrina var. xalapensis: Purslane Speedwell
Veronica serpyllifolia thyme-leaved speedwell
Vicia sp.: Vetch
Viola sempervirens Redwood Violet
Zigadenus venenosus var. venenosus Meadow death-camas

MONOCOTYLEDONS

Grasses and Sedges

Aira caryophyllea: Silver hairgrass
Aira praecox: Early hairgrass
Bromus tectorum: Cheatgras
Bromus vulgaris Columbia brome
Danthonia californica California oatgrass
Danthonia spicata: Poverty oatgrass
Deschampsia cespitosa tufted hair grass
Dichanthelium oligosanthes var. scribnerianum Scribner's witchgrass
Festuca idahoensis ssp. roemeri Roemer's fescue
Festuca (Vulpia) myuros: Rattail fescue
Panicum occidentale (Dianthelium acuminatum): Western witchgrass (panic grass)

Other Monocots

Allium amplectens: slimleaf onion
Allium cernuum: Nodding onion
Camassia leichtlinii: Great camas *
Carex lyngbyei: Lyngbye's sedge
Carex obnupta: Slough (basket) sedge *
Goodyera oblongifolia: Large-leaved rattlesnake (plantain) orchid
Luzula parviflora: Small-lowered wood-rush
Platanthera sp.: Rein orchid
Zygadenus venenosus: Death camas

FERNS AND FERN ALLIES

Aspidotis densa: Indian's-dream fern *
Asplenium trichomanes: Maidenhair spleenwort
Cryptogramma achrostichoides: parsley fern
Polypodium glycyrrhiza: Licorice fern
Pteridium aquilinum: Bracken fern
Selaginella wallacei: Wallace's spikemoss

MOSSES AND LIVERWORTS

Aulacomnium palustre *
Bryum miniatum
Calypogeia sp. liverwort
Dicranoweisia cirrata
Dicranum scoparium: Birdbeak (broom) moss
Hylocomium splendens: Step moss
Imbribryum miniatum Glossy Red Bryum Moss
Isopterygium (Pseudotaxiphyllum) elegans
Isothecium stoloniferum
Kindbergia oregana Oregon Beaked Moss
Lycopodium clavatum stag's-horn clubmoss
Plagiomnium insigne Badge Moss
Plagiothecium undulatum Waved Silk-moss
Polytrichum commune: Common haircap moss
Polytrichum juniperinum: Haircap moss

Polytrichum piliferum: Haircap moss
Racomitrium canescens Roadside rock moss
Rhacomitrium canescens
Rhacomitrium occidentale
Rhizomnium glabrescens
Trachybryum megaptilum

LICHENS

Cladina portentosa: Coastal reindeer lichen
Cladina rangiferina: Reindeer lichen
Cladonia chlorophaea
Cladonia gracilis
Cladonia macilenta
Coelocaulon aculeatum
Hypogymnia physodes
Parmelia saxatilis
Parmelia sulcata
Peltigera aphthosa
Peltigera membranacea: Dog lichen
Umbilicaria sp.
Verrucaria maura: Marine lichen
Xanthoparmelia cumberlandia Rock frog lichen
Xanthoria sp.

FUNGI

Amanita muscaria Fly Agaric
Auriscalpium vulgare Earpick Fungus
Clavulinopsis laeticolor Handsome Club
Dacrymyces chrysospermus Orange Jelly Spot
Entoloma sp.: Mushroom
Fomitopsis mounceae Northern Red Belt
Fomitopsis ochracea
Inocybe sp.: Mushroom
Laccaria laccata: Waxy laccaria mushroom
Lepista nuda Blewit
Lichenomphalia umbellifera Lichen Agaric
Omphalina ericetorum: Mushroom

