

Lakes District Study Area
Fairwinds Development
Detailed Biophysical Assessment

Prepared for:
3536696 Canada Inc.,
Bental Investment Management LP, and
Fairwinds Development Real Estate Management Ltd.

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February 2009

EXECUTIVE SUMMARY

Cascadia Biological Services was retained by Fairwinds Development to complete a biophysical inventory and assessment on remaining developable lands referred to as the Lakes District in Nanoose Bay, British Columbia. The Lakes District encompasses approximately 730 acres and is identified as an urban growth area with the Regional District of Nanaimo's Growth Management Plan. The Study Area is primarily dominated by older second-generation Douglas-fir/arbutus forests with smaller isolated ecosystem polygons consisting of Douglas fir, Garry Oak, as well as rocky outcrops and riparian areas. The study area is also home to Enos Lake including the British Columbia Conservation Data Centre (BC CDC) red listed Enos Lake Sticklebacks. The environmental assessment of the property was initiated in the fall of 2006 and ended in the spring of 2008. Overall, a total of 30 field days was dedicated to the project and involved completing vegetation assessments, wildlife assessments as well as biophysical mapping of environmentally significant attributes including nests sites, wildlife dens as well as all watercourses within the study area. Our assessments resulted in the documentation/mapping of five distinct ecosystems and nine streams, over fifty wildlife trees, ninety species of plants as well as over sixty species of birds and nearly a dozen mammals including otter, beaver etc. Further to the species observations above, we have determined that there are various environmentally significant attributes as well as rare element occurrences on the property. These include rare Garry Oak meadows as well as other sensitive ecosystems including a variety of plants and animals. Overall, impacts to these environmentally sensitive species and ecosystems as a result of the proposed development are expected to be minimal, if the proposed best management practices identified in this report are adhered to. These include the designation of proposed build areas (development pods), adjusting road locations to minimize impacts to sensitive attributes as well as reducing the overall impervious surface over roads and community parking/trail areas. Other recommendations include having an environmental monitor on-site during road construction and site servicing when construction related activities are either moving through and/or adjacent to environmentally sensitive areas.

While any development will impact the natural environment, the Proposed Development, if



developed in keeping with the recommendations set forth herein, will result in the most positive possible outcome for the natural environment. Large tracts of land will be protected in perpetuity and these areas will be appropriately regulated and managed properly, ensuring their continued viability in terms of conservation of ecological integrity, access management and invasive species control.

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1.0 INTRODUCTION

The Fairwinds Development (3536696 Canada Inc.) tasked Cascadia Biological Services with conducting an environmental assessment (EA) to assist both the overall planning process related to the build out of remaining lands referred to as the Lakes District (Study Area) as well as identify, map and evaluate environmentally sensitive attributes related to wildlife, vegetation and watercourses. The assessments would evaluate these attributes based on their environmental significance both at a regional as well as at a local scale. Fieldwork for the project was initiated in the fall of 2006 and was completed in spring of 2008, involving over 30 days of data collection with both a Registered Professional Biologist (R.P.Bio) and a certified wildlife technician. Assessments completed during this time period included vegetation, wildlife as well as stream/fish habitat surveys and spanned all four seasons to ensure the area was thoroughly assessed.

This report therefore presents the findings of the EA activities and is organized into three main sections. Section 1 includes the introduction and summarizes the scope of work, project goals and objectives, general methods, as well as describes the project area and environmental setting. Section 2 describes the results of the EA and further defines the methods used to each particular assessment. Section 3 details development considerations including a discussion and summary of the EA.

1.1 SCOPE OF WORK

The scope of this EA included conducting environmental assessments at two different scales. The first was a project specific property assessment and involved mapping/assessing species distribution as well as watercourse locations through the delineated study area (property boundary). The second was to assess the potential of occurrence of select species listed by the BC Conservation Data Centre (BCBCD) in relation to habitat suitability within the Nanoose Peninsula.

1.2 OBJECTIVES OF THE WORK

The following objectives were initially identified (Fairwinds Development group):

The overall objectives of these assessments were to assess the remaining lands referred to as the Lakes District (refer to Figure 1), an identified urban growth area within the Regional District of Nanaimo's Growth Management Plan, and to document sensitive ecosystems, watercourses that met the definition under the Riparian Areas Regulations (RAR) as well as locate other environmentally sensitive attributes including wildlife trees, dens, nest sites as well as other rare element occurrences. In particular:

- Map all wildlife trees including nest sites;
- Map wildlife dens;
- Document rare plants and ecosystems through a detailed bio-inventory; and
- Map all waterbodies including RAR watercourses and collect biophysical data that would allow for the determination of the Streamside Protection and Enhancement Areas (SPEA) setback.

1.3 ENVIRONMENTAL AND GEOGRAPHIC SETTING

The Study Area measures 298.5 ha (737.61 ac) in area and is located on the Nanoose Bay peninsula in Nanoose, BC. Located on 1:20,000 TRIM Mapsheet #092F.030, the Study Area is bounded by Georgia Strait and residential properties to the north and east, Notch Hill and the Canadian Forces Maritime Experimental and Test Ranges (C.F.M.E.T.R.) to the south, Dolphin Drive to the west and south and private residences/larger tracts of rural land to the west. Refer to figure 1 below outlining the Study Area as well as the surrounding land uses.

1.4 PHYSIOGRAPHY, HYDROLOGY AND CLIMATE

Low relief topography and frequent rocky outcrops characterize the Nanoose Bay peninsula, in which the Study Area is located. Glacial till soils, often with distinct lower layers that is a mixture of sand and crushed rock (from glaciation), are the predominant upland soils. Marine deposits are not present at elevations greater than 100m. The

moisture deficit is approximately 330mm, but varies considerably with aspect, exposure, soils and ground cover.

Climate data for the Study Area are available from Environment Canada's Atmospheric Environment Service (AES) and Ministry of Environment (MoE). AES maintains a climate station at the Nanaimo Airport. The data recorded include temperature and precipitation. The following summarizes the weather data obtained from the AES climate station at Nanaimo Airport and is presented below in bullet form:

- The mean daily temperatures are above freezing throughout the year;
- Mean daily minimum temperatures below freezing can occur from October through March, although the long-term averages of daily minimum temperatures are at or above freezing; and
- The mean daily temperature difference between the coldest winter month and the warmest summer month is approximately 16°C.

Precipitation data show the following patterns:

- Most of the precipitation (86%) falls from October through March;
- Snow can occur any time from October through April; and
- The driest months are in the summer (July and August).

Figure 1. Study Area Overview



1.5 METHODOLOGY

1.5.1 OFFICE STUDY: Identification and Review of Environmental Data

Prior to actual on site investigations of vegetation, wildlife and aquatic communities within the delineated Study Area, a detailed office based investigation on all three environmental components (aquatic resources, wildlife and vegetation) to be studied was undertaken. For the most part, this involved researching government databases, including the Department of Fisheries and Oceans (DFO) and the Ministry of Water, Land and Air Protection (MWLAP), as well as related reports. Please find below a detailed lists of material used and interpreted for our assessments on vegetation, wildlife, and aquatic habitat.

- Aerial photos, reports and Study Area boundaries (Fairwinds Development and Koers Engineering Ltd.).
- Concept Sketch 5m contour Planning Map (Koers Engineering Ltd, 2008).
- BC Conservation Data Centre – Rare Wildlife (Appendix A) and Vascular Plants (Appendix B) of the South Vancouver Island Forest District -
<http://a100.gov.bc.ca/pub/eswp/>
- BC Conservation Data Centre – Rare Plant Communities Tracking List of the South Vancouver Island Forest District - BC Conservation Data Centre -
<http://a100.gov.bc.ca/pub/eswp/> (Appendix C).
- FISS (fish information summary system) databases.
- FWSR (fish wizard stream report) databases.
- BC Conservation Data Center <http://srmwww.gov.bc.ca/cdc>
- Sensitive Habitat Inventory Mapping (SHIM) web site.
<http://www.shim.bc.ca/shim/main.htm>
- Sensitive Ecosystem Inventory <http://www.env.gov.bc.ca/sei/>

1.6 FIELDWORK

Fieldwork related to the detailed biophysical assessment of the Study Area was conducted on various dates between September 15th 2006 and June 30th, 2008. For all aspects of our assessment including vegetation, aquatic habitat and wildlife, transects and delineated site boundaries were laid down over the Study Area to ensure maximum coverage (*Appendix D, Biophysical Assessment Map*). Upon completion, a total of 8 biophysical assessment transects measuring 50m in width were assessed thoroughly as well as a complete Study Area walk through resulting in over 60% coverage of the delineated Study Area. In addition, various biophysical assessments of the Study Area were conducted including a vegetation survey, an amphibian survey, small mammal survey, large mammal survey, raptor and blue heron survey, fish and fish habitat survey, and bird inventory. Specific methods relevant to each survey including a breakdown of field equipment are discussed in greater detail in Section 2 of this report.

2.0 BIOPHYSICAL ASSESSMENT - METHODS & RESULTS

2.1 VEGETATION

2.1.1 Biogeoclimatic Zones

The Study Area lies within the Moist Maritime subzone of the Coastal Douglas Fir zone (CDFmm), which occurs along a small portion of southeastern Vancouver Island, several islands in the Georgia Strait and a narrow strip of the adjacent mainland. Elevation limits of the CDFmm range from sea level to approximately 150m. The CDFmm experiences warm, dry summers and mild, wet winters. Forests on zonal sites are dominated Douglas-fir, accompanied frequently by western red cedar, grand fir, arbutus, garry oak and red alder. Major understory species include salal, dull Oregon-grape, ocean-spray, bracken fern, sword fern, trailing blackberry, western trumpet honeysuckle and Oregon beaked moss. Typical vegetation of CDFmm is presented in Table 1: Vegetation Typically Occurring Within the Moist Maritime Coastal Douglas-fir Subzone (CDFmm).

Table 1. Vegetation Typically Occurring Within the Moist Maritime Coastal Douglas-fir Subzone (CDFmm)

Douglas-fir	<i>Pseudotsuga menziesii</i>
Garry oak	<i>Quercus garryana</i>
Arbutus	<i>Arbutus menziesii</i>
Bigleaf maple	<i>Acer macrophyllum</i>
Western red cedar	<i>Thuja plicata</i>
Grand fir	<i>Abies grandis</i>
Western flowering dogwood	<i>Cornus nuttallii</i>
Shore pine	<i>Pinus contorta</i> var. <i>contorta</i>
Western yew	<i>Taxus brevifolia</i>
Salal	<i>Gaultheria shallon</i>
Dull Oregon-grape	<i>Berberis nervosa</i>

Baldhip rose	<i>Rosa gymnocarpa</i>
Ocean-spray	<i>Holodiscus discolor</i>
Western trumpet honeysuckle	<i>Lonicera ciliosa</i>
Snowberry	<i>Symphoricarpos spp.</i>
Hairy honeysuckle	<i>Lonicera hispidula</i>
Falsebox	<i>Paxistima myrsinites</i>
Labrador tea	<i>Ledum groenlandicum</i>
Indian-plum	<i>Oemleria cerasiformis</i>
Salmonberry	<i>Rubus spectabilis</i>
Red elderberry	<i>Sambucus racemosa</i>
Sword fern	<i>Polystichum munitum</i>
Bracken fern	<i>Pteridium aquilinum</i>
Alaska oniongrass	<i>Melica subulata</i>
Big-leaved sandwort	<i>Moehringia macrophylla</i>
Pacific sanicle	<i>Sanicula crassicaulis</i>
Purple peavine	<i>Lathyrus nevadensis</i>
Broad-leaved shootingstar	<i>Dodecatheon hendersonii</i>
Nodding trisetum	<i>Trisetum cernuum</i>
Vanilla leaf	<i>Achlys triphylla</i>
Three-leaved foamflower	<i>Tiarella trifoliata</i>
Lady fern	<i>Athyrium filix-femina</i>
Skunk cabbage	<i>Lysichitum americanum</i>
False lily-of-the-valley	<i>Maianthemum dilatatum</i>
Electrified cat's tail moss	<i>Rhytidiadelphus triquetrus</i>
Oregon beaked moss	<i>Kindbergia oregana</i>
Step moss	<i>Hylocomium splendens</i>
Lichen	<i>Cladonia spp.</i>
Palm tree moss	<i>Leucolepis menziesii</i>
Sphagnum moss	<i>Sphagnum spp.</i>

2.1.2 Vegetation Communities

The information required for the environmental inventory was obtained through a review of secondary source information and a 10-day field program.

2.1.2.1 Methodology

2.1.2.1.1 Office Study

The office study included a review of available maps and plans related to the Study Area. This information was used to assist in aerial photograph interpretation of vegetation, drainages, landform and any other prominent features located on the property. The Study Area (refer to Figure 1) consisted of the proposed lot plus a special 20m assessment area along the outside perimeter of the Study Area. This 20m area was assessed where feasible due to topographical constraints and focused primarily on mapping adjacent waterbodies that may be subject to the Riparian Assessment Regulations (RAR) as they pertain to projected buffer zones including the Streamside Protection and Enhancement Areas (SPEA) into the property. Maps and aerial photographs reviewed included:

- Air Photo Mosaic (Koers Engineering Ltd, 2008)
- 1:20,000 TRIM Mapsheet
- Concept Sketch 5m contour Planning Map (Koers Engineering Ltd, 2008)

In addition to map and aerial photograph interpretation, an Element Occurrence Report (EOR) was requested from the BC Conservation Data Centre, and a review of environmental databases from the Ministry of Environment, Environmental Stewardship Division [formerly known as the Ministry of Water, Land and Air Protection (MWLAP)]. Internet addresses for these databases are as follows:

- SHIM (Sensitive Habitat Inventory Mapping) -
<http://www.shim.bc.ca/shim/main.htm>
- BC Conservation Data Center: Rare Plant Community Tracking List;
South Island Forest District (Appendix B).
<http://a100.gov.bc.ca/pub/eswp/>
- BC Conservation Data Center: Rare Vascular Plant Tracking List;
South Island Forest District <http://a100.gov.bc.ca/pub/eswp/>

2.1.2.1.2 Field Program

Cascadia Biological Services conducted field reconnaissance of the Study Area in May 2007 to July 17, 2008 during which time the following tasks were completed:

The vegetation of the Study Area was examined by establishing 20 m x 20 m vegetation quadrats within each of the different plant communities. The placement of these quadrats was decided upon based on a general reconnaissance of the Study Area while a GPS unit (Global Positioning System) was used to accurately plot each quadrat on a map (*Appendix D – Biophysical Assessment Map*). The following information was recorded:

- Complete list of plant species within the quadrat; and
- Presence of rare and endangered species.

Overall, a total of 5 distinct vegetation communities (sixth one identified on maps is a disturbed ecosystem and therefore not included in write up below) were assessed resulting in the following quadrats listed below:

Quadrat #1 – Douglas Fir/Arbutus Woodland Open Canopy Ecosystem

Quadrat #2 – Douglas Fir Woodland Ecosystem

Quadrat #3 – Riparian Ecosystem

Quadrat #4 – Garry Oak Meadow Ecosystem

Quadrat #5 – Garry Oak/Arbutus Woodland Ecosystem

The 5 ecosystem types above were delineated for further study based on overall size and importance within the Study Area.

2.1.3 Assessment Results

Vegetation communities within the delineated Study Area consisted primarily of shrubs, coniferous and deciduous species in the young forest stage, several old growth vegetative polygons and flowers along rocky outcrops. Generally speaking, the vegetative composition of the Study Area can be summarized, by ecosystem type, as follows in Table 2 below:

Table 2. Ecosystem Summary Table

Vegetation Community	% Area of Site
Douglas fir/Arbutus Ecosystem	55%
Garry Oak/Arbutus Ecosystem	15%
Garry Oak Meadow	10%
Riparian Ecosystem	10%
Douglas Fir Woodland Ecosystem	8%
Disturbed Ecosystem	2%

Of the individual plant species encountered, none were listed on the *Conservation Data Centre: Rare Vascular Plant/Vegetative Communities Tracking List – South Island Forest District* (Refer to Appendix C). Refer to Appendix D -Biophysical Map for quadrat locations. For a complete list of plants identified in the delineated Study Area, refer to Tables 3-7 below. Please note that this list is a summary of plant species identified in our quadrat assessments and is indicative of the Study Area during late



spring/early summer, and by no means represents the Study Area as a whole due to seasonal variability in plant species. As areas of special concern (rocky outcrops, woodland etc.) where sometimes identified immediately outside of the established quadrats, plants species identified during these assessments have been included into the nearest quadrat location.

Table 3. Quadrat #1 – Douglas Fir/Arbutus Woodland Open Canopy Ecosystem

Average Canopy Closure- 35%

Common Name	Scientific name
Douglas fir	<i>Psuedotsuga menziesii</i>
Garry Oak	<i>Quercus garryana</i>
Arbutus	<i>Arbutus Menziesii</i>
Big-leaf maple	<i>Acer macrophyllum</i>
Trumpeter honeysuckle	<i>Lonicera ciliosa</i>
Small-flowered alumroot	<i>Heuchera micraantha</i>
Nodding onion	<i>Allium cernuum</i>
American vetch	<i>Vicia American</i>
Baldhip rose	<i>Rosa Gymnocarpa</i>
Dull Oregon grape	<i>Mahonia nervosa</i>
Hairy honeysuckle	<i>Lonicera hispidula</i>
Maidenhair fern	<i>Adiantum pedatum</i>
Oceanspray	<i>Holodiscus discolour</i>
Prince's pine	<i>Chimaphila umbellate</i>
Salal	<i>Gaultheria shallon</i>
Scotch broom	<i>Cytisus scoparius</i>
Sword fern	<i>Polystichum munitum</i>
Trailing blackberry	<i>Rubus ursinus</i>
Twinflower	<i>Linnaea borealis</i>
Wall lettuce	<i>Lactuca muralis</i>
Yerba Buena	<i>Satureja douglasii</i>
Moss all sp.	<i>Total cover</i>
Grasses al sp.	<i>Total cover</i>



Plate #1 – Typical view of Douglas fir/Arbutus open canopy ecosystem

Above is a typical view of the Douglas fir/Arbutus ecosystem within the Study Area. Encompassing approximately 55% of the total Study Area (excluding wetted ecosystems) this ecosystem represents the largest vegetative community in our Study Area.

Table 4. Quadrat #2 – Douglas Fir Woodland Ecosystem

Average Canopy Closure- 70%

Common Name	Scientific name
Douglas fir	<i>Psuedotsuga menziesii</i>
Big-leaf maple	<i>Acer macrophyllum</i>
Grand fir	<i>Abies grandis</i>
Arbutus	<i>Arbutus Menziesii</i>
Dull Oregon grape	<i>Mahonia nervosa</i>
Hairy honeysuckle	<i>Lonicera hispidula</i>
Oceanspray	<i>Holodiscus discolor</i>
Salal	<i>Gaultheria shallon</i>
Baldhip rose	<i>Rosa Gymnocarpa</i>
Rattlesnake-plaintain	<i>Goodyera oblongifolia</i>
Pacific sannicle	<i>Sanicle crassicaulis</i>
Saskatoon berry	<i>Maelanchier alnifolia</i>
Sweet-scented bedstraw	<i>Galium triflorum</i>
Yerba Buena	<i>Satureja douglasii</i>
Trailing blackberry	<i>Rubus ursinus</i>
Twinflower	<i>Linnaea borealis</i>
Wall lettuce	<i>Lactuca muralis</i>
Western trumpet honeysuckle	<i>Lonicera ciliosa</i>



Plate #2 – Typical view of Douglas fir woodland ecosystem (opposite side of lake)

Above is a typical view of a Douglas fir woodland ecosystem within the Study Area. Encompassing approximately 8% of the total Study Area (excluding wetted ecosystems) this ecosystem is primarily limited to the north slope of Notch Hill and can be seen in the background of the above photograph.