INVASIVE SPECIES

Agrostis gigantea Redtop grass
Aira praecox Early hairgrass
Anthoxanthum odoratum Sweet vernalgrass
Bromus sterilis Barren brome grass
Buddleja davidii Butterfly bush
Cirsium arvense creeping thistle
Cirsium vulgare bull thistle
Cortaderia selloana Pampas Grass
Cytisus scoparius Scotch broom
Dactylis glomerata Orchard-grass
Digitalis purpurea Common foxglove
Galium aparine catchweed bedstraw
Holcus lanatus Common velvet-grass
Hypochaeris radicata Hairy cat's ear
Jacobaea vulgaris ragwort
Lythrum salicaria purple loosestrife
Mycelis muralis Wall Lettuce
Plantago lanceolata Ribwort plantain
Rubus laciniatus Cutleaf Blackberry
Rumex acetosella Sheep sorrel
Senecio vulgaris common groundsel
Stellaria media common chickweed
Vulpia myuros Rattail fescue grass

APPENDIX B - CAPE ROGER CURTIS AREA MASTER SPECIES AT RISK LIST

Confirmed Species at Risk

English Name	Scientific Name	Confirmed at CRC	BC List	COSEWIC
Mammals				
Steller Sea Lion	*Eumetopias jubatus*	Yes (iNaturalist)	Blue	SC
Birds				
Great Blue Heron, *fannini* subspecies	*Ardea herodias fannini*	Yes	Blue	SC
Western Grebe	*Aechmophorus occidentalis*	Yes (eBird)	Red	SC
Marbled Murrelet	*Brachyramphus marmoratus*	Yes (eBird)	Blue	T
Common Nighthawk	*Chordeiles minor*	Yes (eBird)	Blue	SC
Black Swift	*Cypseloides niger*	Yes (eBird)	Blue	E
Peregrine Falcon, *anatum* subspecies	*Falco peregrinus anatum*	Yes (eBird)	Red	NAR
Peregrine Falcon, *pealei* subspecies	*Falco peregrinus pealei*	Yes (eBird)	Blue	SC
Caspian Tern	*Hydroprogne caspia*	Yes (eBird)	Blue	NAR
California Gull	*Larus californicus*	Yes (eBird)	Red	
Black Scoter	*Melanitta americana*	Yes (eBird)	Blue	
Surf Scoter	*Melanitta perspicillata*	Yes (eBird)	Blue	
Double-crested Cormorant	*Nannopterum auritum*	Yes (eBird)	Blue	NAR
Band-tailed Pigeon	*Patagioenas fasciata*	Yes (eBird)	Blue	SC
Ancient Murrelet	*Synthliboramphus antiquus*	Yes (eBird)	Blue	SC
Common Murre	*Uria aalge*	Yes (eBird)	Red	
Brandt's Cormorant	*Urile penicillatus*	Yes (eBird)	Red	
Amphibians and Reptiles				
Northern Red-legged Frog	*Rana aurora*	Yes (various surveys)	Blue	SC
Plants and Ferns				
slimleaf onion	*Allium amplectens*	Yes (Dawn Hanna 2022)	Blue	
Macoun's meadow-foam	*Limnanthes macounii*	Yes (Terry Taylor)	Red	T

Possible Species at Risk				
English Name	**Scientific Name**	**Confirmed at CRC**	**BC List**	**COSEWIC**
Mammals				
Little Brown Myotis	*Myotis lucifugus*	Likely	Blue	E
Yuma Myotis	*Myotis yumanensis*	Likely	Blue	
Hoary Bat	*Lasiurus cinereus*	Likely	Blue	
Plants and Ferns				
poverty clover	*Trifolium depauperatum* var. *depauperatum*	Possible	Blue	
Macrae's clover	*Trifolium dichotomum*	Possible	Red	
giant chain fern	*Woodwardia fimbriata*	Possible	Blue	
Washington springbeauty	*Claytonia washingtoniana*	Possible	Blue	
Texas toadflax	*Nuttallanthus texanus*	Possible	Blue	
leafless wintergreen	*Pyrola aphylla*	Possible	Blue	
purple sanicle	*Sanicula bipinnatifida*	Possible	Red	T
Moss and Lichen				
rigid apple moss	*Bartramia aprica*	Possible	Red	E
Roell's brotherella	*Brotherella roellii*	Possible	Red	E
vole felt	*Erioderma sorediatum*	Possible	Blue	
seaside bone	*Hypogymnia heterophylla*	Possible	Red	NAR
Invertebrates				
Autumn Meadowhawk	*Sympetrum vicinum*	Possible (on Bowen)	Blue	
Western Pine Elfin, *sheltonensis* subspecies	*Callophrys eryphon sheltonensis*	Possible	Blue	
Johnson's Hairstreak	*Callophrys johnsoni*	Possible	Red	SC
Moss' Elfin, *mossii* subspecies	*Callophrys mossii mossii*	Possible	Red	
Common Wood-nymph, *incana* subspecies	*Cercyonis pegala incana*	Possible (on Bowen in 1933)	Red	
Evening Fieldslug	*Deroceras hesperium*	Possible	Red	DD
Threaded Vertigo	*Nearctula* sp. 1	Possible	Blue	SC
Blue Dasher	*Pachydiplax longipennis*	Possible (on Bowen)	Blue	