Table 5. Quadrat #3 – Riparian ecosystem (RI)

Average Canopy Closure- 70%	
Common Name	Scientific name
Red alder	<i>Alnus rubra</i>
Big-leaf maple	<i>Acer macrophyllum</i>
Douglas fir	<i>Quercus garryana</i>
Pacific water-parsley	<i>Oenanthe sarmentosa</i>
Field mint	<i>Mentha arvensis</i>

Trailing blackberry	<i>Rubus ursinus</i>
Wall lettuce	<i>Lactuca muralis</i>
Braken fern	<i>Pteridium aquilinum</i>
Salmonberry	<i>Rubus specabilis</i>
Skunk cabbage	<i>Lysichiton americanum</i>
Herb-roberts geranium	<i>Geranium robertianum</i>
Sweet-scented bedstraw	<i>Galium triflorum</i>
Common mare's-tail	<i>Hippuris vulgaris</i>
Rose campion	<i>Lychnis coronaria</i>
False bugbane	<i>Trautvetteria caroliniensis</i>
Oceanspray	<i>Holodiscus discolor</i>



Plate #3 – Typical view of Riparian ecosystem ground cover

Above is a typical view of a riparian ecosystem within the Study Area. Encompassing approximately 10% of the total Study Area (excluding wetted ecosystems) this ecosystem

is primarily found within the 20-30m of significant waterbodies measured from the high water mark.

Table 6. Quadrat #4 – Garry Oak Meadow (GOM)

Average Canopy Closure- 8%

Common Name	Scientific name
Douglas fir	<i>Psuedotsuga menziesii</i>
Garry Oak	<i>Quercus garryana</i>
Arbutus	<i>Arbutus Menziesii</i>
Coastal reindeer lichen	<i>Cladina portentosa</i>
Common dandelion	<i>Taraxacum officinale</i>
Hairy honeysuckle	<i>Lonicera hispidula</i>
Meadow death-cammas	<i>Zygadenus venenosus</i>
Oceanspray	<i>Holodiscus discolor</i>
Saskatoon berry	<i>Maelanchier alnifolia</i>
Scotch broom	<i>Cytisus scoparius</i>
Yarrow	<i>Achilea millefolium</i>
Menzie's Pipsissewa	<i>Chimaphila menziessi</i>



Plate #4 – Typical view of Garry Oak meadow ecosystem

Above is a typical view of a Garry Oak Meadow ecosystem within the Study Area. Encompassing approximately 10% of the total Study Area (excluding wetted ecosystems) this ecosystem is primarily limited to the south facing slopes along the northwestern and southeastern corners of the Study Area.

Table 7. Quadrat #5 – Garry Oak/Arbutus woodland ecosystem (GO/AB)

Average Canopy Closure- 8%

Common Name	Scientific name
Douglas fir	<i>Psuedotsuga menziesii</i>
Garry Oak	<i>Quercus garryana</i>
Arbutus	<i>Arbutus Menziesii</i>
Coastal reindeer lichen	<i>Cladina portentosa</i>
Common dandelion	<i>Taraxacum officinale</i>
Freckle pelt	<i>Peltigera Britannica</i>

Hairy honeysuckle	<i>Lonicera hispidula</i>
Himalayan blackberry	<i>Rubus discolor</i>
Dull-oregon grape	<i>Mahonia nervosa</i>
Baldhip rose	Rosa Gymnocarpa
Oceanspray	<i>Holodiscus discolor</i>
Scotch broom	<i>Cytisus scoparius</i>
Meadow death-cammas	<i>Zygadenus venenosus</i>
Trailing blackberry	<i>Rubus ursinus</i>
Twinflower	<i>Linnaea borealis</i>
Wall lettuce	<i>Lactuca muralis</i>
Wood saxifrage	<i>Saxifraga mertensiana</i>
Yerba Buena	<i>Satureja douglasii</i>
Yarrow	<i>Achilea millefolium</i>



Plate #5 – Typical view of Garry Oak/Arbutus ecosystem

Above is a typical view of a Garry Oak/Arbutus ecosystem within the Study Area. Encompassing approximately 15% of the total Study Area (excluding wetted ecosystems) this ecosystem is primarily limited to south facing slopes along the fringes of the Garry Oak meadow polygons.

2.1.4 Rare and Endangered Vascular Plants and Plant Communities

2.1.4.1 Rare and Endangered Vascular Plants

The Conservation Data Centre (CDC) reports the occurrence of 164 taxa of rare and endangered vascular plants within the South Island Forest District, including 86 blue-listed and 78 red-listed species (Refer to *Appendix B – BCCDC Rare Vascular Plants (South Island)*). Rare and endangered species are categorized into ‘red’ ‘blue’ and ‘yellow’ lists. Red listed species include species that are extirpated in British Columbia, in danger of becoming extirpated, or threatened. Blue listed species are species that are sensitive or vulnerable to human activity or habitat encroachment. Yellow-listed taxa are those species or subspecies that are not red or blue listed. Based on Study Area observations, no red/blue listed plant species were observed.

2.1.4.2 Rare and Endangered Plant Communities

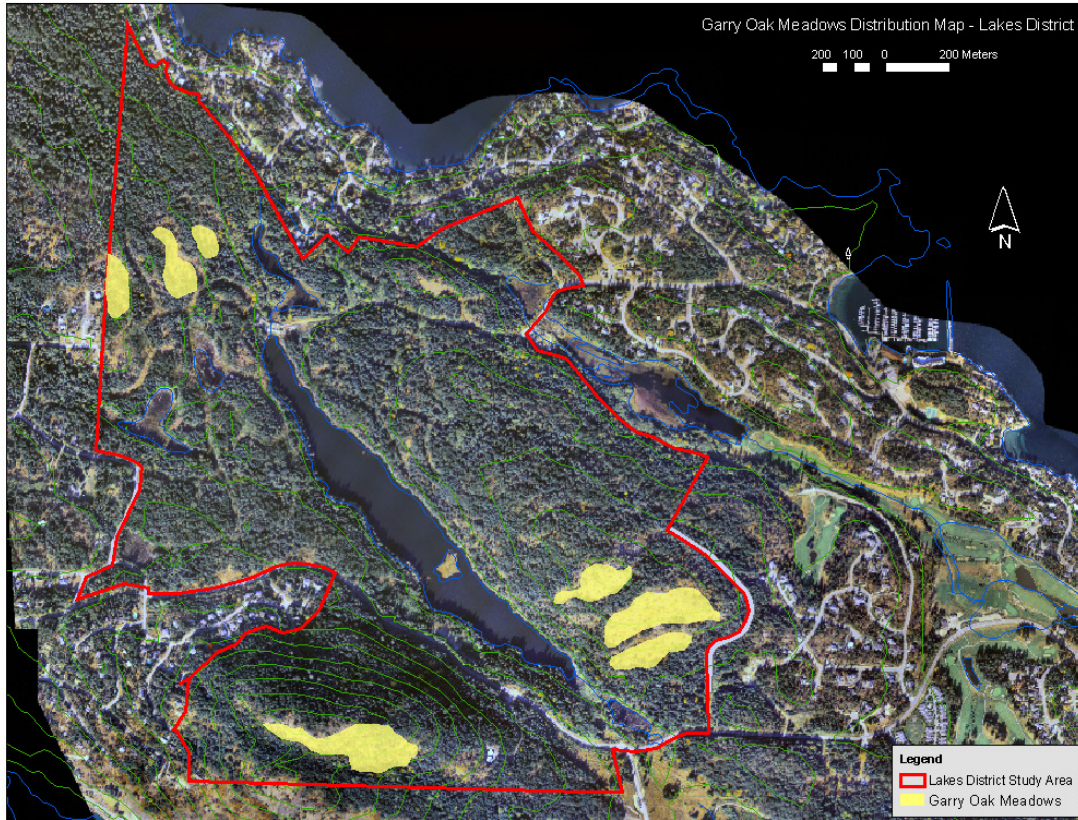
The CDC reports the occurrence of 35 rare and endangered plant communities in the South Island Forest District within the CDFmm, including 28 red-listed and 7 blue-listed plant communities (Refer to *Appendix C – BCCDC Rare Plant Communities - South Island*). Based on Study Area observations, three red/blue-listed communities were identified, being Douglas fir/Arbutus, Garry Oak/Arbutus on rocky outcrops and Garry Oak meadows (California Brome subdominant). Overall sensitivities for the above listed ecosystems range from low-moderate for the Douglas fir/Arbutus ecosystems and high for the Garry Oak/Arbutus and Garry Oak meadows as they are in late successional stages of development. Refer to *Appendix E – Ecosystem Map* for polygon locations. Due to the high habitat values associated with some of the larger Garry Oak polygons, a

separate section labelled 2.1.4.3 Garry Oak Meadows Within the Fairwinds Lakes District is discussed in further detail below.

2.1.4.3 Garry Oak Meadows Within the Fairwinds Lakes District

Located primarily within three distinct areas of the proposed Fairwinds Lakes District over seven polygons (refer to Figure 2 below), the Garry Oak meadows cover an area of approximately 153,622 square meters (37 acres). Consisting primarily of Garry Oak in the canopy layer often in association with lesser percentages of Arbutus, the shrub and herb layers often consists of Ocean-spray and common camas. A dense moss and lichen layer, consisting mainly of rock moss, is common. The Garry Oak ecosystem is generally characterized by sparse-to-open mixed forest with herbaceous layer dominated by bryophytes (mosses) and a dense mixture of spring wildflowers and grasses. In association with the above, the Garry Oak meadows often have a multitude of small to large mammals and are home to variety of bird species as well as various reptiles including the northern alligator lizard and both the northwestern and northern terrestrial garter snakes. As a result of the overall rareness of these ecosystems within British Columbia and Canada and the listing of this ecosystem with the British Columbia Conservation Data Centre (BC CDC), the Fairwinds Development group, in consultation with the Garry Oak Ecosystem Recovery Team (GOERT), have excluded any of these ecosystems from housing development and building footprints. This includes maintaining an average buffer around these ecosystems of typically 10m to ensure building areas do not disturb the polygons. Further to the above, smaller Garry Oak polygons (less than a 1000 square meters in area) will be protected where possible by conservation covenants registered with individual property owners. To ensure these covenants are left in a natural state, photopoint monitoring will be initiated to document the natural state prior to construction in and around the interface of areas deemed sensitive.

Figure 2. Garry Oak Meadows Distribution Map



2.2 WILDLIFE

2.2.1 Survey Methodology

All wildlife surveys conducted on the Study Area were performed as much as possible according to Resource Inventory Committee and/or Canadian Wildlife Service standards where possible. Secondary source information was collected using various government databases and internet searches.

2.2.1.1 *Raptors and Breeding Bird Inventory*

The raptor and breeding bird surveys used a two-part methodology:

- An office background information search; and
- A field study preparation with Study Area inspections.

Presented below are the detailed methodologies used to assess the potential red/blue/yellow listed passerine and raptor habitat use of the delineated Study Area.

2.2.1.1.1 Office Study

The following office preparation was performed prior to the field surveys:

- Review of BC Ministry documents “*Standard Inventory Methodologies for Components of British Columbia’s Biodiversity: Raptors*”(Version 1.1);
- Review of “*Inventory Dataforms for Raptors Standards for Components of British Columbia’s Biodiversity No. 11 [Forms]*”;
- Review of relevant mapping for the Study Area (i.e. topographic mapping, aerial photography); and
- Review of target species including those identified by the British Columbia Conservation Data Centre (BC CDC) as red and/or blue listed

as well as related habitat use, feeding behaviour, breeding behavior, and species vocalizations.

2.2.1.1.2 Field Study

Sample Design

The study design followed the:

- Resource Inventory Committee's (RIC) presence/not detected protocols of "*Standard Inventory Methodologies for Components of British Columbia's Biodiversity: Raptors (Version 1.1) Sections 3.3.3, 3.3.4, 3.3.6 and 3.3.7*;
- Canadian Wildlife Service's (CWS) "*Forest Bird Monitoring Program (FBMP)*"; and
- Environment Canada's (Env. Can.) "*Breeding Bird Survey (BBS)*".

To ensure adequate detection of all species present, our Study Area was delineated into eight separate transects which were equally spaced. (Refer to *Appendix D – Biophysical Assessment Map*). Transects were labelled from 1- 8 starting from the northwest corner and going in a counter clockwise direction in an attempt to capture representative cross sections of all areas of the property. Further to the assessments along these transects, individual point count stations were set up at key locations along the length of the transect ensuring that the majority of the Study Area would be surveyed/inventoried and therefore thoroughly covered using protocols of "standwatch" and roadside call playback methodology. Transects also sampled the different vegetational structure and their structural stages. Additionally, the methodology ensured that the Study Area would be thoroughly covered including possible building locations as well as future roads having the greatest potential impact on the target species.

Any passerine and raptor visual encounters along with auditory accounts (songs/calls) were recorded during each point count survey, roadside call playbacks as well as throughout the site inventory survey as incidental sightings.

Foot (transect) surveys followed the procedures outlined in “*Standard Inventory Methodologies for Components of British Columbia’s Biodiversity: Raptors (Version 1.1) Section 3.3.6*”. This method was used to supplement point count, roadside and call playback surveys in order to verify any presence/not detected (but possible) occurrence of breeding raptors, any heronry areas (nests) or significant passerine, and to identify any nests on the property.

Most survey effort to locate raptor (hawk, owl, eagle) and passerine nest presence was focused on areas in the woodlots. This included observing all tree tops of older second generation conifer trees found on site with a high powered and anchored spotting scope.

Stand Watch (Point Count) and Nocturnal Call Playback Surveys

“Stand Watch” (Point Counts) Methodology

Procedures used in the survey are outlined in “*Standard Inventory Methodologies for Components of British Columbia’s Biodiversity: Raptors (Version 1.1) Section 3.3.7*”, *CWS FBMP and Env. Can. BBS*.

Point counts were spaced approximately 100m apart along transects and covered all of the Study Area where the proposed development pod footprints and roads were the highest. Each involved a five-minute survey at their stop location using the following:

- standing and watching the surrounding area for bird species; followed by
- recording the number of all birds seen (visuals) and heard (song/call) within a radius of approximately 100 m.

Results of these surveys are presented in Tables 8-10

Nocturnal Roadside Call Playback Survey Methodology

The roadside call playback surveys for nocturnal raptors followed procedures outlined in “Standard Inventory Methodologies for Components of British Columbia’s Biodiversity: Raptors (Version 1.1) Section 3.3.3”.

Calls and songs of five target species potentially occurring in the Study Area were played at Owl Calling Stations (OCS) 1-4, (Refer to *Appendix D – Biophysical Map*). Call playbacks were played at each station using a tape recorder for a period of three minutes/target species for a total of fifteen minutes. Following the call/song vocalisations, the observer looked and listened for a visual and/or vocal response of that target species, both during and after each call and song was played. All call playback surveys were conducted by foot.

Target species songs and calls used at the OCS station were as follows; each call/song was played in the following order ensuring that the smallest birds were first and the largest birds called last as per standards:

- 1) Northern Saw-whet Owl (NSWO);
- 2) Northern Pygmy Owl (NOPO) Blue-listed;
- 3) Western Screech Owl (WESO) Blue-listed;
- 4) Barred Owl (BDOW); and
- 5) Great-horned Owl (GHOW).

2.2.1.2 Amphibian Survey

The aim of this inventory was to sample the Study Area by conducting a herpetifaunal survey of reptiles and amphibians along any watercourse and/or wetland on the property. Additionally, areas of greatest sensitivity (adjacent to wetlands) with respect to herpetifaunal habitat were surveyed with greater intensity.

This survey involved a two-part methodology:

- An office background information search; and

- A field study preparation with Study Area visit.

Presented below are the details to the methodologies used to assess the presence/not-detected status potential of the red/blue-listed herpetifauna in the delineated Study Area.

Office Preparation

The following office preparation was performed prior to the field surveys:

- Review of the introductory manual, *Species Inventory Fundamentals (No. 1)*;
- Review of 1:20,000 and 1:5,000 scale maps of the project area;
- Review of BC Ministry documents “*Standard Inventory Methodologies for Snakes Standards for Components of British Columbia’s Biodiversity No. 38: Snakes*”(Version 2.0);
- Review of BC Ministry documents *Inventory Methods for Pond-breeding Amphibians and Painted Turtle Standards for Components of British Columbia’s Biodiversity No. 37 (Version 2.0)*;
- Relevant mapping for the Study Area i.e. topographic mapping, aerial photography); and
- Review of target species including habitat use, feeding behaviour, and breeding behaviour.

Field Study

Sample Design for Amphibians

The amphibian surveys focused on identifying the presence/not-detected status of any herpetifauna but special focus was on the blue listed species the red-legged frog. Although this blue listed species and its habitat identifications were of focus, all incidental amphibian sightings during the survey period were recorded.

The presence/not-detected inventory status of herpetofauna within the Study Area followed methodologies outlined in “*Inventory Methods for Pond-breeding Amphibians and Painted Turtle Standards for Components of British Columbia's Biodiversity No. 37 (Version 2.0)*.” Survey methodologies followed RIC protocol and included:

- Auditory surveys;
- Road/Transect Surveys;
- Time-constrained searches; and
- Systematic surveys.

Further, following the review of aerial photo interpretation amphibian survey habitat inventory locations were identified along the transect. These focused on areas of watercourses and ponded water habitat along riparian edges of all wetlands/lakes as well as on accessible roads with characteristic habitat for the target and other herpetofaunal species.

Auditory Surveys

Auditory surveys were only conducted during evening hours at dusk along with the nocturnal raptor survey. This method of survey involved listening for the calls of male frogs and toads along wetlands accessible during evening/night times.

This survey followed the methodology outlined in Canadian Wildlife Service’s “*North American Amphibian Monitoring Program (NAAMP)*”. Surveys were conducted during the evening at all wetlands. The following methodology was used as part of the RIC protocols:

- A stratified, randomized approach was used for all sites;
- Areas of systematic sampling along the roads accessing the property, roads or around any associated wetlands, the listening stations were set at regular intervals of approximately 100m apart and were incorporated as part of the nocturnal raptor survey;
- Each survey stop lasted fifteen minutes and followed NAAMP guidelines;

- Surveys were carried out after dark; approximately one hour after dusk; and
- All species heard were recorded.

Roadside Transect Surveys

The road surveys were conducted during the evening in conjunction with the nocturnal raptor surveys. Survey structure was consistent with RIC protocols and was designed as follows:

- All stations were incorporated periodically along the road's length (50m apart);
- Where possible, as a process of random stratified sampling, point count locations included areas of small potential breeding ponds and any encountered waterbody areas;
- Where accessible, all roadside ditches were checked during daylight and evening hours;
- Access for the surveys was foot;
- Access to each point was walked at slow speeds (approximately 2 km/h), using flashlights; and
- Attention was paid to potential road kills and any herpetofauna/animal moving across or from the road.

Time-constrained searches

Time-constrained searches involved searching areas of the Study Area that are likely to contain the target species. Searches were performed primarily during the day, following the review of aerial photo interpretation. The amphibian survey was stratified based on their expected occurrence at selected locations. Search effort focused on areas where they were most likely to occur (wetted depressions, streams etc.).

Systematic Searches

Searches for salamanders' larvae and any adult forms were performed along all wetted drainages/ponds within the Study Area. Randomly chosen sections of Stream #1 through

Stream #9 were surveyed for any metamorphosed salamanders. As well, all potential rocks (hiding sites) were overturned where possible around the perimeter of all wetlands. For the identification of any larval stage of salamander and/or red-legged frog along wetted areas, the following survey methodologies were employed:

- foot searches uncovering any woody debris or aquatic vegetation were performed and all vegetation was assessed for egg masses during the foot searches of the ponds;
- 5 MT sites for a period of 72 hrs, 25 Gee traps (minnow traps) baited with cat food were placed in all waterbodies and in depressions that were wet at the time of our survey and checked daily. Each trap was recovered and checked for the presence of any larval salamanders and/or tadpoles of the red-legged frog as well as for all other species of amphibians;
- any shallow pools and areas of warm water in the ponds and sections of ephemeral drainages were examined for tadpoles and salamanders; and
- All species seen or heard were recorded, together with any necessary habitat information.

2.2.1.3 Small Mammal Survey

This survey focused on the entire Study Area and followed the MoE Inventory Branch for the Terrestrial Ecosystems Task Force Resource Inventory Committee (RIC) protocols.

Office Procedures

The following office preparation was performed prior to the field surveys:

- Review of the *“Inventory Methods for Small Mammals : Shrews, Voles, Mice & Rats”, Standards for Components of British Columbia’s Biodiversity, No. 31 (1998);*

- Review the introductory manual No. 1 *Species Inventory Fundamentals*;
- Determine species to be studied;
- Obtain maps for project and Study Area (1:20 000 TRIM maps, 1:5,000 planning maps);
- Determine approximate location of Study Area(s) within this project area;
- Stratify Study Areas based on habitats; and
- Determine sampling area dimensions, trap spacing, trapping intervals.

Field Sampling Procedures

Sample Design

This study involved determining the presence/non-detected status of species by establishing randomly located traps sites along a transect (index lines) within the Study Area (Small Mammal Trap 14 locations – SMT1 -14). The number of traps along the transect was dependent on the potential species, estimated population levels and the objectives of the study (to find presence/non-detected status of small mammals). Live traps were used to provide a means of live-capturing individuals whereas snap traps result in the permanent removal of captured individuals. The following methodology was used during the survey:

- All traps were placed in areas where rodents and small to medium sized mammals were expected to occur in the project Study Area;
- Five small traps (mice, shrews etc.) and two larger traps (used at one location for weasels, raccoons, cats etc,) were used.
- Each type of vegetation unit on the Study Area was sampled using this methodology and traps were placed in homogeneous habitat (*Appendix D, Biophysical Assessment Map*);
- GPS datapoints units were taken for each trap location;
- All traps were flagged with flagging tape at capture stations;

- Traps were placed >2m apart in microclimate sites that would attract shrews and mice, etc. These included positions along or under woody debris or rocks, under bushes, along travel trails;
- Each trap was baited with peanut butter (mice, shrews) and sardines (larger traps);
- Traps were set in the late afternoon and checked the following afternoon to minimize mortalities and trap stress;
- Captured individuals were identified to species;
- Trapping sessions occurred over a period of 72 hrs.
- On completion of the study all traps were removed;

2.2.1.4 Large Mammal Survey

The purpose of the large mammal ground survey was to:

- Assess the presence/not detected (possible) status of any mammals in habitat identified through topographic mapping;
- Identify areas for potential habitat use; and
- Record observations of any mammal presence (incidental sightings).

The following ground-based survey protocol was conducted for this phase of the large mammal survey:

Office Study

- Review of BC Ministry documents Section 2 “Conducting Wildlife Inventory” in the introductory manual, *Species Inventory Fundamentals (No.1)*.;
- Review of mapping for the area (i.e. air photo, 1:5,000 scale and topographic mapping, 1:20,000 scale TRIM mapping);

- Identify areas for potential habitat use and
- Identify all transects to be performed for field study.

Sample Design

This survey involved the assessment of large mammals using presence/not-detected surveys. There were two goals of using this inventory methodology:

To make a list of observed species for the Study Area; and to determine species/habitat associations.

This was made based on the identification of the following:

- Scat sign;
- Track sign;
- Forage/browse sign;
- Scrapings;
- Historical information compilation and
- Direct field observation.

The method of ground-based sampling used for the survey was structured using *Transect Methodology (Encounter Transects)*. Protocol for this ground-based survey followed the procedures as outlined in *Species Inventory Fundamentals Standards for Components of British Columbia's Biodiversity No.1*. The ground-based surveys were performed during the day and evening (during the nocturnal raptor survey). During the day ground surveys commenced as soon as it was light enough to classify animals on the ground (0630 hrs.). Using binoculars transects were walked as well as along the existing trails and roads.

Species Ratings and Accounts

Background

Attached in Appendix A, is a list of BC Conservation Data Centre's Rare Vertebrate Animal Tracking List for the South Island Forest District (2008). Red and Blue rated vertebrates potentially occurring within this Forest District are listed.

The COSEWIC and British Columbia's Red, Blue and Yellow rating status definition for each species identified are presented below.

COSEWIC ratings for species have been defined the following ways:

Extinct - A species that no longer exists.

Extirpated - A species that no longer exists in the wild in Canada, but occurring elsewhere (for example, in captivity or in the wild in the United States).

Endangered - A species facing imminent extirpation or extinction.

Threatened - A species likely to become endangered if limiting factors are not reversed.

Vulnerable - A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.

Not At Risk - A species that has been evaluated and found to be not at risk.

Indeterminate - A species for which there is insufficient scientific information to support status designation.

Red, Blue and Yellow status as defined by the B.C. Conservation Data Centre's Red, Blue and Yellow definitions are as follows:

Red list:

Includes any indigenous species or subspecies (taxa) considered to be Extirpated, Endangered, or Threatened in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed. Red-listed taxa include those that have been, or are being, evaluated for these designations.

Blue List:

Includes any indigenous species or subspecies (taxa) considered to be Vulnerable in British Columbia. Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered or Threatened.

Yellow list:

Any indigenous species or subspecies (taxa), which is not at risk in British Columbia. The CDC tracks some Yellow listed taxa, which are vulnerable during times of seasonal concentration (eg. breeding colonies).

Raptors listed in BC Conservation Data Centre's Rare Vertebrate Animal Tracking List South Island Forest District (2008) and their COSEWIC status are presented in a species evaluation below. Presented as well, are the "target species" (defined by "*") – raptors that have the potential to occur in the Study Area. Evaluating the habitat necessary to sustain the raptor and comparing these requirements to the Study Areas attributes have selected the target species. Study Area attributes have been taken from vegetation analysis during the fieldwork exercise and a review of BEC zone inventory data, forest cover mapping by the evaluation of the Study Area general vegetative structure, and field surveys.

Presented below is a short summary that describes the habitat requirements and the potential for occurrence of each targeted Red/Blue or Yellow Listed animal in the South Island Forest District.

Select Accounts of Red/Blue/Yellow Raptor Species Potentially Occurring on the Study Area

Order Falconiformes

Family Accipitridae

Bald Eagle (*Haliaeetus leucocephalus*), BAEA - Yellow Listed

The bald eagle is listed Yellow by the CDC in the South Island Forest District (April 2008) and is not listed with COSEWIC.

The habitat in the Study Area is well suitable for breeding or foraging for this species. The bald eagle is primarily associated with aquatic habitats including seashores, lakes, rivers, sloughs, and marshes (Campbell *et. al.* 1990, Bent 1937 and Palmer, 1988). Most

nests of this species along the coast have been no further than 100 m from the shore of a large water body (Campbell *et. al.* 1990).

Bald eagles were found nesting at several locations on the property. Refer to *Appendix H – Environmental Constraints Map* (wildlife trees) for approximate locations of the nests.

Northern Goshawk (*Accipiter gentilis*), NOGO – Red-listed

Two subspecies of the northern goshawk occur in British Columbia: *A. g. atricapillus* and *A. g. laingi*. *A. g. laingi* is RED-listed because the population is sparse, restricted to coastal forest, and heavily reliant on mature-to-old forest. It is designated as vulnerable in Canada by COSEWIC. *A. g. atricapillus* is considered to be regionally important. It is considered a species of conservation concern because it is associated with habitats that are becoming rare, and it is a species for which B.C. has a global responsibility because adjacent jurisdictions have listed it at risk. The northern goshawk (*Accipiter gentilis atricapillus*) is designated as “not at risk” by COSEWIC for all provinces and territories in Canada as of 1995.

For the northern goshawk major prey are usually associated with old-growth forests or forest edges. The “nest area”, may contain several nest sites, is approximately 12 ha, and characterized by several stands of large, old trees with dense canopy cover (Crocker-Bedford 1990, Palmer 1988). Northern goshawk foraging area occupies about 2,400 ha including the post-fledging area (Austin 1994). It may include a diversity of landforms and forest cover types, but areas with greater canopy cover, greater basal area, and more trees per hectare are used more frequently in some parts of the species range within mature forest and old forest interspersed with low and tall shrubs (Bright-Smith 1994, Crocker-Bedford 1990, Palmer 1988).

Northern goshawk nest area is situated in stands of large trees, with dense canopies and relatively open understories. Nesting habitat is typically on gentle slopes, usually less than 30% slope, and always less than 60%. Post-fledging habitat contains numerous feeding perches (stumps, downed snags, large horizontal limbs below the canopy), and their relatively open understorey is thought to facilitate the pursuit and capture of prey (Graham *et. al.* 1994 Austin 1994)

Post-fledging habitat should provide abundant hunting opportunities to young, while maintaining higher than average cover from predators. This post-fledging area is characterized by a mosaic of structural stages, and coarse woody debris throughout the habitat, these provide extensive and varied habitat for the prey base of the Northern goshawk (Graham *et. al.* 1994).

Northern goshawks are expected on-site.

American Peregrine Falcon (*Falco peregrinus anatum*), PEFA - Red Listed

This species has been designated by COSEWIC as threatened in BC. There are three sub species/races reported in North America. Of the three, the anatum (*F. p. anatum*) and Peale's race (*F. p. pealei*), are both located in BC. The tundrius peregrine (*F. p. tundrius*) is considered a transient through the province (Campbell *et. al.* 1990). Two of the PEFA sub species are considered at risk; the anatum and the tundrius are the only races officially listed as threatened (downlisted from endangered in 1999 USFWS) in the U.S. The tundrius has been recently changed to "Endangered" for Canada (COSEWIC) and the Peale's population is considered stable in BC.

The American peregrine falcon in BC breeds along the outer and inner coasts but tends to be centralized along sea bird colonies (Campbell *et. al.* 1990). With the exception of eyries in the Fraser lowlands (Campbell *et. al.* 1990), there are no known coastal mainland breeding sites (Campbell *et. al.* 1990). The American peregrine falcon prefer nest sites close to water (Palmer 1998), - niches in open terraces of cliffs and valleys in the province, not too high in elevation. Forage areas are favored when adjacent to lakes and large waterbodies (Bent 1937, Palmer 1998). As a result of the above habitat requirements, the overall Study Area is thought suitable for breeding and/or foraging for this species although no individuals have been documented to date.

Order Strigiformes

Family Tytonidae

Barn Owl (*Tyto alba*), BNOW - Blue Listed

This species is Blue listed by the CDC in the South Island Forest District (April 2005). It is designated as vulnerable by COSEWIC in western Canada and endangered in eastern Canada since 1999.

The Barn owl breeds throughout the year in BC with its range restricted to the Fraser Lowlands, southern Vancouver Island and the odd occurrence in the Okanagan Valley (Campbell *et. al.* 1990). It prefers open country within agricultural systems, nesting in cavities, cliff crevices. Eggs and rears young year round (Bent 1937, Campbell *et. al.* 1990).

The Barn owl is common and most abundant in all of Canada in the Lower Mainland of BC (Campbell *et. al.* 1990). Highest concentrations and densities of this owl are along the coast (Campbell *et. al.* 1990). Although it is one of the most abundant owls in the Fraser Lower Mainland it is unlikely to occur in the Study Area because of the absence of foraging habitat. The family Tytonidae are evolutionarily a tropical owl and require larger than normal owl food requirements (VanTyne and Berger 1971). The Barn owl prefers open country associated with agricultural areas, but also frequents grasslands, river bottom meadows, and to a lesser extent, cities, and residential areas (Campbell *et. al.* 1990).

In the Fraser Lowlands the population is predominately resident where it breeds in old building structures adjacent to fields necessary for foraging. As a result of the habitat requirements, barn owls are not thought likely to occur within the Study Area, however, have the potential to occur given small tracks of suitable habitat.

Family Strigidae

***Western Screech-Owl (*Otus kennicottii macfarlanei*), WESO – Blue-listed**

This species is currently indeterminate by COSEWIC in BC and listed as Blue in the South Island Forest District (June 2008). It is a target species for the survey as it has a moderate likelihood of occurring in the Study Area.

The western screech owl is an occupant of riparian deciduous areas roosting in cavities, nest boxes, trees vines and crevices (Campbell *et. al.* 1990, Bent 1937). Being quite adaptive, the western screech owl frequents orchards, parks and gardens in more urbanized areas. That said, because nesting of this species is likely to occur at elevations above 540 metres (Campbell *et. al.* 1990). These owls are not expected to breed within the Study Area and instead, may use the available habitat primarily for foraging.

***Great-horned Owl (*Bubo virginianus saturatus*), GHOW**

The CDC does not list this species as Red, Blue or Yellow, nor is it listed with COSEWIC as a bird of concern in Canada. This bird is a target species for the Study Area as it has a moderate to high likelihood of occurring given the available habitat. The Great-horned owl is very common in BC being very versatile and occupying a number of habitats, quite commonly timberland areas. It frequents lakeshores, river valleys, agricultural and residential areas, swamps, fresh and brackish marine marshes, and estuaries (Campbell *et. al.* 1990) nesting in densities of one pair/8.2 km² (Kirley and Springer 1980).

As a resident (non-migratory) species, the Great-horned owl stays on the lower mainland year-round. It breeds throughout the province almost anywhere there are groups of small trees and it may be found in dense forests and/or open woodlots bordering lakes and streams. Nests have been discovered from sea level to approximately 1,220 m (Campbell *et. al.* 1990).

As a result of the above habitat requirements, the overall Study Area is thought suitable for breeding and/or foraging for this species.

***Northern Pygmy Owl (*Glaucidium gnoma*), NOPO – Blue-listed**

This species has been designated as “not at risk” by COSEWIC in BC and is listed as a Blue species of concern by the CDC in the South Island Forest District (June 2008). This is a target species.

The northern pygmy owl is an uncommon resident across the province of BC and most abundant across the northwest and southern part of the province. Resident populations are restricted to the southern portions of the province (Campbell *et. al.* 1990).

This owl occupies the edges of open coniferous forests or mixed woodlands of riparian thickets, damp and dry meadows, vacant city lots, parks, cemeteries and residential areas. The northern pygmy owl is primarily a cavity nester and as a result, its nests discovered in BC have been in old woodpecker holes of coniferous trees including Douglas-fir, western hemlock, and western larch. It has a moderate potential of occurring within the Study Area due to the presence of suitably sized trees.

***Barred Owl (*Strix varia*), BDOW**

This species has been designated as “not at risk” by COSEWIC in BC and is not listed a species of concern by the CDC in the South Island Forest District (2003). The Barred owl is a target species.

The Barred owl is a resident across BC and a widespread breeder along the southern and eastern end of the province. Despite being primarily a bird of deep forests, preferring mixed coniferous woodlands (spruce, sub-alpine fir, western hemlock, lodgepole pine, western red cedar), it occurs less commonly in deciduous woodlots (Campbell *et. al.* 1990). The BDOW has been seen in areas such as farmlands, cities, and residential areas, it has been seen in riparian thicket, on railroad bridges, house awnings, ornamental trees, fence rows, television aerials, apartment balconies and trees in parks, school yards, and along busy streets to an elevation of approximately 1,250 m (Campbell *et. al.* 1990). Summer accounts in the coastal area of BC have been in Surrey, Vancouver, and on Mount Seymour.

Barred owls are expected within the Study Area.

Short-Eared Owl (*Asio flammeus*) – Blue Listed

This species has been designated as vulnerable by COSEWIC in BC since 1994 and Blue listed by the CDC in the South Island Forest District (2003).

The Short-eared owl prefers large open fields for breeding and foraging.

Short-eared owls are not expected on the Study Area.

***Northern Saw-whet Owl (*Aegolius acadicus*), NSWO**

This owl species is designated as “not at risk” by COSEWIC in BC and is not listed a species of concern by the CDC in the South Vancouver Island Forest District (2003).

The Northern saw-whet owl is a target species.

The Northern saw-whet owl is found primarily in forested habitats of mixed coniferous/deciduous stands to elevations from sea level to approximately 2,200 m (Campbell *et. al.* 1990). Species have been recorded on the coast in spring and summer in New Westminster and Surrey (Campbell *et. al.* 1990).

Northern saw-whet owls nest in old snags that have been excavated by woodpeckers (secondary cavity nesters). It has a moderate potential of occurring on-site due to the presence of suitably sized trees.

Select Accounts of Red/Blue/Yellow Amphibian Species Potentially Occurring on the Study Site

Red-legged Frog (*Rana aurora*), Blue-listed

This species has been designated as vulnerable by COSEWIC in BC and Blue listed by the CDC in the South Island Forest District (2008).

Outside of the breeding season, these frogs are highly terrestrial and can be found in forests far from standing water. They can occasionally be found inside decayed logs.

Breeding takes place early in the spring in shallow water in permanent ponds and swamps. This frog calls underwater and the calls are weak so it is difficult to hear above water. Eggs, which are laid in a large (20 to 30 cm) loose gelatinous clusters tend to deteriorate toward the end of embryonic development. The embryos develop and hatch after about four weeks of development, and the tadpoles transform after four or five

This small mammal prefers dense, moist coniferous forests, on beaches, and in marshes, in heavily wooded, wet areas, on the banks of sluggish streams, in beach debris, and during winter rainy season may be found well away from water. It is found primarily near estuaries, wetlands, lakes, streams, and in agricultural areas and riparian forests. It is insectivorous with foods including soft-bodied arthropods and terrestrial and aquatic invertebrates; insect larvae, slugs and snails, Ephemeroptera naiads, earthworms and unidentified invertebrates, primarily aquatic.

It has a high potential of occurring on the Study Area.

Vancouver Island Ermine (*Mustella ermina anguinae*), Red-listed

While COSEWIC in BC has rated the sub species *M. e. haidarum* as vulnerable this sub species is not recognized by COSEWIC and it has been Red listed by the CDC in the South Island Forest District (2008).

The ermine, or short-tailed weasel is intermediate in size between the long-tailed weasel and the least weasel. It inhabits a variety of habitats. In North America, it is most abundant in boreal, montane, and Pacific Coast coniferous forests. Ermines avoid dense forests and settle in successional or forest-edge habitats, wet meadows, marshes, ditches, riparian woodlands, or riverbanks with high densities of small mammals. Ermine exhibit a decided preference for early successional communities and avoided forested habitats and male ermine were more often associated with shrubs than were females. Males generally occupy a wider range of habitats than females and both male and female ermines occupy more habitat types during spring and summer than during fall and winter. Given the large diversity of available habitat within the Study Area, this species has a moderate potential of occurring in our Study Area.

2.2.2 Assessment Results

2.2.2.1 Bird Inventory

The bird survey was conducted on various dates in between September 2006 and July 2008. The night/nocturnal surveys were completed on the evening of January 16th 2007. A total of 62 bird species (passerines and raptors) were encountered on the Study Area during the transect survey and as incidental sightings. As point count stations/owl calling stations were aligned along designated transects, the summary table below incorporates all birds identified to the nearest transect location and number. The following summarizes the results of the transect/point count and roadside call playback surveys performed on the delineated Study Area over a two year period.

Table 8. Summary Table of Passerine Bird Survey

Transect #	Date	Total Species Encountered Along Each Transect	Red/Blue Species Encountered
1	Various 2008	11	0
2	Various 2008	13	0
3	Various 2008	8	0
4	Various 2008	10	0
5	Various 2008	13	0
6	Various 2008	18	1
7	Various 2008	9	0
8	Various 2008	10	0
TOTAL		92	0

Detailed information on species observed is presented below in Table 9 and 10.