APPENDIX C – CAPE ROGER CURTIS AREA MASTER BIRD LIST

American Coot
American Crow
American Goldfinch
American Pipit
American Robin
American Wigeon
Ancient Murrelet
Anna's Hummingbird
Bald Eagle
Band-tailed Pigeon
Barn Swallow
Barred Owl
Barrow's Goldeneye
Belted Kingfisher
Bewick's Wren
Black Oystercatcher
Black Scoter
Black Swift
Black Turnstone
Black-capped Chickadee
Black-headed Grosbeak
Black-throated Gray Warbler
Bonaparte's Gull
Brandt's Cormorant
Brown Creeper
Brown-headed Cowbird
Bufflehead
Bushtit
Cackling Goose
California Gull
Canada Goose
Caspian Tern
Cassin's Vireo
Cedar Waxwing
Chestnut-backed Chickadee
Cliff Swallow
Common Goldeneye
Common Loon
Common Merganser
Common Murre
Common Nighthawk
Common Raven
Common Yellowthroat
Common/Barrow's Goldeneye
Cooper's Hawk
Dark-eyed Junco
Double-crested Cormorant
Downy Woodpecker
Dunlin
Fox Sparrow
Glaucous-winged Gull
Golden-crowned Kinglet
Golden-crowned Sparrow
Great Blue Heron
Great Grey Owl
Greater Scaup
Greater Yellowlegs
Greater/Lesser Scaup
Green-winged Teal
Hairy Woodpecker
Hammond's Flycatcher
Harlequin Duck
Heermann's Gull
Hermit Thrush
Herring Gull
Olympic Gull (hybrid)
Hooded Merganser
Horned Grebe
House Finch
House Wren
Hutton's Vireo
Iceland Gull
Lesser Scaup
Lincoln's Sparrow
Long-tailed Duck
MacGillivray's Warbler
Mallard
Marbled Murrelet
Merlin
new world warbler sp.
Northern Flicker
Northern Harrier
Northern Pintail
Olive-sided Flycatcher
Orange-crowned Warbler
Pacific Loon
Pacific Wren
Pacific-slope Flycatcher
Parasitic Jaeger
Pelagic Cormorant
Peregrine Falcon
Pied-billed Grebe
Pigeon Guillemot
Pileated Woodpecker
Pine Siskin
Purple Finch
Red Crossbill
Red-breasted Merganser
Red-breasted Nuthatch
Red-breasted Sapsucker
Red-necked Grebe
Red-tailed Hawk
Red-throated Loon
Rhinoceros Auklet
Ring-billed Gull
Ring-necked Duck
Rock Pigeon
Ruby-crowned Kinglet
Ruby-crowned/Golden-crowned Kinglet
Rufous Hummingbird
Savannah Sparrow
Sharp-shinned Hawk
Short-billed Gull
Snow Goose
Song Sparrow
Spotted Sandpiper
Spotted Towhee
Steller's Jay
Surf Scoter
Surfbird
Swainson's Thrush
Townsend's Warbler

Tree Swallow
Trumpeter Swan
Trumpeter/Tundra Swan
Turkey Vulture
Varied Thrush
Violet-green Swallow
Warbling Vireo
Yellow-rumped Warbler
Western Grebe
Western Gull
Western Sandpiper
Western Tanager
Western Wood-Pewee
Western/Glaucous-winged Gull
White-crowned Sparrow
White-throated Sparrow
White-winged Scoter
Willow Flycatcher
Wilson's Warbler
Yellow Warbler

APPENDIX D - BIRD SPECIES LIST FROM POINT COUNTS CONDUCTED IN 2009

Table 1: Bird species documented during a Variable Range Point Count in the Cape Roger Scott proposed development area on July 29 and 30, 2009.