Table 9. Species Abundance and Diversity Along Each Transect

Transect	No. of Individuals Observed at Each Station
1	20
2	26
3	9
4	14
5	19
6	35
7	15
8	17
Total	155

Table 10 Avian Species List

Coopers hawk	<i>Accipiter cooperii</i>
Sharp-shinned hawk	<i>Accipiter striatus</i>
Red-winged blackbird	<i>Agelaius phoeniceus</i>
American wigeon	<i>Anas Americana</i>
Green winged teal	<i>Anas crecca</i>
Mallard	<i>Anas platyrhynchos</i>
Great blue heron	<i>Ardeus Herodias</i>
Ring-necked duck	<i>Aythya collaris</i>
Cedar waxwing	<i>Bombycillia cedrorum</i>
Ruffed Grouse	<i>Bonasa umbella</i>
Canada Goose	<i>Branta canadensis</i>
Great-horned owl	<i>Bubo virginianus</i>
Bufflehead	<i>Bucephala albeola</i>
Common goldeneye	<i>Bucephala clangula</i>

Red-tailed hawk	<i>Buteo jamaicensis</i>
California Quail	<i>Callipepla californica</i>
House Finch	<i>Carpodacus mexicanus</i>
Turkey vulture	<i>Cathartes aura</i>
Hermit thrush	<i>Catharus guttatus</i>
Brown creeper	<i>Certhia Americana</i>
Belted kingfisher	<i>Ceryle alcyon</i>
Northern Flicker	<i>Colaptes auratus</i>
Oliveside flycatcher	<i>Contopus cooperi</i>
Northwestern Crow	<i>Corvus caurinus</i>
Common Raven	<i>Corvus corax</i>
Stellar's jay	<i>Cyanocitta stelleri</i>
Tundra swan	<i>Cygnus columbianus</i>
Mute swan	<i>Cygnus olor</i>
Yellow-rumped warbler	<i>Dendroica coronata</i>
Townsend's warbler	<i>Dendroica townsendi</i>
Pileated wood pecker	<i>Dryocopus pileatus</i>
Dusky flycatcher	<i>Empidonax oberholseri</i>
Merlin	<i>Falco columbarius</i>
American kestrel	<i>Falco sparverius</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Barn swallow	<i>Hirundo rustica</i>
Varied thrush	<i>Ixoreus naevius</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Hooded merganser	<i>Lophodytes cucullatus</i>
Song Sparrow	<i>Melospiza melodia</i>
Common merganser	<i>Mergus merganser</i>
Savannah sparrow	<i>Passerculus sandwichensis</i>
Fox sparrow	<i>Passerella iliaca</i>

Black-headed grosbeck	<i>Pheucticus melanocephalus</i>
Downy woodpecker	<i>Picoides pubescens</i>
Hairy woodpecker	<i>Picoides villosus</i>
Spotted Towhee	<i>Pipilo maculatus</i>
Chestnut-backed chickadee	<i>Poecile sclateri</i>
Golden-crowned kinglet	<i>Regulus satrapa</i>
Rufous hummingbird	<i>Selasphorus rufus</i>
Red-breasted nuthatch	<i>Sitta Canadensis</i>
Red-breasted sapsucker	<i>Sphyrapicus nuchalis</i>
Barred Owl	<i>Strix varia</i>
European starling	<i>Sturnus vulgaris</i>
Bewick's wren	<i>Thryomanes bewickii</i>
Winter wren	<i>Troglodytes troglodytes</i>
American robin	<i>Turdus Migratorius</i>
Hutton's vireo	<i>Vireo huttoni</i>
Vireo Spp.	<i>Vireo NA</i>
Wilson's Warbler	<i>Wilson's warbler</i>

Diurnal Stand Watch/Point Counts

The greatest number of individuals and species diversity was observed along transect 6 and the lowest was along transect 3. No heronry/rookery sites were noted within the Study Area during the survey despite meticulous searching with a high powered/anchored spotting scope. The Study Area does however have moderate-high foraging opportunities as well as good resting/perching opportunities for diurnal raptors.

Nocturnal Stand Watch/Point Counts

The nocturnal raptors (owls) survey was conducted the evening of January 15th 2007 at four raptor/owl calling station (OCS #1- #4), which had been established at what was

assumed to be an excellent calling location (*Appendix D – Biophysical Assessment Map*). The site proved to be successful in luring in 2 Great Horned-Owls as well as 2 Barred Owls. The arrival of the owls from the west (approximately 20 minutes after the initiation of calls – Owl Calling Station #3) suggests that they are most probably nesting within the Study Area.

2.2.2.2 Amphibian Survey

The amphibian survey was conducted on various dates in between March 2007 and July 2008.

A total of 11 roughskin newts, 6 red-legged frogs and 22 pacific tree frogs were encountered during the survey period. Transects were the same as the bird inventory transects. All wetlands and adjacent riparian areas as well as woodland trails were surveyed for species.

In total, approximately 7 hours of survey time was spent searching a range of locations and habitats throughout the Study Area, including:

- All ephemeral drainages and wetted depressions; and
- All lakes and wetlands.

Auditory Survey Results

One night was spent performing the auditory surveys (January 15th 2007). This was performed in part during the nocturnal raptor survey. Any visual and auditory accounts were recorded.

No red listed species of amphibians were heard or located during the survey period. The only recorded calls came from numerous breeding Pacific Tree Frogs (*Hyla regalis*) in various locations throughout the site.

Time Constraint and Systematic Search Results

This survey methodology was the most productive for amphibian encounters. A total of 39 individuals were found during the survey. A majority of effort was spent in the riparian ecosystem as well as along watercourses labelled S1 to S9. In these locations, the survey focused on frogs and salamanders.

The Pacific tree frog, red-legged frog and roughskin newt were the only species encountered during our survey and were located in both the streams and in the lakes/wetlands as well as in the isolated wetted depression. Species assessed are presented in *Table 11 below*:

Table 11. Amphibians Encountered During Time Constraint and Systematic Searches

Species	No.	Method	Total Time	Location
Roughskin newt	1	Minnow trap	72hrs.	Minnow trap #1
Pacific Tree Frog	3	Minnow trap	72hrs.	Minnow trap #1
Pacific Tree Frog	3	Minnow trap	72hrs.	Minnow trap #2
Red-legged frogs	2	Minnow trap	72hrs.	Minnow trap #2
Roughskin newt	1	Minnow trap	72hrs.	Minnow trap #2
Pacific Tree Frog	3	Minnow trap	72hrs.	Minnow trap #3
Red-legged frogs	1	Minnow trap	72hrs.	Minnow trap #3
Roughskin newt	4	Minnow trap	72hrs.	Minnow trap #3
Pacific Tree Frog	7	Minnow trap	72hrs.	Minnow trap #4
Red-legged frogs	2	Minnow trap	72hrs.	Minnow trap #4
Roughskin newt	3	Minnow trap	72hrs.	Minnow trap #4
Pacific Tree Frog	6	Minnow trap	72hrs.	Minnow trap #5
Roughskin newt	2	Minnow trap	72hrs.	Minnow trap #5
Red-legged frogs	1	Minnow trap	72hrs.	Minnow trap #5

Each minnow trap was checked after the 24 hour period ensuring minimal mortalities.

2.2.2.3 Small Mammal Survey

Fourteen (Havahart™) traps (Small Mammal Traps – SMT 1 - 14) were set at various homogeneous vegetative areas within the Study Area (*Appendix D, Biophysical Assessment Map*) and each habitat type was sampled, where feasible. Larger traps were also placed at all small mammal trap locations, with the primary intention to observe mid size mammals including squirrels, raccoons etc. The traps were recovered after a period of 48 hrs. (checked every 24 hr. period). Out of all the traps, 2 raccoons, 5 squirrels and 13 deer mice were caught. Please refer to Table 12 below:

Table 12. Results of Live Small and Medium Mammal Trapping

Trap Site Number	Species Captured
SMT #1	1 deer mouse, 1 grey squirrel
SMT #2	1 deer mouse
SMT #3	1 red squirrel, 1 raccoon
SMT #4	1 deer mouse
SMT #5	1 stellars jay
SMT #6	1 deer mouse, 1 raccoon
SMT #7	2 deer mouse
SMT #8	0
SMT #9	1 deer mouse
SMT #10	1 deer mouse, 1 red squirrel
SMT #11	1 grey squirrel
SMT #12	3 deer mouse
SMT #13	1 deer mouse, 1 grey squirrel
SMT #14	1 deer mouse

2.2.2.4 Large Mammal Survey

The Study Area was walked numerous times during the course of evaluation and each time it was searched for large mammal signs. As well, a more detailed assessment involving 8 transects was performed in conjunction with the bird survey. *Table 13* presents an overview of wildlife sightings within the Study Area.

Table 13. Results of Wildlife Sightings

Species	Evidence
Blacktail Deer	Visual/Carcass
Turkey Vulture	Visual
Grey Squirrel	Visual
Red Squirrel	Visual
Bald Eagle	Visual/Carcass
Red-tailed Hawk	Visual
Eastern Cottontail	Visual/Carcass
Raccoon	Visual
Cougar	Scat
Sharp-shinned Hawk	Visual
River Otter	Visual/scat
Beaver	Historical
Domestic Cat	Visual

2.3 AQUATIC RESOURCES

2.3.1 Watercourses

There are two primary ($> 3^{\text{rd}}$ order) and several smaller first order watercourses within the Study Area that meet the definition of a stream as described in the Fish/Stream Identification Guidebook (1998). The watercourses are labelled S1 to S9 in a counter clockwise direction starting with S1 (Enos Creek – Watershed Code 920-440400) and ending with Dolphin lake (Watershed Code 920-440127) and Dolphin Creek labelled S9. In all cases, the watercourses have scour and mineral alluvium and meet the minimum lengths of 100m of continuous channel. Due to the steep topography, numerous barriers to upstream fish migration and the absence of salmonids in the watershed, fish presence within the Study Area is limited to Stickleback in Enos Lake and Enos Creek. All direct tributaries are considered non-fish bearing as a result of the aforementioned barriers at Enos Lake, however, meet fish stream habitat as they flow into larger waterbodies containing fish. These watercourses are subject to the Riparian Areas Regulations (RAR) legislation and therefore require further detailed assessments at time of construction. The exception to this is Stream #2 (S#2) along the northern edge of the property, which flows north directly into the ocean as well as Dolphin Lake, and Creek. These two watercourses are considered non-fish bearing and are not subject to the Riparian Areas Regulations (RAR) legislation. The classification is a result of a background search (FISS databases 2008) and detailed sampling over 10 years associated with the Enos Lake Stickleback sampling program. Refer to Appendix F map for watercourse locations as well as detailed fisheries/biophysical table summarized for all watercourses presented in Table 13 below.

2.3.2 Fisheries Resources

2.3.2.1 Background

Fisheries data available from the Fisheries Information Summary System (FISS) for the Lakes District Study Area is presented in Appendix G (FISS 2008). Of critical

importance within the Lakes District study area is the Enos Lake Stickleback. The Enos Lake Stickleback pair is part of a group of similar unique stickleback pairs that are present in several low lying lakes within the Georgia Basin. Both the Benthic and Limnetic species have been identified by the Committee on the Status of Endangered Species in Canada (COSEWIC) and recommendations were put forward to the Federal Government for their protection. Through the recommendations by COSEWIC, the two stickleback species are listed as endangered and are now protected under the Species at Risk Act (SARA). The Enos Lake Stickleback are restricted to this single small lake and are experiencing a severe decline in numbers due to the introduction of exotics and the resulting deterioration of habitat. Due to the sensitive nature of these species urban development and future land uses adjacent to the lake will require careful monitoring. Base line water testing is already taking place, which provides all pertinent lake information at a pre-development stage. At the time of the writing of this report, the species pair in Enos Lake has been reduced to a hybrid swarm through the introduction of the signal crayfish. It is unknown how or for how long the signal crayfish have been in Enos Lake, although they are present in other lake and stream systems on Vancouver Island. The hybrid swarm designation given to the stickleback by scientists out of the University of British Columbia (UBC) means that both species have interbred to a point whereby they are no longer distinct from each other. The scientists that make up the Enos Lake recovery team are recommending a new COSEWIC assessment be undertaken on the Enos Lake Stickleback due to the hybridization of the two species, which has resulted in the extinction of the individual species in the wild. Scientists at UBC have a small stock of relatively purebred Benthic and Limnetic stickleback in several ponds and will continue to study these fish. There is a small chance, if genetic purity of this captive stock is maintained; there could be opportunity in the future to re-introduce the two species back into the lake. The introduction of these species pairs (if feasible) would have to be done in conjunction with the removal of both the existing crayfish and hybrid stickleback populations within the lake.

2.3.2.2 Surface Water Use

Water licenses within the Lakes District Study Area are limited to those associated with golf course irrigation out of Dolphin Lake which in turn pumps water out of Enos Lake. Water is pumped from Enos Lake to Dolphin Lake during the summer months, where it then flows through the golf course to holding ponds on the 18th fairway to be used for golf course irrigation.

2.3.2.3 Lake and Pond Use

Currently there is virtually no recreational use of the ponds or the two lakes on the property. Due to the shallow depth, aquatic vegetation and woody debris on the ponds there is little opportunity for them to be used for boating or other surface water activities. There is however potential to use Dolphin and more particularly Enos Lake for recreational boating. This use on the lakes should have minimal impact provided that there are limited access points for launching boats. Cascadia also recommends the restriction of gasoline outboards on the lakes to avoid potential fuel spills and to minimize the impact on wildlife.

2.3.3 Survey Methodology

2.3.3.1 Office Study

A review of Ministry of Environment, Environmental Stewardship Division (MoE) and the Department of Fisheries and Oceans (DFO) environmental databases was undertaken. Internet addresses for these databases are as follows:

Fisheries Data Warehouse

Fish Information Summary System (FISS)

<http://www.shim.bc.ca>

2.3.3.2 Field Survey

Stream Biophysical Survey

A biophysical habitat survey was conducted using parameters outlined in the MoE/DFO Stream Survey forms, which allowed information to be collected on the following:

- Channel characteristics - including floodplain description;
- Description of watercourse length, average channel width, average wetted width, average maximum depth and banks;
- Barriers to fish passage - including debris jams, culverts, weirs, beaver dams etc.;
- Substrate characteristics - including estimated percentages of materials;
- Description and percentage of pools, runs, and riffles;
- Location and description of bridges, culverts, water control, water intake and storm water discharge structures;
- Vegetation - detailed riparian overstorey, understorey, and herb layer characteristics including a species list;
- Threatened, rare and endangered species - estimated use and a detailed species list; and
- Potential salmonid spawning and rearing habitat rating (low, medium or high) with rationale for rating described.

2.3.4 Stream/Lake Biophysical Results

Waterbodies within the delineated site boundaries include two primary watercourses, which flow in opposite directions through the Lakes District. Enos Lake flows from the center of the Study Area north while Dolphin Lake and creek flow from just outside of the eastern boundary of the property to the southeast through the Fairwinds golf course. Overall, there are nine distinct streams with 17 reaches identified. Overview biophysical data for the watercourses identified is presented below in Table 14 and provides basic information including channel width, gradient etc. for the watercourses assessed. Biophysical characteristics for the largest waterbody on-site (Enos Lake) is presented below in Section 2.3.4.1. Where required, higher intensity surveys focusing on large woody debris recruitment, litter fall and shade zones of sensitivity (ZOS) will be

conducted in accordance with the newly adopted RAR legislation when building pods as well as the associated infrastructure works, fall within the Riparian Areas Regulations (RAR) assessment areas. This includes a 30m buffer from fish habitat, which may increase depending on local factors including whether or not the waterbody flows through a ravine.

2.3.4.1 Enos Lake

Enos Lake (watershed code 920-440400, ID:000356PARK) is a small coastal lake at 48-53m in elevation. Historical use of the waterbody includes a Rainbow trout stocking program in 1948 followed by a dam at the lake outlet in 1958 to facilitate local water provisions to nearby residents. Covering an area of 17.6 ha and a maximum lake depth of 12.4m. Deep waters are limited to both the centre and northern sections of the lake. Water flow into the lake is limited to two creeks along the northwestern flank of the lake as well as from two other smaller creek systems located along the southwestern and northeastern flanks. A newly constructed stormwater detention area adjacent to Enos Marsh along the southern boundary of the waterbody provides stormwater control for newly developed areas along Bonnington Avenue as well as from future developments labeled Phase 9C and 7D. With current sedimentation rates, the lake will be infilled in approximately 6000 years, however, may quadruple as a result of urbanization (COSEWIC, 2002).

Table 14. Stream Biophysical Assessment Table

Stream #	Reach #	Average Channel Width (m)	Average Gradient (%)	Primary Substrate	Dominant Riparian Vegetation	Fish Bearing Status	Length (m)	Comments
S1	1	3.71	10	cooble	Fir	Yes	80	Enos Creek
S1	2	lake	0.5	finer	Fir	Yes	2175	Enos Lake
S2	1	0.78	11	gravel	Fir	No	241	1 st order stream
S3	1	1.01	45	bedrock	Arbutus	Yes*	136	steep bedrock controlled
S3	2	wetland	0.5	finer	Fir/Arbutus	Yes*	193	**NFC
S3	3	1.12	15	gravel	Fir/Arbutus	Yes*	192	mostly overland flow
S4	1	0.89	7	gravel	Fir/Arbutus	Yes*	232	1 st order stream
S5	1	0.45	40	bedrock	Fir/Arbutus	Yes*	75	very small 1 st order
S6	1	3.78	28	cobble	Fir/Maple	Yes*	346	Incised creek - waterfall
S6	2	wetland	0.5	finer	Fir/Cedar	Yes*	406	NFC
S6	3	2.10	10	gravel	Fir/Cedar	Yes*	21	mostly outside Study Area
S6.1	1	1.85	12	cobble	Fir/Maple	Yes*	246	1 st order

								stream
S6.2	1	1.45	08	cobble	Fir/Maple	Yes*	340	moderate flows
S6.2	2	wetland	0.5	finer	Fir/Maple	Yes*	133	NFC
S6.2	3	0.83	7	gravel	Fir/Maple	Yes*	124	Mostly overland flow
S7	1	1.13	13	cobble	Fir/Arbutus	Yes*	156	very small
S8	1	1.06	12	gravel	Fir/Cedar	Yes*	76	very small
S9	1	lake	0.5	finer	Fir/Cedar	No	167	headwater of Dolphin Lake

* - Fish bearing under RAR legislation

** - No Fish Caught

2.3.6 Minnow Trap Assessment Summary

Twenty five minnow traps baited with cat food and set in 5 separate locations (five traps at each location) (*Appendix D, Biophysical Assessment Map*) was monitored over the course of three days (checked once a day). The results of our assessment are presented below in Table 15.

Table 15. Minnow Trap Sampling Summary Table

Species	No.	Method	Total Time	Location
Roughskin newt	1	Minnow trap	72hrs.	Minnow trap #1
Pacific Tree Frog	3	Minnow trap	72hrs.	Minnow trap #1
Pacific Tree Frog	3	Minnow trap	72hrs.	Minnow trap #2
Red-legged frogs	2	Minnow trap	72hrs.	Minnow trap #2
Roughskin newt	1	Minnow trap	72hrs.	Minnow trap #2
Pacific Tree Frog	3	Minnow trap	72hrs.	Minnow trap #3
Red-legged frogs	1	Minnow trap	72hrs.	Minnow trap #3
Roughskin newt	4	Minnow trap	72hrs.	Minnow trap #3
Pacific Tree Frog	7	Minnow trap	72hrs.	Minnow trap #4
Red-legged frogs	2	Minnow trap	72hrs.	Minnow trap #4
Roughskin newt	3	Minnow trap	72hrs.	Minnow trap #4
Pacific Tree Frog	6	Minnow trap	72hrs.	Minnow trap #5
Roughskin newt	2	Minnow trap	72hrs.	Minnow trap #5
Red-legged frogs	1	Minnow trap	72hrs.	Minnow trap #5

2.4 CULTURALLY MODIFIED TREES

During the overall assessment of the Study Area, a concentrated effort was made in to identify culturally modified trees within the delineated boundaries. Observation focused primarily on larger trees including red cedar, which were customarily used by indigenous peoples for various items including baskets etc. During the biophysical assessment of the Study Area no culturally modified trees were observed.

3.0 DEVELOPMENT CONSIDERATIONS

3.1 AQUATIC RESOURCES

The following represents a list of potential impacts to aquatic life and aquatic habitat within the proposed site boundaries and Study Area. Of the waterbodies identified, only Enos Lake/Creek and tributaries are considered fish habitat and therefore are subject to the RAR legislation. Overall, disturbances to these watercourses as well as the non fish bearing watercourses are expected to be minimal through the use of Low-Impact Development (LID) techniques and other and Best Management Practices (BMP) for planning & design with respect to stormwater management. These include minimizing overall stream crossing locations, maintaining adequate riparian reserves as well as controlling stormwater to maintain overall hydrological function. Please refer to the Impact Summary Table below (Table 16) for a complete list of impacts and mitigation solutions.

3.2 WILDLIFE

Wildlife impacts within the delineated site boundaries include loss of habitat for various animals presently utilizing this parcel of land as identified in our assessment. Of particular importance however, are the locations of several Garry Oak meadows within the southeastern and northwestern sections of the Study Area identified in Appendix E, Ecosystems Map. These polygons are of particular importance as they provide habitat for a variety of unique animals including several species of reptiles, butterflies and have a high propensity for wildflowers. As well, special attention should also be given to the riparian /Garry Oak/arbutus ecosystems as they provide various wildlife habitat opportunities for various birds including two species of owls. In summary, although construction activities associated with the proposed development will undoubtedly impact habitat within select areas, the overall percentage of proposed protected areas within the Study Area is expected to be high (>25%). As a result, minimal risk is

expected to the species identified in our assessments or of those species listed as having the potential to occur by the BC CDC (British Columbia Conservation Data Centre). Please refer to the Impact Summary Table below (Table 16) for a list of impacts and mitigation and enhancement recommendations.

3.3 VEGETATION

Assessments in 2007/2008 identified 91 plant species in 5 different vegetative communities. Of the five identified, the greatest diversity of plants was along the Douglas Fir/Arbutus community quadrat with 23 species identified. Assessments within this quadrat resulted in the identification of numerous flowering plants (non identified by the BC CDC as red/blue listed) forming part of a larger distinct ecosystem within a Douglas fir dominated stand of conifers. As this polygon forms one of the largest ecosystems within the Study Area, this area will undoubtedly be affected by construction activities as it has most of the buildable land within the Study Area. As a means to reduce disturbance, however, many strategies are to be employed during the development of the Lakes District, including clustering of development, delineation of “disturbance envelopes” and identification of designated “environmental management areas” within clustered development areas, and landscape design and construction guidelines to address concerns surrounding extent of clearing and potential introduction of exotic/invasive species. Please refer to the Impact Summary table below (Table 16) for a list of potential impacts and mitigation & enhancement recommendations.

Table 16. Impact Summary Table

Environmental Parameter	Potential Impacts	Mitigative Measures	Residual Impacts
<i>Vegetation</i>	Potential loss of natural vegetation currently existing on site within development areas	<p>Limit disturbances to sensitive environmental polygons (Appendix F) to no more than 30% of total area</p> <p>Reclamation of disturbed areas with native trees and shrubs.</p> <p>Replant disturbed Garry Oak trees (outside of Goert polygons) at a ratio of 3:1</p>	<p>Loss of vegetation in the area immediately required to accommodate the development footprint</p> <p>Positive impacts resulting from revegetation with native species.</p> <p>Increase to overall Garry Oak population and distribution within the study area</p>
<i>Aquatic Life and Habitat</i>	Potential loss of riparian buffers along low-moderate value habitat within development areas.	Minimize disturbances to riparian reserves as per RAR recommendations.	Increase in stormwater runoff and instream flows
<i>Wildlife</i>	<p>Loss of habitat resulting from vegetation clearing.</p> <p>Changes in wildlife movements.</p>	<p>Construction of nesting boxes with old growth attributes to accommodate the loss of older second generation forest</p> <p>Maintain undisturbed 3-5m buffer around select wildlife trees (veteran Douglas firs)</p> <p>Ensure connectivity through wildlife corridors</p> <p>No potentially sensitive</p>	<p>Loss of habitat for some species where vegetation is permanently removed to accommodate building footprints</p> <p>Minimal changes to wildlife movements</p>

	<p>Sensory disturbance to sensitive species.</p> <p>Stress to wildlife caused by increases in human encounters including foot and road traffic</p>	<p>species found to breed within 100 m of the proposed roads, driveway or building sites.</p> <p>Improve signage and provide educational material to local residences</p>	<p>Potential disturbance to some wildlife species</p> <p>Minimal/short term stress associated with increases in traffic</p>
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3.4 MONITORING

It is recommended that all construction activities within areas identified as “sensitive” (refer to *Appendix F – Environmentally Sensitive Polygons*) be to be monitored by a Registered Professional Biologist. These include areas designated as Garry Oak ecosystems, Garry Oak/Arbutus woodland ecosystems, riparian areas as per the RAR requirements as well as wildlife trees and dens. Further, it is recommended that a detailed sediment control plan be implemented prior to fall/winter rains and that sediment control structures be monitored during high rainfall events (>30mm/24 hours).

3.5 PRELIMINARY DEVELOPMENT IMPACTS SUMMARY

In support of the Preliminary Development Impact Assessment, an Environmental Constraints/Opportunities Map was prepared as a means to consolidate information related to topography, hydrology, sensitive ecosystems and recommended buffers (Refer to *Appendix H – Environmental Constraints Map*). The resultant working map provides a detailed summary of physical constraints and identified conservation values observed during the biophysical assessment stage of the project. More importantly, this map will guide the conceptual planning & design of the Lakes District as a means to explore alternative layouts/design scenarios that accommodate identified conservation values

within the Study Area. Please refer to Appendix H, Environmental Constraints Map for a detailed site map identifying all environmentally sensitive polygons within the Study Area. Works within these polygons, if required, should be discussed with a Registered Professional Biologist so that any potential negative impacts are minimized.

Given this pro-active approach to planning & design of the Lakes District, an expressed intent to designate a significant portion of the Study Area as an interconnected park system, the opportunity for BMP's during project construction, as well as the proposed mitigation & enhancement strategies, overall impacts associated with development within the Study Area will be minimized. These measures, taken together, will ensure the protection and functional integrity of the Lakes District's natural systems and in turn, will help make it a more sustainable neighbourhood.

4.0 BIBLIOGRAPHY

Austin, K.K. 1994. Habitat use and home range size of breeding northern goshawks in the southern Cascades. MSc thesis, Oreg. State Univ., Corvallis, OR.

Bent, A.C. 1937. Life Histories of North American Birds of Prey. Part 1. Smithsonian Institution, United States National Museum, Bulletin 167, U.S. Government Printing Office, Washington.

Bessinger, S.R. and Osborne, D.R. 1982. Effects of urbanization on avian community organization. Condor.

Bright-Smith, D.J. and R.W. Mannan. 1994. *Habitat use by breeding male northern goshawks in Northern Arizona*. Studies in Avian Biology 16:58-65.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser and M.C.E. McNall. 1990. The birds of British Columbia, Volumes 1 and 2. Royal British Columbia Museum and Canadian Wildlife Service.

Crocker-Bedford, C. 1990. Status of the Queen Charlotte goshawk. Unpubl. rep. U.S. Dept. Agriculture, Forest Service, Ketchikan, AK. 16 p.

Fish Stream Identification Guidebook – Second Edition (1998). Ministry of Forests. Government of British Columbia. August 1998

FISS 2008. Fisheries Information Summary System. <http://www-ops2.pac.dfo-mpo.gc.ca/fiss/dcf01.cfm>

Graham, R.T., R.T. Reynolds, M.H. Reiser, R.L. Bassett and D.A. Boyce. 1994. Sustaining forest habitat for the northern goshawk: a question of scale. In The northern goshawk: ecology and management. W.M. Block, M.L. Morrison and M.H. Reiser (eds.). Proc. symp. Cooper Ornith. Soc., 14-15 April 1993, Sacramento, CA. Studies in Avian Biol. No. 16. pp. 12-17.

Kirkley, J. S. and M. A. Springer. 1980. Nesting populations of Red-tailed Hawks and Great Horned Owls in central Ohio. Raptor Res 14:22–28.

Palmer, R. 1988. Handbook of North American Birds/Diurnal Raptors, Part 1 Vol. 4, Part 2 Vol. 5. 1998

Vantyne, Josselyn and Andrew J. Berger. *Fundamentals of Ornithology*, Dover Publications, Inc. New York. 1971.

Appendices

- Appendix A – BCCDC Rare Vertebrates (South Island)
- Appendix B – BCCDC Rare Vascular Plants (South Island)
- Appendix C – BCCDC Rare Plant Communities (South Island)
- Appendix D – Biophysical Assessment Map
- Appendix E – Ecosystem Map
- Appendix F – Waterbodies Map
- Appendix G – FISS Database Records
- Appendix H – Environmental Constraints Map



Appendix A – BCCDC Rare Vertebrates (South Island)



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Scientific Name	English Name	RISC Code	Global Rank	Prov Rank	Prov Rank Review Date	Prov Rank Change Date	COSEWIC	COSEWIC (
<i>Accipiter gentilis laingi</i>	Northern Goshawk, <i>laingi</i> subspecies	B-NOGO-LA	G5T2	S2B	November 29,2005	June 16,1997	T (Nov 2000)	
<i>Aechmophorus occidentalis</i>	Western Grebe	B-WEGR	G5	S1B,S2N	November 29,2005	November 29,2005		
<i>Allogona townsendiana</i>	Oregon Forestsnail	IM-ALLTOW	G3G4	S1S2	December 31,2002	December 31,2002	E (Nov 2002)	
<i>Ardea herodias fannini</i>	Great Blue Heron, <i>fannini</i> subspecies	B-GBHE-FA	G5T4	S3B,S4N	November 29,2005	April 24,2002	SC (Mar 2008)	
<i>Asio flammeus</i>	Short-eared Owl	B-SEOW	G5	S3B,S2N	November 29,2005	June 01,1996	SC (Mar 2008)	
<i>Botaurus lentiginosus</i>	American Bittern	B-AMBI	G4	S3B	November 29,2005	June 30,1998		
<i>Brachyramphus marmoratus</i>	Marbled Murrelet	B-MAMU	G3G4	S2B,S4N	November 29,2005	June 30,1998	T (Nov 2000)	
<i>Branta canadensis occidentalis</i>	Canada Goose, <i>occidentalis</i> subspecies	B-CAGO-OC	G5T2T3	S1N	November 29,2005			
<i>Butorides virescens</i>	Green Heron	B-GRHE	G5	S3S4B	November 29,2005	June 30,1998		
<i>Callophrys erythron sheltonensis</i>	Western Pine Elfín, <i>sheltonensis</i> subspecies	IL-CALERY-SH	G5TNR	S3	November 20,2006	January 15,2007		
<i>Callophrys johnsoni</i>	Johnson's Hairstreak	IL-CALJOH	G3G4	S1S2	November 20,2006	October 18,2001		
<i>Callophrys mossii mossii</i>	Moss' Elfín, <i>mossii</i> subspecies	IL-CALMOS-MO	G4T4	S2S3	November 20,2006	January 15,2007		
<i>Carychium occidentale</i>	Western Thorn	IM-CAROC	G3G4	S2S3				
<i>Ceryonius pegala incana</i>	Common Wood-nymph, <i>incana</i> subspecies	IL-CERPEG-IN	G5T4T5	S2	November 20,2006	January 15,2007		
<i>Cervus canadensis roosevelti</i>	Roosevelt Elk	M-CECA-RO	G5T4	S3	December 08,2006	January 15,2007		
<i>Chrysemys picta pop. 1</i>	Western Painted Turtle - Pacific Coast Population	R-CHPI	G5TNR	S2	December 03,2007	January 15,2007	E (Apr 2006)	
<i>Coccyzus americanus</i>	Yellow-billed cuckoo	B-YBCU	G5	SXB	November 29,2005	June 01,1996		
<i>Coenonympha tullia insulana</i>	Common Ringlet, <i>insulana</i> subspecies	IL-COETUL-IN	G5T3T4	S1	November 20,2006	January 15,2007		
<i>Conia tenuis</i>	Sharp-tailed Snake	R-COTE	G5	S1	December 03,2007	June 30,1998	E (May 1999)	
<i>Copatlepharon fuscum</i>	Sand-verberna Moth	IL-COPFUS	G1G2	S1	April 07,2006	April 07,2006	E (Nov 2003)	
<i>Coronothorus townsendii</i>	Townsend's Big-eared Bat	M-COTO	G4	S3	December 08,2006	January 15,2007		
<i>Cryptomastix devia</i>	Puget Oregonian	IM-CRYDEV	G3	SX	December 31,2002	December 31,2002	XT (Nov 2002)	
<i>Dermochelys coriacea</i>	Leatherback	R-DECO	G2	S1S2N	December 03,2007	January 31,1992	E (May 2001)	
<i>Enallagma hageni</i>	Hagen's Bluet	IO-ENAHAG	G5	S3S4	January 04,2004			
<i>Epitheca canis</i>	Beaverpond Baskettail	IO-EPICAN	G5	S3	January 04,2004	October 04,2001		
<i>Eremophila alpestris strigata</i>	Horned Lark, <i>strigata</i> subspecies	B-HOLA-ST	G5T2	SX	November 29,2005	July 02,2003	E (Nov 2003)	
<i>Erynnis propertius</i>	Propertius Duskywing	IL-ERYPRO	G5	S2S3	November 20,2006	January 15,2007		
<i>Erythemis collocata</i>	Western Pondhawk	IO-ERYCOL	G5	S3	January 04,2004	October 16,2000		
<i>Euchloe ausonides insularis</i>	Large Marble, <i>insularis</i> subspecies	IL-EUCAUS-IN	G5T1	SX	November 20,2006	December 06,1999	XT (May 2000)	
<i>Eumetopias jubatus</i>	Steller Sea Lion	M-ELJU	G3	S2S3B,S3N	December 08,2006	January 15,2007	SC (Nov 2003)	
<i>Euphydryas editha taylora</i>	Edith's Checkerspot, <i>taylora</i> subspecies	IL-EUPEDI-TA	G5T1	S1	November 20,2006	January 15,2007	E (Nov 2000)	
<i>Euphyes vestris</i>	Dun Skipper	IL-EUPVES	G5	S3	November 20,2006	October 04,2001	T (Nov 2000)	
<i>Falco peregrinus anatum</i>	Peregrine Falcon, <i>anatum</i> subspecies	B-PEFA-AN	G4T4	S2B	November 29,2005	June 30,1998	SC (Apr 2007)	
<i>Falco peregrinus pealei</i>	Peregrine Falcon, <i>pealei</i> subspecies	B-PEFA-PE	G4T3	S3B	November 29,2005	June 30,1998	SC (Apr 2007)	
<i>Fossaria vancouverensis</i>		IM-FOSVAN	GHQ	SH	January 01,2000	January 01,2000		
<i>Fratercula cirrhata</i>	Tufted Puffin	B-TUPU	G5	S3B,S4N	November 29,2005	June 01,1996		
<i>Gasterosteus</i> sp. 2	Enos Lake Limnetic Stickleback	G1	S1	S1	January 12,2004	January 31,1992	E (Nov 2002)	
<i>Gasterosteus</i> sp. 3	Enos Lake Benthic Stickleback	G1	S1	S1	January 12,2004	January 31,1992	E (Nov 2002)	
<i>Glaucidium gnoma swarthi</i>	Northern Pygmy-Owl, <i>swarthi</i> subspecies	B-NPOW-SW	G5T3Q	S3	November 29,2005	June 01,1996		
<i>Gulo gulo vancouverensis</i>	Wolverine, <i>vancouverensis</i> subspecies	M-GUGU-VA	G4T1Q	SH	December 08,2006	September 17,2001	SC (May 1989)	
<i>Hemphillia dromedarius</i>	Dromedary Jumping-slug	IM-HEMDRO	G3G4	S2			T (May 2003)	
<i>Hemphillia glandulosa</i>	Warty Jumping-slug	IM-HEMDRO	G3G4	S2S3			SC (May 2003)	
<i>Hirundo rustica</i>	Barn Swallow	B-BASW	G5	S3S4B	November 29,2005	November 29,2005		
<i>Lagopus leucura saxatilis</i>	White-tailed Ptarmigan, <i>saxatilis</i> subspecies	B-VTPT-SA	G5T3	S3	November 29,2005	June 01,1996		
<i>Lampetra macrostoma</i>	Cowichan Lake Lamprey	F-LAMA	G1	S1	January 12,2004	May 17,1985	T (Nov 2000)	
<i>Marmota vancouverensis</i>	Vancouver Island Marmot	M-MAVA	G1	S1	December 08,2006	June 30,1998	E (Mar 2008)	



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<i>Oncorhynchus clarkii clarkii</i>	Cutthroat Trout, <i>clarkii</i> subspecies	F-ONCL-CL	G4T4	S3S4	January 12,2004	March 06,2000	
<i>Pachydiplax longipennis</i>	Blue Dasher	IO-PACLON	G5	S3S4	January 04,2004	March 10,2004	
<i>Pamassius smirtheus olympianus</i>	Rocky Mountain Parnassian, <i>olympiannus</i> subspecies	IL-PARSMI-OL	G5T4	S2S3	November 20,2006	January 15,2007	
<i>Patagioenas fasciata</i>	Band-tailed Pigeon	B-BTPI	G4	S3S4B	November 29,2005	October 06,2000	
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	B-DCCO	G5	S3B	November 29,2005	November 29,2005	NAR (May 1978)
<i>Phalacrocorax penicillatus</i>	Brandt's Cormorant	B-BRCO	G5	S1B,S4N	November 29,2005	June 01,1996	
<i>Physella heterostrophia</i>	Pewee Phlysa	IM-PHY-HET	G5Q	S1S3	April 20,2004	April 20,2004	
<i>Physella integra</i>	Ashy Phlysa	IM-PHY-INT	G5	S1S3	January 01,2000	January 01,2000	
<i>Pinicola enucleator carlottae</i>	Pine Grosbeak, <i>carlottae</i> subspecies	B-PIGR-CA	G5T3	S3B	November 29,2005	June 30,1998	
<i>Pituophis catenifer catenifer</i>	Gopher Snake, <i>catenifer</i> subspecies	B-PICR-CA	G5T5	SX	December 03,2007	June 30,1998	XT (May 2002)
<i>Plebejus icarioides blackmorei</i>	Boisduval's Blue, <i>blackmorei</i> subspecies	IL-PLICA-BL	G5T3	S3	November 20,2006	April 26,2001	
<i>Plebejus saepiolus insularis</i>	Greenish Blue, <i>insularis</i> subspecies	IL-PLESAE-IN	G5TH	SH	November 20,2006	December 06,1999	E (Nov 2000)
<i>Poocetes gramineus affinis</i>	Vesper Sparrow, <i>affinis</i> subspecies	B-VESP-AF	G5T3	S1B	November 29,2005	June 30,1998	E (Apr 2006)
<i>Pristioma johnsoni</i>	Broadwhorl Tightcoil	IM-PRIOH	G2G3	S2S3			
<i>Progne subis</i>	Purple Martin	B-PUMA	G5	S2S3B	November 29,2005	November 29,2005	
<i>Promenetus umbilicatus</i>	Umbilicate Sprite	IM-PROUMB	G4	S3S4			
<i>Prophysaon coeruleum</i>	Blue-grey Taildropper	IM-PROCOE	G3G4	S1			E (Apr 2006)
<i>Prophysaon vanatta</i>	Scarletback Taildropper	IM-PROVAN	G4	S3S4			
<i>Ptychoramphus aleuticus</i>	Cassin's Auklet	B-CAAU	G4	S2S3B,S4N	November 29,2005	October 06,2000	
<i>Rana aurora</i>	Red-legged Frog	A-RAAU	G4	S3S4	December 03,2007	January 12,1994	SC (Nov 2004)
<i>Rana pipiens</i>	Northern Leopard Frog	A-RAPI	G5	S1	December 03,2007	June 01,1996	E (May 2000)
<i>Salvelinus malma</i>	Dolly Varden	F-SAMA	G5	S3S4	January 12,2004	March 06,2000	
<i>Sialia mexicana</i> pop. 1	Western Bluebird (Georgia Depression population)	B-WEBL	G5TNRQ	SHB	November 29,2005	December 05,2000	
<i>Sorex palustris brooksi</i>	American Water Shrew, <i>brooksi</i> subspecies	M-SOPA-BR	G5T2	S2	December 08,2006	October 13,2000	
<i>Speyeria zerene bremnerii</i>	Zerene Fritillary, <i>bremnerii</i> subspecies	IL-SPEZER-BR	G5T3T4	S2	November 20,2006	January 15,2007	
<i>Sturnella neglecta</i> pop. 1	Western Meadowlark (Georgia Depression population)	B-WEME	G5TNRQ	SXB	November 29,2005	December 05,2000	
<i>Stygobromus quatsinensis</i>	Quatsino Cave Amphipod		G2G3	S2S3	April 27,2001	April 27,2001	
<i>Sympetrum vicinum</i>	Autumn Meadowhawk	IO-SYMVIC	G5	S3S4	January 04,2004		
<i>Tramea lacerata</i>	Black Saddlebags	IO-TRALAC	G5	S1	December 08,2006	January 15,2007	
<i>Tyto alba</i>	Barn Owl	B-BNOW	G5	S3	November 29,2005	June 01,1996	SC (Nov 2001)
<i>Uria aalge</i>	Common Murre	B-COMU	G5	S2B,S4N	November 29,2005	June 01,1996	
<i>Vertigo andrusiana</i>	Pacific Vertigo	IM-VALAND	G2G3	S2			
<i>Zonitoides nitidus</i>	Black Gloss	IM-ZONNIT	G5	S3S4	March 15,2005	March 15,2005	