Common Name	Latin Name	1	2	3	4	5	6	7	8	9	10	11	No. of veg polygons in which species was observed
Red-breasted Nuthatch	*Sitta canadensis*	■	■	■	■	■	■	■	■	■	■	■	11
Chestnut-backed Chickadee	*Parus rufescens*	■	■	■	■	■	■	■	■	■	■	■	11
Spotted Towhee	*Pipilo maculatus*	■	■	■	■	■	■	■	■	■	■	■	11
Winter Wren	*Troglodytes troglodytes*	■	■	■	■	■	■	■		■	■	■	10
Golden-crowned Kinglet	*Regulus satrapa*	■		■	■	■	■	■		■	■	■	9
Pacific Slope Flycatcher	*Empidonax difficilis*	■	■	■		■	■	■	■			■	8
American Robin	*Turdus americanus*	■		■	■		■	■		■			6
Pine Siskin	*Carduelis pinus*	■			■	■		■		■		■	6
Brown Creeper	*Certhia americana*			■			■		■	■	■	■	6
Cassin's Vireo	*Vireo cassinii*	■		■		■		■			■		5
Northwestern Crow	*Corvus caurinus*	■		■				■			■	■	5
Black-capped Chickadee	*Poecile atricapillus*		■					■		■		■	4
Hairy Woodpecker	*Picoides villosus*	■						■		■		■	4
Ruby-crowned Kinglet	*Regulus calendula*	■		■				■		■			4
Dark-eyed Junco	*Junco hyemalis*	■				■		■		■			4
Red-breasted Sapsucker	*Sphyrapicus ruber*		■			■		■					3
Pileated Woodpecker	*Dryocopus pileatus*	■				■					■		3
Swainson's Thrush	*Catharsus ustulatus*					■		■					2
Western Tanager	*Piranga ludaviciana*		■							■			2
Yellow-rumped Warbler	*Dendroica coronata*							■		■			2
Wilson's Warbler	*Wilsonia pusilla*		■			■							2
Bewick's Wren	*Thryomanes bewickii*										■	■	2
Western Wood Peewee	*Contopus sordidulus*							■			■		2

Common Name	Latin Name	1	2	3	4	5	6	7	8	9	10	11	No. of veg polygons in which species was observed
Yellow Warbler	*Dendroica petechia*	■									■		2
Belted Kingfisher	*Ceryle alcyon*	■									■		2
Turkey Vulture	*Cathartes aura*	■											1
Canada Goose	*Branta canadensis*	■											1
Common Merganser	*Mergus merganser*	■											1
Red Crossbill	*Loxia curvirostra*	■											1
Empidonax Flycatcher	*Empidonax spp.*	■											
Barred Owl	*Strix varia*							■			■		
Downy Woodpecker	*Picoides pubescens*										■		1
Common Nighthawk	*Chordeiles minor*										■		1
Black-headed Grosbeak	*Pheuticus melanocephalus*									■			1
Fox Sparrow	*Passerella iliaca*									■			1
Warbling Vireo	*Vireo gilvus*				■								1
Willow Flycatcher	*Empidonax traillii*					■							1
Mountain Chickadee	*Poecile gambeli*									■			1
Hutton's Vireo	*Vireo hutonni*				■								1
Hammond's Flycatcher	*Empidonax hammondii*							■					1
Glaucous-winged Gull	*Larus glaucescens Naumann*							■					1
Number of species for which polygon is habitat		**20**	**9**	**11**	**9**	**14**	**8**	**21**	**5**	**17**	**15**	**12**	