Appendix B – BCCDC Rare Vascular Plants (South Island)

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Scientific Name	English Name	RISC Code	Global Rank	Prov Rank	Prov Rank Review Date	Prov Rank Change Date	COSEWIC	COSEWIC Comments
<i>Abronia latifolia</i>	yellow sand-verbena	ABROLAT	G5	S3	March 15, 2002	March 07, 2001		
<i>Abronia umbellata</i> var. <i>breviflora</i>	pink sand-verbena	ABROUMB1	G4G5TNR	S1	January 31, 2005	May 20, 2004	E (May 2004)	Full Species
<i>Acaulon muticum</i> var. <i>rufescens</i>		ACAUMUT1	G4G5T4	S1	March 28, 1997	March 28, 1997		
<i>Agrostis pailens</i>	dune bentgrass	AGROPAL	G4G5	S3	November 28, 2005	October 17, 2001		
<i>Allium amplexans</i>	slimleaf onion	ALLAMP	G4	S3	April 09, 2001	March 07, 2001		
<i>Allium crenulatum</i>	Olympic onion	ALLUCRE	G4	S2	December 29, 2000	April 05, 2000		
<i>Allium geyeri</i> var. <i>tenerum</i>	Geyer's onion	ALLIGEY2	G4G5T3T5	S2S3	October 13, 2005	November 24, 2005		
<i>Alopecurus carolinianus</i>	Carolina meadow-foxtail	ALOPCAR	G5	S2	December 29, 2000	April 05, 2000		
<i>Anagallis minima</i>	chaffweed	ANAGMIN	G5	S2S3	December 29, 2000	April 30, 1996		
<i>Anemone drummondii</i> var. <i>drummondii</i>	alpine anemone	ANEMDRU1	G4T4	S2S3	December 29, 2000	April 30, 1996		
<i>Asplenium adnigrum</i>	corrupt spleenwort	ASPLADU	G3?	S2S3	December 29, 2000	April 05, 2000		
<i>Aster curtus</i>	white-top aster	ASTECUR	G3	S3	September 10, 2007	October 30, 2007	T (May 2000)	
<i>Aster paucicapitatus</i>	Olympic mountain aster	ASTEPAU	G3?	S3	October 18, 2006	October 18, 2006		
<i>Aster radulinus</i>	rough-leaved aster	ASTERAD	G4G5	S1	December 29, 2000	April 30, 1996		
<i>Balsamorhiza deltoidea</i>	deltoid balsamroot	BALSDDEL	G5	S1	January 15, 2005	May 14, 2001	E (May 2000)	
<i>Bartramia stricta</i>	apple moss	BARTSTR	GU	S1	December 01, 2000	December 01, 1996	E (May 2000)	
<i>Bidens amplissima</i>	Vancouver Island beggarticks	BIDEAMP	G3	S3	April 09, 2001	March 07, 2001	SC (Nov 2001)	
<i>Boboschoenus fluvialis</i>	river bulrush	BOLBFLU	G5	S1S2	November 28, 2005	November 28, 2005		
<i>Botrychium simplex</i>	least moonwort	BOTRSIM	G5	S2S3	December 29, 2000	January 21, 1999		
<i>Bulbosylis capillaris</i>	densetuft hairsedge	BULBCAP	G5	S1	October 30, 2006	October 30, 2006		
<i>Callitriche heterophylla</i> ssp. <i>heterophylla</i>	two-edged water-starwort	CALLHET2	G5T5	S2S3	December 29, 2000	April 30, 1996		
<i>Callitriche longipedunculata</i>	long-stalked water-starwort	CALLLO	G2G3	S1	October 22, 2001	October 23, 2001		
<i>Camassia quamash</i> ssp. <i>azurea</i>	common camas	CAMAQUA3	G5T2T4	S1S3	January 31, 2007	January 31, 2007		
<i>Camissonia contorta</i>	contorted-pod evening-primrose	CAMICON	G5	S1	December 29, 2000	April 30, 1996	E (Apr 2006)	
<i>Cardamine angulata</i>	angled bitter-cress	CARDANG	G5	S2S3	December 29, 2000	April 30, 1996		
<i>Cardamine parviflora</i> var. <i>arenicola</i>	small-flowered bitter-cress	CARDPAR1	G5T5	S1	December 29, 2000	April 11, 2000		
<i>Cardionema ramosissimum</i>	sandmat	CARDRAM	G5?	S1	October 26, 2007	October 30, 2007		
<i>Carex feta</i>	green-sheathed sedge	CAREFET	G5	S2	November 25, 2002	November 25, 2002		
<i>Carex gmelinii</i>	Gmelin's sedge	CAREGME	G4G5	S2S3	December 29, 2000	April 30, 1996		
<i>Carex interrupta</i>	green-fruited sedge	CAREINE	G4	S2	December 29, 2000	November 26, 2004		
<i>Carex pansa</i>	sand-dune sedge	CAREPAN	G4	S2S3	December 29, 2000	January 21, 1999		
<i>Carex scoparia</i>	pointed broom sedge	CARESCO	G5	S2S3	December 29, 2000	April 30, 1996		
<i>Carex tumulicola</i>	foothill sedge	CARETUM	G4	S2	August 08, 2007	November 28, 2005	E (Mar 2008)	
<i>Castilleja ambigua</i> ssp. <i>ambigua</i>	paintbrush owl-clover	CASTAMB1	G4T3T4	S2S3	September 10, 2007	October 30, 2007		
<i>Castilleja levisecta</i>	golden paintbrush	CASTLEV	G1	S1	August 07, 2007	April 30, 1996	E (May 2000)	
<i>Castilleja victoriae</i>	Victoria owl-clover	CASTVIC	G1	S1	August 29, 2007	January 26, 2007		
<i>Centaureum muhlenbergii</i>	Muhlenberg's centaury	CENTMUH	G5?	S1	December 29, 2000	April 30, 1996	E (Mar 2008)	
<i>Cephalanthera austriaca</i>	phantom orchid	CEPHAUS	G4	S2	December 29, 2000	April 30, 1996	T (May 2000)	
<i>Ceratophyllum echinatum</i>	spring hornwort	CERAECH	G4?	S3	July 09, 2002	July 09, 2002		
<i>Chamaesyce serpyllifolia</i> ssp. <i>serpyllifolia</i>	thyme-leaved spurge	CHAMSER1	G5T5	S2S3	December 29, 2000	April 30, 1996		
<i>Clarkia amoena</i> var. <i>caurina</i>	farewell-to-spring	CLARAMO1	G5T5?	S3	April 09, 2001	March 07, 2001		
<i>Clarkia amoena</i> var. <i>lindleyi</i>	farewell-to-spring	CLARAMO2	G5T5	S3	April 09, 2001	March 07, 2001		
<i>Clarkia purpurea</i> ssp. <i>quadrivulnera</i>	small-flowered godetia	CLARPUR2	G5T5	S1	December 29, 2000	October 31, 2001		
<i>Claytonia washingtoniana</i>	Washington springbeauty	CLAYWAS	G2G4	S2	December 29, 2000	January 12, 1999		
<i>Convolvulus soldanella</i>	beach bindweed	CONVSOL	G5	S3	January 09, 2003	January 09, 2003		
<i>Corydalis scouleri</i>	Scouler's corydalis	CORYSCO	G4	S3S4	September 12, 2006	November 30, 2004	NAR (Nov 2006)	
<i>Crassula aquatica</i>	pigmyweed	CRASAQU	G5	S3	April 09, 2001	March 07, 2001		
<i>Crassula connata</i> var. <i>connata</i>	erect pigmyweed	CRASCON1	G5TNR	S2	December 29, 2000	April 30, 1996		
<i>Cuscuta campestris</i>	field dodder	CUSCPEN	G5	S2S3	December 29, 2000	April 30, 1996		
<i>Cyperus squarrosus</i>	awned cyperus	CYPESQU	G5	S3	October 03, 2001	October 03, 2001		
<i>Draba lonchocarpa</i> var. <i>vestita</i>	lance-fruited draba	DRABLO	G5T3	S2S3	December 29, 2000	April 30, 1996		
<i>Dryopteris arguta</i>	coastal wood fern	DRYDARG	G5	S2S3	December 29, 2000	April 30, 1996	SC (Nov 2001)	
<i>Elatine brachysperma</i>	short-seeded waterwort	ELATBRA	G5	S1S2	October 30, 2006	October 30, 2006		
<i>Elatine rubella</i>	three-flowered waterwort	ELATRUB	G5	S2S3	December 29, 2000	April 30, 1996		
<i>Eleocharis parvula</i>	small spike-rush	ELEOPAR	G5	S2S3	December 29, 2000	April 30, 1996		
<i>Eleocharis rostellata</i>	beaked spike-rush	ELEOROS	G5	S2S3	December 29, 2000	April 05, 2000		
<i>Entosthodon fascicularis</i>	banded cord-moss	ENTOFA	G4G5	S2S3	September 10, 2007	October 30, 2007	SC (May 2005)	
<i>Epilobium ciliatum</i> ssp. <i>watsonii</i>	purple-leaved willowherb	EPILCIL3	G5T3T5	S2S3	December 29, 2000	April 30, 1996		
<i>Epilobium densiflorum</i>	dense spike-primrose	EPILDEN	G5	S1	February 07, 2005	January 27, 2004	E (May 2005)	
<i>Epilobium glaberrimum</i> ssp. <i>fastigiatum</i>	smooth willowherb	EPILGLA1	G5T4T5	S2S3	December 29, 2000	April 30, 1996		



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<i>Githopsis specularioides</i>	common bluecup	GITHSPE	G 5	S2S3	December 29,2000	November 25,1999	
<i>Glehnia littoralis</i> ssp. <i>leiocarpa</i>	American glehnia	GLEHLIT1	G5T5	S3	January 09,2003	January 09,2003	
<i>Glyceria leptostachya</i>	slender-spiked mannagrass	GLYCLEP	G 3	S2S3	December 29,2000	April 30,1996	
<i>Hedysarum occidentale</i>	western hedysarum	HEDYOCC	G 5	S3	October 18,2006	October 18,2006	
<i>Helenium autumnale</i> var. <i>grandiflorum</i>	mountain sneezeweed	HELEAUT1	G5T3T5	S2S3	December 29,2000	April 30,1996	
<i>Heterocodon rariflorum</i>	heterocodon	HETERAR	G 5	S3	March 15,2002	March 07,2001	
<i>Heterodermia sitchensis</i>	seaside centipede	HETESIT	G2G3	S1	August 15,2007	August 15,2007	E (Apr 2006)
<i>Hippuris tetraphylla</i>	four-leaved mare's-tail	HIPPTET	G 5	S2S3	November 28,2001	November 28,2001	
<i>Hutchinsia procumbens</i>	hutchinsia	HUTCPRO	G 5	S1	December 29,2000	April 30,1996	
<i>Hydrocotyle ranunculoides</i>	floating water pennywort	HYDRRAN	G 5	SH	October 24,2007	October 30,2007	
<i>Hydrophyllum tenuipes</i>	Pacific waterleaf	HYDRTEN	G4G5	S2	September 10,2007	October 30,2007	
<i>Hypericum scouleri</i> ssp. <i>nortoniae</i>	western St. John's-wort	HYPESCO1	G5T3T5	S2S3	December 29,2000	April 30,1996	
<i>Hypogymnia heterophylla</i>	Seaside Bone	HYPOHET	G 3	S1			T (Mar 2008)
<i>Idahoia scapigera</i>	scalegod	IDAHSKA	G 5	S2	December 29,2000	April 30,1996	
<i>Isoetes nuttallii</i>	Nuttall's quillwort	ISOENUT	G4?	S3	April 09,2001	March 07,2001	
<i>Jaumea carnosa</i>	fleshy jaumea	JAUMCAR	G4G5	S2S3	December 29,2000	April 30,1996	
<i>Juncus kelloggii</i>	Kellogg's rush	JUNCKEL	G3?	S1	December 29,2000	April 30,1996	
<i>Juncus occidentalis</i>	western rush	JUNCOCC	G 5	S2S3	November 28,2005	November 28,2005	E (May 2003)
<i>Juncus oxymeris</i>	pointed rush	JUNCOXY	G 5	S2S3	December 29,2000	April 30,1996	
<i>Lasthenia glaberrima</i>	smooth goldfields	LASTGLA	G 5	S1	August 01,2003	August 01,2003	E (Mar 2008)
<i>Lasthenia maritima</i>	hairy goldfields	LASTMAR	G 4	S2S3	December 29,2000	April 30,1996	
<i>Lathyrus littoralis</i>	grey beach peavine	LATHLIT	G 5	S2	December 11,2003	December 11,2003	
<i>Lepidium oxycarpum</i>	sharp-pod peppergrass	LEPOXY	G 4	SH	October 24,2006	October 24,2006	
<i>Lewisia columbiana</i> var. <i>columbiana</i>	Columbia lewisia	LEWICOL1	G4T4	S2S3	November 28,2005	November 28,2005	
<i>Leymus triticoides</i>	creeping wildrye	LEYMTRI	G4G5	S1	December 29,2000	April 30,1996	
<i>Lilaea scilloides</i>	flowering quillwort	LILASCI	G5?	S2S3	December 29,2000	April 30,1996	
<i>Limnanthes macounii</i>	Macoun's meadow-foam	LIMNMAC	G 2	S2	August 07,2007	November 28,2005	T (Nov 2004)
<i>Linaria canadensis</i> var. <i>texana</i>	blue toadflax	LINACAN1	G5T4T5	S3	November 28,2005	November 28,2005	
<i>Lomatium dissectum</i> var. <i>dissectum</i>	fern-leaved desert-parsley	LOMADIS1	G4T4	S1	October 29,2001	October 29,2001	
<i>Lomatium grayi</i>	Gray's desert-parsley	LOMAGRA	G 5	S1	December 29,2000	April 30,1996	
<i>Lotus formosissimus</i>	seaside birds-foot trefoil	LOTUFOR	G 4	S1	December 29,2000	April 30,1996	E (May 2000)
<i>Lotus pinnatus</i>	bog bird's-foot trefoil	LOTUPIN	G4G5	S1	December 29,2000	April 30,1996	E (May 2004)
<i>Lotus unifoliolatus</i> var. <i>unifoliolatus</i>	Spanish-clover	LOTUUNI1	G5T5	S3	September 10,2007	October 30,2007	
<i>Lupinus densiflorus</i> var. <i>densiflorus</i>	dense-flowered lupine	LUPIDEN2	G5T4	S1	December 29,2000	April 01,1998	E (May 2005)
<i>Lupinus lepidus</i>	prairie lupine	LUPILEP	G 5	S1	December 29,2000	April 30,1996	E (May 2000)
<i>Lupinus oregonus</i> var. <i>kincaidii</i>	Kincaid's lupine	LUPIORE1	G5T2	SH	December 29,2000	December 30,2000	
<i>Lupinus rivularis</i>	streambank lupine	LUPIRIV	G2G4	S1	December 29,2000	April 30,1996	E (Nov 2002)
<i>Madia minima</i>	small-headed tarweed	MADIMIN	G 4	S1	December 29,2000	September 14,1999	
<i>Malaxis brachypoda</i>	white adder's-mouth orchid	MALABRA	G4Q	S2S3	December 29,2000	April 30,1996	
<i>Marah oregonus</i>	manroot	MARAORE	G 5	S1	September 10,2007	February 20,2003	
<i>Meconella oregana</i>	white meconella	MECOORE	G2G3	S1	January 15,2005	November 25,2004	E (May 2005)
<i>Megaladonta beckii</i> var. <i>beckii</i>	water marigold	MEGABEC1	G4G5T4T5	S3	April 09,2001	March 07,2001	
<i>Melica harfordii</i>	Harford's melic	MELIHAR	G 5	S2S3	October 30,2006	October 30,2006	
<i>Microseris bigelovii</i>	coast microseris	MICRBIG	G 4	S1	December 29,2000	October 06,2000	E (Apr 2006)
<i>Microseris lindleyi</i>	Lindley's microseris	MICRLIN	G 5	S1	December 29,2000	April 30,1996	E (Mar 2008)
<i>Mimulus dentatus</i>	tooth-leaved monkey-flower	MIMUDEN	G 5	S2	August 19,2003	August 19,2003	
<i>Minuartia pusilla</i>	dwarf sandwort	MINUPUS	G 5	S1	December 29,2000	April 30,1996	E (May 2004)
<i>Mitella caulescens</i>	leafy mitrewort	MITECAU	G 5	S2S3	November 28,2001	November 28,2001	
<i>Montia chamissoi</i>	Chamisso's montia	MONTCHA	G 5	S2S3	November 28,2001	November 28,2001	
<i>Montia diffusa</i>	branching montia	MONTDIF	G 4	S1	August 28,2001	August 28,2001	
<i>Myrica californica</i>	California wax-myrtle	MYRICAL	G 5	S3	March 03,2003	March 03,2003	
<i>Myriophyllum quitense</i>	waterwort water-milfoil	MYRIQU	G4?	S2S3	December 29,2000	April 30,1996	
<i>Myriophyllum ussuriense</i>	Ussurian water-milfoil	MYRIUSS	G 3	S3	January 15,2002	March 07,2001	
<i>Navarretia intertexta</i>	needle-leaved navarretia	NAVAIN	G 5	S2	December 29,2000	April 30,1996	
<i>OphioGLOSSUM pusillum</i>	northern adder's-tongue	OPHIPUS	G 5	S2S3	December 29,2000	October 06,2000	
<i>Orobancha pinnatifida</i>	pine broomrape	OROBPIN	G 4	S1	September 24,2001	December 30,2000	
<i>Orthocarpus bracteatus</i>	rosy owl-clover	ORTHBRA	G3?	S1	December 29,2000	October 06,2000	E (May 2004)
<i>Orthocarpus imbricatus</i>	mountain owl-clover	ORTHIMB	G 5	S1	December 29,2000	April 30,1996	
<i>Oxalis oregana</i>	redwood sorrel	OXALOORE	G 5	S2S3	October 30,2006	December 02,1999	
<i>Piperia candida</i>	white-lip rein orchid	PIPECAN	G3G4	S2	December 15,2001	October 11,2000	
<i>Plagiobothrys figuratus</i> ssp. <i>figuratus</i>	fragrant popcornflower	PLAGFIG1	G4T4	S1	December 29,2000	April 30,1996	E (Mar 2008)
<i>Plagiobothrys tenellus</i>	slender popcornflower	PLAGTEN	G4G5	S2	December 29,2000	April 05,2000	
<i>Pleuricospora timbriolata</i>	fringed pinesap	PLEUFIM	G 4	SH	December 29,2000	April 30,1996	
<i>Pleuropogon refractus</i>	nodding semaphoregrass	PLEUREF	G 4	S3	September 15,2001	April 12,2001	
<i>Polygonum hydrophyloides</i>	water-pepper	POLYHYR	G 5	S2S3	December 29,2000	April 30,1996	
<i>Polygonum monspeliense</i>	black-knapweed	POLYMON	G 5	S1	December 29,2000	January 09,2003	

COSEWIC uses the name *lindleyi* and the English Lindley's false silverpuff tracks the taxon as *Mic* common name Lindley's



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<i>Ranunculus alismifolius</i> var. <i>alismifolius</i>	water-plantain buttercup	RANJAL1	G5T5	S1	December 29,2000	April 30,1996	E (May 2000)	
<i>Ranunculus californicus</i>	California buttercup	RANJAL	G5	S1	February 20,2003	February 20,2003		
<i>Ranunculus lobbii</i>	Lobb's water-buttercup	RANULOB	G4	SH	October 30,2006	April 30,1996		
<i>Rubus lasiococcus</i>	dwarf bramble	RUBULAS	G5	S2S3	December 29,2000	April 30,1996		
<i>Rubus nivalis</i>	snow bramble	RUBUNIV	G4?	S2	December 29,2000	December 02,1999		
<i>Rupertia physodes</i>	California-tea	RUPEPHY	G4	S3	October 03,2001	October 03,2001		
<i>Salix lemmonii</i>	Lemmon's willow	SALILEM	G5	S1	December 29,2000	April 30,1996		
<i>Salix sessilifolia</i>	soft-leaved willow	SALISES	G4	S2S3	December 29,2000	April 30,1996		
<i>Sanguisorba menziesii</i>	Menzies' burnet	SANGMEN	G3G4	S2S3	December 29,2000	April 30,1996		
<i>Sanicula arctopoides</i>	snake-root sanicle	SANIARC	G5	S1	December 29,2000	April 30,1996	E (May 2001)	
<i>Sanicula bipinnatifida</i>	purple sanicle	SANIBIP	G5	S2	December 29,2000	April 30,1996	T (May 2001)	
<i>Schoenoplectus americanus</i>	O'Leary's bulrush	SCHOAME	G5	S1	December 29,2000	November 07,2000		
<i>Selaginella oregana</i>	Oregon selaginella	SELAORE	G4	S1S3	November 28,2005	November 28,2005		
<i>Senecio macounii</i>	Macoun's groundsel	SENEMAC	G5	S3	April 09,2001	March 07,2001		
<i>Sidalcea hendersonii</i>	Henderson's checker-mallow	SIDAHEN	G3	S3	April 09,2001	March 07,2001		
<i>Silene scouleri</i> ssp. <i>grandis</i>	Scouler's catchfly	SILESCO1	G5TNR	S1	December 29,2000	April 30,1996	E (May 2003)	
<i>Sparganium fluctuans</i>	water bur-reed	SPARFLU	G5	S2S3	December 29,2000	January 21,1999		
<i>Syntrichia laevigata</i>	twisted oak moss	TORTLAE2	GNR	S2S3	September 10,2007	October 30,2007	SC (May 2004)	Full Species
<i>Thelypteris nevadensis</i>	Nevada marsh fern	THELNEV	G4	S1	December 29,2000	April 30,1996		
<i>Thysanocarpus curvipes</i>	sand lacepod	THYSCUR	G4G5	S3	September 10,2007	October 30,2007		
<i>Tonella tenella</i>	small-flowered tonella	TONETEN	G5	S1	February 22,2005	December 27,2001	E (Nov 2003)	
<i>Toxicodendron diversilobum</i>	poison oak	TOXIDIV	G5	S2S3	December 29,2000	April 30,1996		
<i>Trifolium cyathiferum</i>	cup clover	TRIFCYA	G4	S1	December 29,2000	April 30,1996		
<i>Trifolium depauperatum</i> var. <i>depauperatum</i>	poverty clover	TRIFDEP1	G5T5?	S3	May 08,2002	May 08,2002		
<i>Trifolium dichotomum</i>	Macrae's clover	TRIFDIC	G4?	S2S3	September 10,2007	October 30,2007		
<i>Triglochin concinna</i>	graceful arrow-grass	TRIGCON	G5	S2	December 29,2000	April 05,2000		
<i>Trillium ovatum</i> var. <i>hibbersonii</i>	dwarf trillium	TRILOVA2	G5T1Q	S1	December 29,2000	January 11,1999		
<i>Triphysaria versicolor</i> ssp. <i>versicolor</i>	bearded owl-clover	TRIPVER1	G5T5	S1	May 14,2001	May 14,2001	E (May 2000)	
<i>Triteleia howellii</i>	Howell's triteleia	TRITHOW	G3G4	S1	March 24,2005	August 18,2003	E (May 2003)	
<i>Utricularia ochroleuca</i>	ochroleucous bladderwort	UTRIOCH	G4?	S2S3	September 10,2007	October 30,2007		
<i>Verbena hastata</i> var. <i>scabra</i>	blue vervain	VERBHAS1	G5T5	S2	December 29,2000	February 11,2000		
<i>Viola howellii</i>	Howell's violet	VIOLHOW	G4	S2S3	December 29,2000	April 30,1996		
<i>Viola praemorsa</i> ssp. <i>praemorsa</i>	yellow montane violet	VIOLPRA1	G5T3T5	S2	February 28,2005	April 30,1996	E (Nov 2007)	
<i>Wolffia columbiana</i>	Columbian water-meal	WOLFCOL	G5	S1	December 29,2000	April 30,1996		
<i>Woodwardia fimbriata</i>	giant chain fern	WOODFIM	G5	S3	April 09,2001	March 07,2001		
<i>Yabea microcarpa</i>	California hedge-parsley	YABEMIC	G5?	S2	September 10,2007	October 30,2007		





Appendix C – BCCDC Rare Plant Communities (South Island)



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Scientific Name	English Name	Global Rank	Prov Rank	Prov Rank Review Date	Prov Rank Change Date	BC Status	Identified Wildlife	CDC Track Bt
<i>Abies amabilis</i> - <i>Picea sitchensis</i> / <i>Opiopanax horridus</i>	amabilis fir - Sitka spruce / devil's club	GNR	S3	March 31, 2001	March 31, 2001	Blue	Y	Cv
<i>Abies amabilis</i> - <i>Thuja plicata</i> / <i>Rubus spectabilis</i> Moist Maritime 1	amabilis fir - western redcedar / salmonberry Moist Maritime 1	G3G4	S1S2	March 31, 2001	June 16, 1992	Red	Y	Cv
<i>Abies amabilis</i> - <i>Thuja plicata</i> / <i>Rubus spectabilis</i> Moist Maritime 2	amabilis fir - western redcedar / salmonberry Moist Maritime 2	G3G4	S2S3	July 11, 2002	July 11, 2002	Blue	Y	Cv
<i>Abies amabilis</i> - <i>Thuja plicata</i> / <i>Rubus spectabilis</i> Very Wet Maritime	amabilis fir - western redcedar / salmonberry Very Wet Maritime	GNR	S4	June 15, 2000	June 15, 2000	Yellow	N	Cv
<i>Abies amabilis</i> - <i>Thuja plicata</i> / <i>Tiarella trifoliata</i> Moist Maritime 1	amabilis fir - western redcedar / three-leaved foamflower Moist Maritime 1	G2	S2	June 15, 2000	June 15, 2000	Red	Y	Cv
<i>Abies amabilis</i> - <i>Thuja plicata</i> / <i>Tiarella trifoliata</i> Very Wet Maritime	amabilis fir - western redcedar / three-leaved foamflower Very Wet Maritime	G3G4	S3S4	March 31, 2001	September 29, 1994	Yellow	N	Cv
<i>Abies amabilis</i> - <i>Tsuga mertensiana</i> / <i>Gymnocarpium dryopteris</i> Moist Maritime 1	amabilis fir - mountain hemlock / oak fern Moist Maritime 1	G4G5	S4		March 31, 2001	Yellow	N	M
<i>Abies amabilis</i> - <i>Tsuga mertensiana</i> / <i>Streptopus lanceolatus</i>	amabilis fir - mountain hemlock / rosy twistedstalk	G4G5	S4		September 29, 1994	Yellow	N	M
<i>Abies grandis</i> / <i>Mahonia nervosa</i>	grand fir / dull Oregon-grape	G1	S1	June 15, 2000	June 15, 2000	Red	Y	CI
<i>Abies grandis</i> / <i>Tiarella trifoliata</i>	grand fir / three-leaved foamflower	G1	S1	June 15, 2000	June 15, 2000	Red	Y	CI
<i>Alnus rubra</i> / <i>Carex obnupta</i> [<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>]	red alder / slough sedge [black cottonwood]	G1	S1	June 22, 2004	October 29, 1991	Red	Y	CI
<i>Alnus rubra</i> / <i>Lysichiton americanus</i>	red alder / skunk cabbage	GNR	S2S3	June 22, 2004	October 30, 1991	Blue	Y	CI
<i>Alnus rubra</i> / <i>Rubus spectabilis</i> / <i>Equisetum arvense</i>	red Alder / salmonberry / common horsetail	GNR	S3	March 31, 2001	March 31, 2001	Blue	Y	Cv
<i>Anaphalis margaritacea</i> - <i>Aster foliaceus</i>	pearly everlasting - leafy aster	G2	S2	July 11, 2002	July 11, 2002	Red	Y	M
<i>Arbutus menziesii</i> / <i>Arctostaphylos columbiana</i>	arbutus / hairy manzanita	G2	S2		July 26, 2002	Red	Y	CI
<i>Artemisia campestris</i> - <i>Festuca rubra</i> / <i>Racomitrium canescens</i>	northern wormwood - red fescue / grey rock-moss	GNR	S1			Red	Y	CI
<i>Calamagrostis purpurascens</i> Herbaceous Vegetation	purple reedgrass Herbaceous Vegetation	G2	S2		June 15, 2000	Red	Y	CI
<i>Carex lasiocarpa</i> - <i>Rhynchospora alba</i>	slender sedge - white beak-rush	G2	S2			Red	Y	CI
<i>Carex lyngbyei</i> Herbaceous Vegetation	Lyngbye's sedge herbaceous vegetation	GNR	S3			Blue	Y	CI
<i>Carex macrocephala</i> Herbaceous Vegetation	large-headed sedge Herbaceous Vegetation	G1G2	S1S2		July 26, 2002	Red	Y	CI
<i>Carex sitchensis</i> - <i>Oenanthe sarmentosa</i>	Sitka sedge - Pacific water-parsley	G3	S3			Blue	Y	Cv
<i>Carex sitchensis</i> / <i>Sphagnum</i> spp.	Sitka sedge / peat-mosses	G2	S2			Red	Y	Cv
<i>Chamaecyparis nootkatensis</i> / <i>Sphagnum</i> spp.	yellow-cedar / peat-mosses	GNR	S4?	April 02, 1993	April 02, 1993	Yellow	N	Cv
<i>Chamaecyparis nootkatensis</i> - <i>Tsuga mertensiana</i> / <i>Lysichiton americanus</i>	yellow-cedar - mountain hemlock / skunk cabbage	G4	S4	June 23, 2004	June 23, 2004	Yellow	N	M
<i>Chamaecyparis nootkatensis</i> - <i>Tsuga mertensiana</i> / <i>Veratrum viride</i>	yellow-cedar - mountain hemlock / Indian hellebore	GNR	S4	June 23, 2004	June 23, 2004	Yellow	N	M
<i>Deschampsia cespitosa</i> - <i>Sidalcea hendersonii</i>	tufted hairgrass - Henderson's checker-mallow	G2	S1S2	May 26, 1992	September 20, 1991	Red	Y	Cv
<i>Deschampsia cespitosa</i> ssp. <i>beringensis</i> - <i>Aster subspicatus</i>	tufted hairgrass - Douglas' aster	G3	S3			Blue	Y	CI
<i>Deschampsia cespitosa</i> ssp. <i>beringensis</i> - <i>Hordeum brachyantherum</i>	tufted hairgrass - meadow barley	G3	S3			Blue	Y	CI
<i>Distichlis spicata</i> var. <i>spicata</i> Herbaceous	spikegrass	G5	S4G2			Red	Y	CI



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<i>Festuca idahoensis</i> ssp. <i>roemerii</i> - <i>Koeleria macrantha</i>	Roemer's fescue - Junegrass	G1	S1	April 29,1993	June 15,2000	Red	Y	CI
<i>Juncus arcticus</i> - <i>Plantago macrocarpa</i>	arctic rush - Alaska plantain	GNR	S1			Red	Y	CI
<i>Ledum groenlandicum</i> / <i>Kalmia microphylla</i> / <i>Sphagnum</i> spp.	Labrador tea / western bog-laurel / peat-mosses	G4	S3			Blue	Y	C ¹ /N ¹
<i>Leymus mollis</i> ssp. <i>mollis</i> - <i>Lathyrus japonicus</i>	dune wildrye - beach pea	GNR	S1S2			Red	Y	C ¹
<i>Menyanthes trifoliata</i> - <i>Carex lasiocarpa</i>	buckbean - slender sedge	G3	S3		July 31,2002	Blue	Y	CI /N ¹
<i>Myosurus minimus</i> - <i>Montia</i> spp. - <i>Limnathes macounii</i>	tiny mouse-ear - montias - Macoun's meadow-foam	G2	S1		June 15,2000	Red	Y	CI
<i>Myrica gale</i> / <i>Carex sitchensis</i>	sweet gale / Sitka sedge	G3	S2			Red	Y	CI /N ¹ /N ¹
<i>Phlox diffusa</i> - <i>Selaginella wallacei</i>	spreading phlox - Wallace's selaginella	GNR	S2		July 11,2002	Red	Y	M
<i>Picea sitchensis</i> / <i>Calamagrostis nutkaensis</i>	Sitka spruce / Pacific reedgrass	G3G5	S3	July 11,2002	July 11,2002	Blue	Y	C ¹
<i>Picea sitchensis</i> / <i>Carex obnupta</i>	Sitka spruce / slough sedge	G2G3	S2S3	September 29,1994	September 29,1994	Blue	Y	C ¹
<i>Picea sitchensis</i> / <i>Eurhynchium oregonum</i>	Sitka spruce / Oregon beaked-moss	GNR	S3	June 15,2000	June 15,2000	Blue	Y	C ¹
<i>Picea sitchensis</i> / <i>Gaultheria shallon</i> <i>Picea sitchensis</i> / <i>Maianthemum dilatatum</i> Very Wet Hypermaritime 1	Sitka spruce / salal Sitka spruce / false lily-of-the-valley Very Wet Hypermaritime 1	GNR G1G2	S4 S1S2	June 15,2000 September 29,1994	June 15,2000 September 29,1994	Yellow Red	N Y	C ¹ C ¹
<i>Picea sitchensis</i> / <i>Malus fusca</i>	Sitka spruce / Pacific crab apple	GNR	S3		June 15,2000	Blue	Y	C ¹
<i>Picea sitchensis</i> / <i>Polystichum munitum</i> <i>Picea sitchensis</i> / <i>Rubus spectabilis</i> Very Dry Maritime	Sitka spruce / sword fern Sitka spruce / salmonberry Very Dry Maritime	G3 G3	S3 S2	September 29,1994 June 26,1992	September 29,1994 June 26,1992	Blue Red	Y Y	C ¹ C ¹
<i>Picea sitchensis</i> / <i>Rubus spectabilis</i> Very Wet Maritime	Sitka spruce / salmonberry Very Wet Maritime	G3	S2	September 29,1994	September 29,1994	Red	Y	C ¹
<i>Picea sitchensis</i> / <i>Trisetum canescens</i>	Sitka spruce / tall trisetum	G1G2	S1S2	June 15,2000	June 15,2000	Red	Y	C ¹
<i>Pinus contorta</i> - <i>Chamaecyparis nootkatensis</i> / <i>Racomitrium lanuginosum</i>	lodgepole pine - yellow-cedar / hoary rock-moss	G4	S4	June 15,2000	March 22,2007	Yellow	N	C ¹
<i>Pinus contorta</i> / <i>Sphagnum</i> spp.	lodgepole pine / peat-mosses	GNR	S4S5	November 17,1993	January 05,1993	Yellow	N	C ¹ /1 /1
<i>Pinus contorta</i> / <i>Sphagnum</i> spp. CDFmm <i>Pinus contorta</i> / <i>Sphagnum</i> spp. Very Dry Maritime	lodgepole pine / peat-mosses CDFmm lodgepole pine / peat-mosses Very Dry Maritime	GNR GNR	S1 S3	May 12,1992 June 17,2000	May 12,1992 June 15,2000	Red Blue	Y Y	CI C ¹
<i>Pinus contorta</i> var. <i>contorta</i> - <i>Chamaecyparis nootkatensis</i> / <i>Trichophorum cespitosum</i>	shore pine - yellow-cedar / tufted clubrush	GNR	S5	September 29,1994	September 29,1994	Yellow	N	C ¹ /N ¹
<i>Plantago maritima</i> - <i>Puccinellia pumila</i> <i>Poa macrantha</i> Herbaceous Vegetation	sea plantain - dwarf alkaligrass dune bluegrass Herbaceous Vegetation	G2 GNR	S2 S1			Red Red	Y Y	C ¹ C ¹
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Alnus rubra</i> / <i>Rubus spectabilis</i> <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Salix sitchensis</i>	black cottonwood - red alder / salmonberry black cottonwood / Sitka willow	GNR GNR	S3 S2S3	September 29,1994 July 11,2002	September 29,1994 July 11,2002	Blue Blue	Y Y	CI C ¹
<i>Populus tremuloides</i> / <i>Malus fusca</i> / <i>Carex</i> <i>obnupta</i>	trembling aspen / Pacific crab apple / obnupta	G1G2 G1G2	S1G2 S1G2	July 26,2002	July 26,2002	Red	Y	CI



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<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Gautheria shalton</i> Dry Maritime	Douglas-fir - western hemlock / salal Dry Maritime	G3G4	S2S3	June 15,1992	June 15,1992	Blue	Y	Cv
<i>Pseudotsuga menziesii</i> - <i>Tsuga heterophylla</i> / <i>Gautheria shalton</i> Moist Maritime	Douglas-fir - western hemlock / salal Moist Maritime	GNR	S3	June 15,2000	June 15,2000	Blue	Y	Cv
<i>Quercus garryana</i> - <i>Arbutus menziesii</i>	Garry oak - arbutus	G1	S1	June 15,2000	June 15,2000	Red	Y	Cl
<i>Quercus garryana</i> / <i>Bromus carinatus</i>	Garry oak / California brome	G1	S1	July 03,1992	July 03,1992	Red	Y	Cl
<i>Quercus garryana</i> / <i>Holodiscus discolor</i>	Garry oak / oceanspray	G1	S1	June 15,2000	June 15,2000	Red	Y	Cl
<i>Ruppia maritima</i> Herbaceous Vegetation	beaked ditch-grass Herbaceous Vegetation	GNR	S2			Red	Y	Cl
<i>Salicornia virginiana</i> - <i>Glauk maritima</i>	American glasswort - sea-milkwort	G3G4	S2			Red	Y	Cl
<i>Salix reticulata</i> Community	net-veined willow Community	GNR	SNR			Yellow	N	Bv Cv /N /N
<i>Salix sitchensis</i> / <i>Carex sitchensis</i>	Sitka willow / Sitka sedge	G3	S3			Blue	Y	Cv /N /N
<i>Salix sitchensis</i> - <i>Salix lucida</i> sap. <i>lasiantha</i> / <i>Lysichiton americanus</i>	Sitka willow - Pacific willow / skunk cabbage	G2	S2			Red	Y	Cl
<i>Sidaicea hendersonii</i> Tidal Marsh	Henderson's checker-mallow Tidal Marsh	G1	S1	July 10,2000	July 10,2000	Red	Y	Cv
<i>Spiraea douglasii</i> / <i>Carex sitchensis</i>	hardhack / Sitka sedge	G4	S4			Yellow	N	Cl /N /N
<i>Thuja plicata</i> / <i>Achlys triphylla</i>	western redcedar / vanilla leaf	G1	S1	July 15,2002	July 15,2002	Red	Y	Cl
<i>Thuja plicata</i> / <i>Carex obnupta</i>	western redcedar / slough sedge	GNR	S2S3	June 26,1992	June 26,1992	Blue	Y	Cv
<i>Thuja plicata</i> - <i>Chamaecyparis nootkatensis</i> / <i>Coptis asplenifolia</i>	western redcedar - yellow-cedar / spleenwort-leaved goldthread	G4G5	S4S5	September 29,1994	September 29,1994	Yellow	N	Cv /1
<i>Thuja plicata</i> - <i>Chamaecyparis nootkatensis</i> / <i>Coptis asplenifolia</i> Moist Maritime 2	western redcedar - yellow-cedar / spleenwort-leaved goldthread Moist Maritime 2	G4G5	S2S3	July 16,2002	July 16,2002	Blue	Y	Cv
<i>Thuja plicata</i> - <i>Chamaecyparis nootkatensis</i> / <i>Lysichiton americanus</i>	western redcedar - yellow-cedar / skunk cabbage	GNR	S3S4	July 08,2004	March 31,2001	Yellow	N	Cv
<i>Thuja plicata</i> / <i>Lonicera involucrata</i>	western redcedar / black twinberry	GNR	S2	June 26,1992	June 26,1992	Red	Y	Cv
<i>Thuja plicata</i> / <i>Oemleria cerasiformis</i>	western redcedar / Indian-plum	G1	S1	July 15,2002	July 11,2002	Red	Y	Cl Cv /1 /1 /1
<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Lysichiton americanus</i>	western redcedar - Sitka spruce / skunk cabbage	G3?	S3?	September 29,1994	July 16,2002	Blue	Y	/1
<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Oplopanax horridus</i> Very Wet Hypermaritime 1	western redcedar - Sitka spruce / devil's club Very Wet Hypermaritime 1	G1G3	S1S3	March 31,2005	March 31,2005	Yellow	N	Cv
<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Polystichum munitum</i>	western redcedar - Sitka spruce / sword fern	G3?	S2S3	September 29,1994	September 29,1994	Blue	Y	Cv
<i>Thuja plicata</i> - <i>Picea sitchensis</i> / <i>Tiarella trifoliata</i>	western redcedar - Sitka spruce / three-leaved foamflower	GNR	S4	July 08,2004	July 08,2004	Yellow	N	Cv /0
<i>Thuja plicata</i> / <i>Polystichum munitum</i> Very Dry Maritime	western redcedar / sword fern Very Dry Maritime	GNR	S2S3	June 25,1992	June 25,1992	Blue	Y	Cv
<i>Thuja plicata</i> - <i>Pseudotsuga menziesii</i> / <i>Eurhynchium oregonum</i>	western redcedar - Douglas-fir / Oregon beaked-moss	GNR	S1	July 15,2002	July 15,2002	Red	Y	Cl
<i>Thuja plicata</i> / <i>Rubus spectabilis</i>	western redcedar / salmonberry	GNR	S1S2	June 25,1992	June 26,1992	Red	Y	Cv