*Northwestern garter snake, *Thamnophis ordinoides*, observed in vegetation Polygon 1

APPENDIX E - TERRESTRIAL INVERTEBRATE SPECIES LIST FROM INATURALIST

Acronicta insita	**Large Gray Dagger**
Agrotis vancouverensis	**Vancouver Dart**
Aquarius remigis	**Common Water Strider**
Ariolimax columbianus	**Pacific Banana Slug**
Caenurgina erechtea	**Forage Looper Moth**
Caripeta aequaliaria	**Western Conifer Looper**
Catoptria oregonicus	**Catoptria oregonicus**
Cisseps fulvicollis	**Yellow-collared Scape Moth**
Coccinella novemnotata	**Nine-spotted Lady Beetle**
Coccinella septempunctata	**Seven-spotted Lady Beetle**
Drepana arcuata	**Arched Hooktip Moth**
Elasmostethus cruciatus	**Red-cross Shield Bug**
Elathous nebulosus	**Elathous nebulosus**
Epirrhoe alternata	**Common Carpet Moth**
Eulia ministrana	**Ferruginous Eulia Moth**
Habronattus oregonensis	**Oregon Paradise Spider**
Haplotrema vancouverense	**Robust Lancetooth Snail**
Harmonia axyridis	**Asian Lady Beetle**
Harpaphe haydeniana	**Yellow-spotted Millipede**
Homorthodes hanhami	**Homorthodes hanhami**
Ianassa pallida	**Pale Prominent**
Idaea dimidiata	**Single-dotted Wave**
Lambdina fiscellaria	**Hemlock Looper Moth**
Leptarctia californiae	**California Tiger Moth**
Leptoglossus occidentalis	**Western Conifer Seed Bug**
Lethocerus americanus	**Lethocerus americanus**
Lophocampa argentata	**Silver-spotted Tiger Moth**
Mesogona olivata	**Mesogona olivata**
Monadenia fidelis	**Pacific Sideband**
Noctua pronuba	**Large Yellow Underwing**
Ochlodes sylvanoides	**Woodland Skipper**
Oligia divesta	**Oligia divesta**
Orthosia transparens	**Orthosia transparens**
Paonias excaecata	**Blinded Sphinx**
Parabagrotis sulinaris	**Parabagrotis sulinaris**
Platyptilia carduidactylus	**Artichoke Plume Moth**
Protodeltote albidula	**Pale Glyph**
Pseudothyatira cymatophoroides	**Tufted Thyatirine Moth**
Pyrrharctia isabella	**Isabella Tiger Moth**
Rheumaptera undulata	**scallop shell moth**
Scoliopteryx libatrix	**Herald Moth**
Spiramater lutra	**Otter Spiramater Moth**
Vespericola columbiana	**Northwest Hesperian**
Zale minerea	**Colorful Zale Moth**
Zelus tetracanthus	**Four-spurred Assassin Bug**
Zootermopsis angusticollis	**Pacific Dampwood Termite**

APPENDIX F - OPERATIONAL GUIDELINES THAT WOULD BE USED IN THE DEVELOPMENT OF A NEW REGIONAL PARK AT CAPE ROGER CURTIS

Natural Resource Management

Goal 1: Ensure ecosystem health and long-term resiliency to conserve diverse biological communities and their associated habitats

Strategy 1.2: Enhance ecosystem connectivity
Guidelines:

- Carefully site park infrastructure to avoid or reduce habitat fragmentation.
- Reduce the amount of trails in highly fragmented areas wherever possible.
- Strive to protect or restore known wildlife travel corridors and consider these in park development or in collaboration with other jurisdictions.