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<i>Trichophorum alpinum</i> / <i>Scorpidium revolvens</i>	Hudson Bay clubrush / rusty hook-moss	G2	S2			Red	Y	C1 / N
<i>Tsuga heterophylla</i> - <i>Abies amabilis</i> / <i>Blechnum spicant</i>	western hemlock - amabilis fir / deer fern	GNR	S5	March 31, 2001	March 31, 2001	Yellow	N	C1
<i>Tsuga heterophylla</i> - <i>Abies amabilis</i> / <i>Blechnum spicant</i> Moist Maritime	western hemlock - amabilis fir / deer fern Moist Maritime	G2G4	S2	July 22, 2002	July 22, 2002	Red	Y	C1
<i>Tsuga heterophylla</i> - <i>Abies amabilis</i> / <i>Rhytidopsis robusta</i>	western hemlock - amabilis fir / pipecleaner moss	G3	S3	November 16, 1993	June 16, 1992	Blue	Y	C1
<i>Tsuga heterophylla</i> - <i>Abies amabilis</i> / <i>Vaccinium alaskaense</i>	western hemlock - amabilis fir / Alaskan blueberry	GNR	S4?	June 17, 1992	April 01, 1993	Yellow	N	C1
<i>Tsuga heterophylla</i> - <i>Chamaecyparis nootkatensis</i> / <i>Gaultheria shallon</i> Very Wet Hypermaritime 1	western hemlock - yellow-cedar / salal Very Wet Hypermaritime 1	GNR	S4	September 29, 1994	September 29, 1994	Yellow	N	C1
<i>Tsuga heterophylla</i> - <i>Picea sitchensis</i> / <i>Rhytidadelphus loreus</i>	western hemlock - Sitka spruce / lanky moss	GNR	S3	September 29, 1994	March 31, 2001	Blue	Y	C1 / O
<i>Tsuga heterophylla</i> - <i>Pinus contorta</i> / <i>Cladonia rangiferina</i>	western hemlock - lodgepole pine / grey reindeer lichen	G3G5	S3S5	June 15, 2000	March 22, 2007	Yellow	N	C1
<i>Tsuga heterophylla</i> - <i>Pseudotsuga menziesii</i> / <i>Eurhynchium oreganum</i>	western hemlock - Douglas-fir / Oregon beaked-moss	G3G4	S2	June 15, 2000	June 15, 2000	Red	Y	C1
<i>Tsuga heterophylla</i> - <i>Thuja plicata</i> / <i>Blechnum spicant</i>	western hemlock - western redcedar / deer fern	G2G3	S2	June 15, 2000	June 15, 2000	Red	Y	C1
<i>Tsuga heterophylla</i> - <i>Thuja plicata</i> / <i>Gaultheria shallon</i> Moist Maritime 1	western hemlock - western redcedar / salal Moist Maritime 1	G3G4	S2	June 15, 2000	June 15, 2000	Red	Y	C1
<i>Tsuga heterophylla</i> - <i>Thuja plicata</i> / <i>Gaultheria shallon</i> Moist Maritime 2	western hemlock - western redcedar / salal Moist Maritime 2	G3	S3	June 15, 2000	June 15, 2000	Blue	Y	C1
<i>Tsuga heterophylla</i> - <i>Thuja plicata</i> / <i>Gaultheria shallon</i> Very Wet Maritime	western hemlock - western redcedar / salal Very Wet Maritime	G3	S3	February 15, 2006	March 28, 2006	Blue	Y	C1
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Phyllodoce empetriformis</i> Moist Maritime 1	mountain hemlock - amabilis fir / pink mountain-heather Moist Maritime 1	G5	S4		September 29, 1994	Yellow	N	M
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Rubus pedatus</i>	mountain hemlock - amabilis fir / five-leaved bramble	G4G5	S4S5		September 29, 1994	Yellow	N	M
<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Vaccinium alaskaense</i>	mountain hemlock - amabilis fir / Alaskan blueberry	G4G5	S3S4	July 22, 2002	July 22, 2002	Yellow	N	M
<i>Tsuga mertensiana</i> - <i>Chamaecyparis nootkatensis</i> / <i>Blechnum spicant</i>	mountain hemlock - yellow-cedar / deer fern	GNR	S4	March 25, 1993	March 31, 2001	Yellow	N	M / O
<i>Tsuga mertensiana</i> - <i>Chamaecyparis nootkatensis</i> / <i>Sphagnum capillifolium</i>	mountain hemlock - yellow-cedar / common red peat-moss	GNR	S5		March 25, 1993	Yellow	N	M / O Br / N / N / N
<i>Typha latifolia</i> Marsh	common cattail Marsh	G5	S3			Blue	Y	



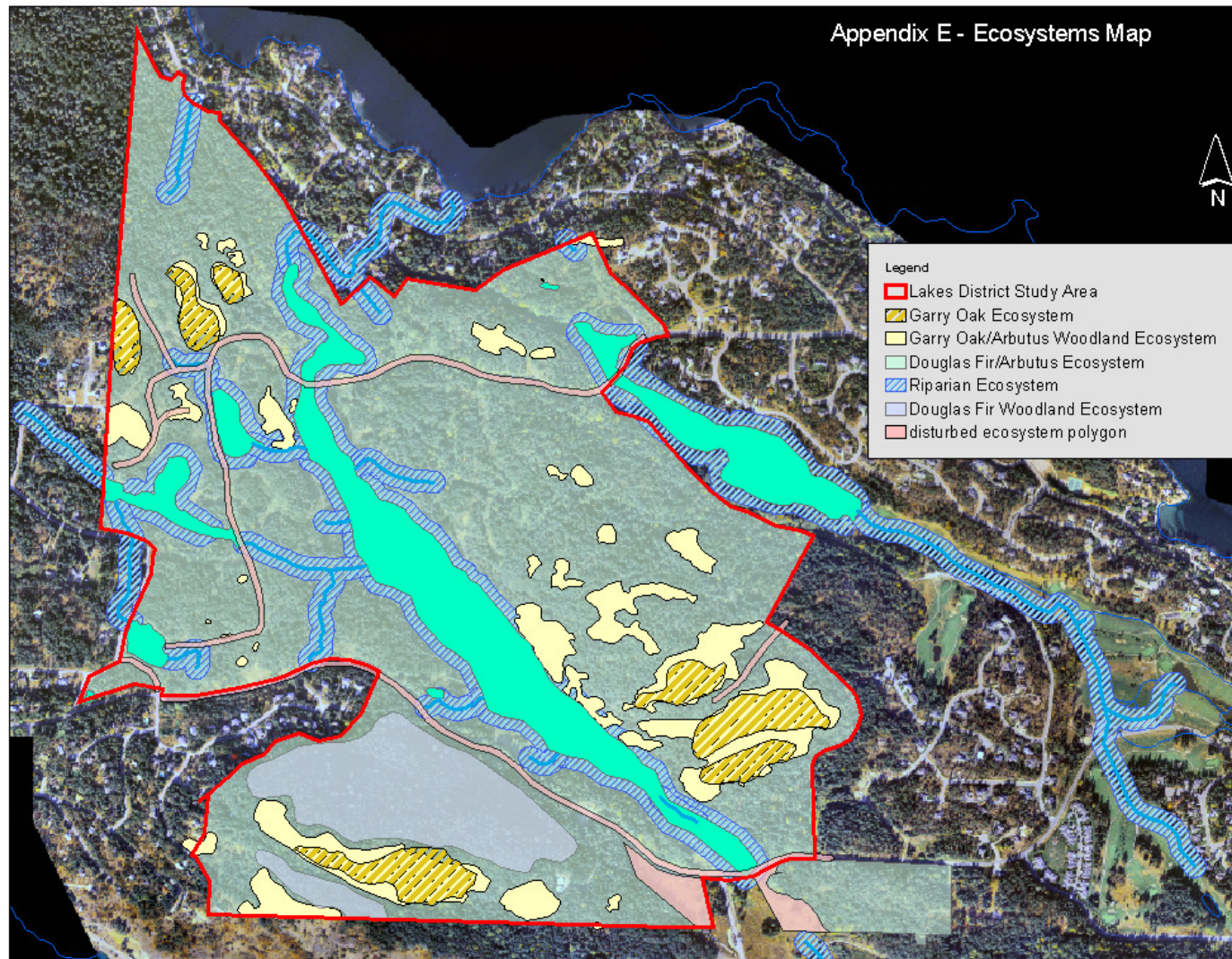


Appendix D – Biophysical Assessment Map





Appendix E – Ecosystem Map







Appendix F – Waterbodies Map







Appendix G – FISS Database Records



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FISS Report

Gazetted Name : ENOS LAKE
Watershed Code : 920-440400
Waterbody Identifier : 00356PARK
Region : 1
Alias :
Type : L
Report created on : [Fri Jul 18 10:52:01 PDT 2008](#)

Lake Information

Physical Information

Surface Area (ha)	Perimeter (m)	Max Depth (m)	Mean Depth (m)	Elevation (m)	Shoal Area	Outlets	Permanent Inlets	Reference Number
16.19	1609	10.7	5.5					BCLKS-1000

Chemical Information

No records found

Access Information

No records found

Facility Information

No records found

Management Objectives

Habitat Type **Objective 1** **Objective 2**
Not Specified

Enhancement

Activity	Start Year	Finish Year	Species Name	Comments	Reference Number	Geo Ref 1	Geo Ref 2
151 Stocking/Colonization	1948	1948	Rainbow Trout		REL-SUM	W	307262
210 Biophysical Surveys (unspecified)	1964	1964			BCLKS-1000	W	307262
213 Fish Sampling	1979	1979	Threespine Stickleback	Electroshocking was conducted to collect fish specimens.	MC192	W	307262
213 Fish Sampling	1979	1979	Threespine Stickleback		BCLKS-330	W	307262
Water Withdrawal	1964	1964			BCLKS-1000	W	307262

Harvests and Uses

No records found

Resource Use

No records found

Resource Values

No records found

Resource Sensitivities

Description	Comments	Reference Number	Geo Ref 1	Geo Ref 2
Sensitive fish stock	Enos Lake Stickleback species pairs were listed as endangered under SARA in January 2005.	DFO0459	W	307262

Land Use

No records found

Fisheries Potentials and Constraints

Activity	Impact	Degree of Impact	Comments	Species Name	Reference Number	Geo Ref 1	Geo Ref 2
653 Not Accessible	Describing constraint for increasing fisheries production	Not Specified			BCLKS-1000	W	307262

Obstructions

No records found

Escapements

No records found

Fish Distributions

Species Name	Stock / Stock Type	Stock Char	Management Class	Activity	Comments	Refs And Dates	Geo Ref 1	Geo Ref 2
Enos Lake Benthic Stickleback	ENOS LAKE BENTHIC / NOT SPECIF	Resident	Wild indigenous	OBL Fish observed at this point or zone		(HQ0778, 01-OCT-1998)	W	307262
Enos Lake Limnetic Stickleback	ENOS LAKE LIMNETIC / NOT SPECIF	Resident	Wild indigenous	OBL Fish observed at this point or zone		(HQ0778, 01-OCT-1998)	W	307262
Rainbow Trout	997 / NOT SPECIF	Not Specif	Hatchery production	OBL Fish observed at this point or zone		(REL-SUM, no date)	W	307262



Stickleback / NOT (General) SPECIF	Resident	Wild indigenous	OBL Fish observed at this point or zone	(ENOS LAKE BENTHIC (SB6) AND ENOS LAKE LIMNETIC (SB7) STICKLEBACK ARE THOUGHT TO BE NEW SPECIES BUT ARE NOT YET NAMED AS SUCH. REF# = HQ0778, HQ0840, HQ0841)	(HQ0778, 01-OCT-1998) (HQ0840, 01-OCT-1998) (HQ0841, 01-OCT-1998)	W 307262
Threespine / NOT Stickleback SPECIF	Not Specif	Not Specified	OBL Fish observed at this point or zone		(BCLKS-330, 29-FEB-1980) W (MC192, 01-JAN-1980)	307262
Threespine / NOT Stickleback SPECIF	Not Specif	Wild indigenous	OBL Fish observed at this point or zone	. PROVINCIALY RED-LISTED UNDER CDC (REF # HQ2251) BOTH LIMNETIC AND BENTHIC STICKLEBACKS EXIST HERE. POPULATION CONSIDERED THREATEND UNDER BOTH COSEWIC AND AMERICAN FISHERIES SOCIETY LISTS (REF # HQ2247)	(HQ2247, 01-APR-1998) (HQ2251, no date)	W 307262

Species and Life Phase History

No records found

Fiss References

Search EcoCat for keywords: [ENOS LAKE](#)

Reference Number : HQ2251

Title : **CONSERVATION DATA CENTER WEBSITE**

Description : WEBSITE: [HTTP://SRMWWW.GOV.BC.CA/CDC/TABLE_VERTEBRATES.HTM](http://SRMWWW.GOV.BC.CA/CDC/TABLE_VERTEBRATES.HTM)

Location : WORLD WIDE WEB [HTTP://SRMWWW.GOV.BC.CA/CDC/TABLE_VERTEBRATES.HTM](http://SRMWWW.GOV.BC.CA/CDC/TABLE_VERTEBRATES.HTM)

Reference code : Government Database

Year :

Author : MINISTRY OF SUSTAINABLE RESOURCE MANAGEMENT

Reference Number : BCLKS-1000



Description :
Location : MINISTRY OF SUSTAINABLE RESOURCE MANAGEMENT, Victoria, BC
Reference code : Letter
Year : 1965
Author : HURN, D.R.

Reference Number : HQ2247
Title : **INDIGENOUS FISH SPEICES POTENTIALLY AT RISK IN BC WITH RECOMMENDATIONS AND PRIORITIES FOR CONSERVATION FORESTRY/RESOURCE USE, INVENTORY AND RESEARCH**
Description : 168 PAGES
Location : AQUATIC INFORMATION BRANCH, VICTORIA, B.C.
Reference code : Government Report
Year : 1998
Author : MINISTRY OF FISHERIES

Reference Number : REL-SUM
Title : **RELEASE Database**
Description :
Location : Ministry of Sustainable Resource Management, Victoria, BC
Reference code : Government Database
Year :
Author : MINISTRY OF SUSTAINABLE RESOURCE MANAGEMENT

Reference Number : DFO0459
Title : **Recovery Strategy for Paxton Lake, Enos Lake, and Vananda Creek Stickleback Species Pairs (Gasterosteus spp.) in Canada Proposed.**
Description : In Species at Risk Act Recovery Strategy Series. Ottawa: 31 pp.
Location : DFO Library.
Reference code : Government Report
Year : 2006
Author : FISHERIES AND OCEANS CANADA

Reference Number : DFO0459
Title : **Recovery Strategy for Paxton Lake, Enos Lake, and Vananda Creek Stickleback Species Pairs (Gasterosteus spp.) in Canada Proposed.**
Description : In Species at Risk Act Recovery Strategy Series. Ottawa: 31 pp.
Location : DFO Library.
Reference code : Government Report
Year : 2006
Author : NATIONAL RECOVERY TEAM FOR STICKLEBACK SPECIES PAI

Reference Number : HQ0778
Title : **STATUS OF THE STICKLEBACK SPECIES PAIR, GASTEROSTEUS SPP., IN BALKWILL, EMILY AND PRIEST LAKES, TEXADA ISLAND, BRITISH COLUMBIA**
Description : PREPARED FOR FISHERIES BRANCH, MINISTRY OF ENVIRONMENT, LANDS AND PARKS, VICTORIA, BC
Location : BC FISHERIES, VICTORIA, BC

Reference code : Consultant Report
 Year : 1998
 Author : HATFIELD, TODD

Reference Number : HQ0840
 Title : **STATUS OF THE STICKLEBACK SPECIES PAIR, GASTEROSTEUS SPP., IN HADLEY LAKE, LESQUETI ISLAND, BRITISH COLUMBIA**
 Description : PREPARED FOR FISHERIES BRANCH AND BC CONSERVATION DATA CENTRE, MINISTRY OF ENVIRONMENT, LANDS AND PARKS, VICTORIA, BRITISH COLUMBIA
 Location : BC FISHERIES, VICTORIA, BC
 Reference code : Consultant Report
 Year : 1998
 Author : HATFIELD, TODD

Reference Number : HQ0841
 Title : **STATUS OF THE STICKLEBACK SPECIES PAIR, GASTEROSTEUS SPP., IN PAXTON LAKE, TEXADA ISLAND, BRITISH COLUMBIA**
 Description : PREPARED FOR FISHERIES BRANCH MINISTRY OF ENVIRONMENT, LANDS AND PARKS, VICTORIA, BRITISH COLUMBIA
 Location : BC FISHERIES, VICTORIA, BC
 Reference code : Consultant Report
 Year : 1998
 Author : HATFIELD, TODD

Reference Number : MC192
 Title : **Specimens Collected in B.C. Under Permit 1616**
 Description : 2 pp.
 Location : MOE, Victoria
 Reference code : Letter
 Year : 1980
 Author : MCPHAIL, J.D.

Reference Number : MC192
 Title : **Specimens Collected in B.C. Under Permit 1616**
 Description : 2 pp.
 Location : MOE, Victoria
 Reference code : Letter
 Year : 1980
 Author : UNIVERSITY OF BRITISH COLUMBIA

Reference Number : BCLKS-330
 Title : **UNTITLED REPORT: FISH COLLECTION DATA FOR ENOS LAKE**
 Description :
 Location : MINISTRY OF SUSTAINABLE RESOURCE MANAGEMENT, Victoria, BC
 Reference code : Letter
 Year : 1980
 Author : MCPHAIL, J.D.



Ministry of Environment - Fisheries Inventory Data Queries

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12 references were found.

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Appendix H – Environmental Constraints Map