Strategy: 1.3: Conserve biological communities
Guidelines:

- Conserve natural habitat and ecological processes to support species at risk.
- Prepare specific plant and animal management plans where necessary.
- Recognize the value of novel ecosystems (e.g. old fields, barns or other human-created landscapes) that provide surrogate habitat for a wide range of native species and manage them accordingly.
- Recognize, understand, and educate that perfect data will never exist to manage plant and animal populations.
- Understand that a shifting baseline syndrome (a gradual change in the accepted norm for ecological conditions) can affect how people perceive the natural world.
- Manage succession in areas where natural processes and/or human-induced changes will result in the loss of critical habitat or ecosystem type.
- River, floodplain, ocean, mountain viewscapes and scenic corridors identified in park management plans may be maintained through vegetation management, provided that vegetation removal does not result in the loss of critical habitat or significant impacts to natural resources.
- Participate in working groups/committees to coordinate management activities with respect to specific populations (for example: bears, bats, snow geese).
- Minimize anthropogenic impacts on native species communities.

Strategy 1.4: Conserve and protect natural processes and features

Guidelines:

- Manage ecosystems with minimal interference to maintain ecological processes in as natural a state as possible.
- Discourage development and infrastructure in dynamic areas (e.g. rock-fall areas) to allow natural processes to occur and protect visitor safety.
- Take special precautions to protect large veteran trees in parks. This may include inventory, monitoring and management actions when their health may be threatened.
- Protect natural soundscapes within parks wherever possible.
- Protect the natural lightscapes in parks wherever possible and mitigate light pollution levels through the use of light abatement practices.
- Provide ecological information and recommendations for the incorporation of natural assets into the park natural asset management program and financial planning.

Strategy 1.5: Maintain, enhance and restore natural communities, structures or conditions
Guidelines:

- Consider habitat restoration projects that directly contribute to ecosystem health, without jeopardizing the park's existing habitat values, special features or identity. Projects will be evaluated based on fit with park management plan or park purpose as well as the expected contribution to regional biodiversity.
- Restore and enhance plant communities using native plants adapted to site conditions. Where site disturbance is severe, non-invasive, non-native species may be used to stabilize disturbed areas.
- Assess forest health to understand how closely ecosystems match optimal conditions and what factors, if any, are pushing them off optimal pathways and determine whether intervention is warranted.
- Increase naturalized areas within parks to provide additional habitat and reduce the level of service where appropriate.
- Map and maintain a georeferenced inventory of restored areas in order to track and determine cumulative impacts.

Strategy 1.6: Manage invasive species
Guidelines:

- Manage invasive species that displace native species, impair ecosystem processes, reduce biodiversity and/or threaten human health and safety.
- Invasive species and pest control strategies will be based on well-researched integrated pest management plans. Herbicides may be used to control invasive plants when other methods have proven ineffective, cost prohibitive or deleterious, and the impacts of inaction exceed the impacts of herbicide use. Use of anticoagulant rodenticides should

not occur in Regional Parks due to the high risk of injury to non-target species and secondary poisoning of predator species.
- Map and maintain a georeferenced inventory of targeted invasive plants in order to track and determine efficacy of treatments.
- Work with other regional park staff to identify illegal green waste dumping locations. Where appropriate, install signage to educate neighbours regarding invasive plants and the need to dispose of them properly.
- Participate in regional committees or workshops in order to share information and best management practices regarding invasive species.

Strategy 1.7: Mitigate for and adapt to effects of climate change
Guidelines:

- Protect, restore and maintain forests that can mitigate the effects of climate change through flood and temperature attenuation, carbon sequestration and improved air quality and can contribute to regional greenhouse gas reduction targets.
- Consider the potential impacts of climate change in all restoration and enhancement plans.
- Ensure climate stressors and changes are considered during park management planning processes.
- Consider managed retreat or floodable infrastructure as an alternative to structural protection or accommodation measures to manage emerging natural hazard risks due to climate change.

Strategy 1.8: Conserve soil resources
Guidelines:

- Conserve the soil resources of parks and manage erosion, physical removal, degradation or contamination of soil.
- Promote soil health as a vital living component of the ecosystem.
- Use native soils for restoration projects wherever possible. If imported soils are used, they should be free of weeds and contaminants.

Strategy 1.9: Conserve water resources
Guidelines:

- Manage rain and storm water on parkland in order to promote aquifer recharge, protect water quality, reduce the risk of flooding and erosion, and prevent contaminated water from entering sensitive ecosystems.
- Identify and protect areas where ecological conditions are particularly sensitive to hydrological changes and encourage the retention or replacement of buffers around sensitive areas in order to protect flow regimes and water quality.

- Protect, enhance, create, and restore water features and riparian areas wherever possible.

Goal 2. Provide opportunities for public to connect with natural areas while conserving the integrity and resilience of ecosystems

Strategy 2.1: Site park infrastructure and visitor use in less sensitive areas
Guidelines:

- Use analysis of the Sensitive Ecosystem Inventory, Conservation Value Mapping, and other relevant data to identify lands of high conservation value and environmentally sensitive areas to inform park management decisions.
- Develop criteria to identify highly sensitive areas within parks that can be designated during planning processes as areas prioritized for protection and then managed exclusively for natural resource values with limited access.
- Use barriers like dense shrub thickets or fences to protect designated habitat areas while retaining sightlines.
- Plan and develop trails and facilities with strategies to minimize habitat fragmentation, avoid wildlife conflicts and protect sensitive areas and species at risk.
- Avoid or mitigate negative impacts to park natural resources when developing park facilities. When impacts can't be avoided or mitigated, compensation should be considered in another area of the park.
- Use environmentally friendly design, building practices, materials, and products whenever possible.
- Consider incorporating green infrastructure (green roofs, green walls, bioswales, etc.) around built facilities.
- Accept that some beneficial wildlife species may occupy regional park structures and coexistence should be promoted wherever possible and appropriate.
- Manage unauthorized trails at an acceptable level.

Strategy 2.2: Use best management practices to protect natural resources
Guidelines:

- Develop or adopt best management practices where required in order to comply with environmental regulations and meet required standards.
- Conduct environmental impact assessments for new development projects.
- Work with construction coordinators, operations and planning staff to use develop environmental management plans for park development projects.

Strategy 2.3 Manage and monitor impacts of visitor use
Guidelines:

- Evaluate recreational impacts to parkland to ensure that the desired resource conservation and visitor experience objectives are being achieved. This may include developing desired condition objectives for popular trails or features within parks and monitoring for limits of acceptable change that if reached, may require intervention.
- Determine attributes to monitor as indicators of environmental change such as trail width, number of unsanctioned trails, soil compaction, loss of vegetation, or prevalence of invasive plant species.
- Use permanent or temporary closures of selected areas to reduce or eliminate undesirable human impacts to sensitive sites and wildlife.
- Discourage active and passive feeding of wildlife within Regional Parks through signage, public education and enforcement.

Goal 3: Provide opportunities for public involvement in natural resource management through partnerships and stewardship activities

Strategy 3.1: Form collaborative partnerships
Guidelines:

- Build relationships and maintain strong connections with other levels of government, First Nations, academic institutions, community organizations and the private sector
- Share knowledge and work collaboratively to conserve important habitats, waterways and wildlife corridors to realize shared natural resource management goals inside as well as outside of the park.

Strategy 3.2: Provide opportunities for stewardship and education
Guidelines:

- Provide effective and meaningful opportunities for park staff, park partners, park associations, volunteers and the public to engage in park ecosystem restoration, enhancement, maintenance, inventory and research.
- Help build the capacity of volunteers and partner organizations to assist in park natural resource management.

Strategy 3.3: Enhance understanding of parks through research
Guidelines:

- Permit research in parks by partners, academic institutions and other agencies to broaden our understanding of park resources and inform management decisions.
- Regulate independent and academic research in Regional Parks by stipulating terms and conditions in a formal research permit.

Strategy 3.4: Promote the sharing of expertise
Guidelines:

- Provide information about the Regional Parks' natural resources and encourage information sharing through participation in forums, working groups, task forces, advisory panels, committees, workshops, and through communication with other Metro Vancouver departments.
- Use and contribute to open data sources wherever feasible to disseminate information on Regional Parks natural resources.
- Highlight and profile the regional park natural resources and programs through a variety of formats, such as newsletters, websites, webinars, social media, and videos, to share results and garner interest in regional park natural resources.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