

**Schooner Cove at Fairwinds**  
**Detailed Biophysical Assessment**

Prepared for:  
**3536696 Canada Inc, bcIMC Realty Corp,  
Bental LP, and  
Fairwinds Development Real Estate Management Ltd.**  
(the “Developer”)

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**February 2009**

## EXECUTIVE SUMMARY

Cascadia Biological Services was retained by the Developer to complete a biophysical inventory and assessment on the remaining developable lands referred to as the Schooner Cove Study Area (“Study Area”) in Nanoose Bay, British Columbia. The Study Area encompasses approximately 15.5 acres and is identified as an urban growth area within the Regional District of Nanaimo’s Regional Growth Strategy.

Located along the shores of the Strait of Georgia on the Nanoose Peninsula, 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 several small and isolated/discontinuous coastal bluff polygons that are severely fragmented and too small to have been considered for inclusion into the provincial Sensitive Ecosystem Inventory (SEI)(<100 m<sup>2</sup>). At the time of our assessment in 2008, approximately 73% of the entire Study Area was classified as disturbed. These polygons consisted primarily of buildings, pavement and other manmade structures including tennis courts etc. The environmental assessment of the property was initiated in the fall of 2006 and ended in the spring of 2008. Overall, a total of 3 field days were 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 four distinct ecosystems and two small isolated 1<sup>st</sup> order watercourses. As well, numerous species of plants as well as over a dozen species of birds and mammals were observed. Further to these species observations, we have determined that there are several environmentally significant attributes on the property. These include three small Garry Oak meadows (less than 1500



m<sup>2</sup> in area) as well as other sensitive ecosystems including two small (less than 1500 m<sup>2</sup> in area) riparian areas.

Overall, impacts to these environmentally significant areas is expected to be high as the area envisions more intensive development associated with a waterfront village program.

The proposed density in part reflects offsite mitigation in the form of a very large proposed park proposed by the Developer under the draft neighbourhood plan for the nearby Lakes District. The Lakes District park areas represent habitat that is both higher value and more interconnected than exists or would be possible within the Study Area. Other recommendations include having an environmental monitor on-site during road construction and site servicing when construction related activities occur adjacent to sensitive environmental attributes either within the Study Area and/or on neighbouring lands. It is recommended that new landscaping incorporate native vegetation where possible. As a result of the above recommendations, the proposed development is expected to have positive impacts both in relation to the Study Area and wildlife habitat in the broader ecosystem as large connected areas of land will be protected in perpetuity and managed to ensure long-term viability through access management and invasive species control.

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## **1.0 INTRODUCTION**

The Developer tasked Cascadia Biological Services with conducting an environmental assessment (EA) to assist both planning for development of the Schooner Cover study area (the “Study Area”) located at 3521 Dolphin Drive and adjacent properties in Nanoose Bay British Columbia and more particularly shown in the map appended as Figure 1. Pursuant to this we undertook to identify, map and evaluate environmentally sensitive attributes related to wildlife, vegetation and watercourses. The assessments 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 the spring of 2008 and involved over 3 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, and describes the Study Area and its environmental setting. Section 2 describes the results of the EA and further defines the methods used in 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 Study Area (property boundary). The second was to assess the potential 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 overall goal was to assess the land referred to as the Study Area (refer to Figure 1), an identified urban growth area within the Regional District of Nanaimo's Regional Growth Strategy, and document sensitive ecosystems and watercourses that meet 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. Specific objectives related to the goal included the following,

- 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 6.27 ha (15.49 acres) in area and is located primarily at 3521 Dolphin Drive in Nanoose B.C. Located on 1:20,000 TRIM Mapsheet #092F.030. The Study Area is bounded by Georgia Strait to the north, Dolphin Drive to the west and south and private residences to the east. Refer to figure 1 below outlining the Study Area.

## **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 a distinct

lower layer that is a mixture of sand and crushed rock (from glaciation), are the predominant upland soils. Marine deposits are not present, when the elevation is greater than 100m. The moisture deficit is approximately 330mm, but varies considerably with aspect, exposure, soils and ground cover.

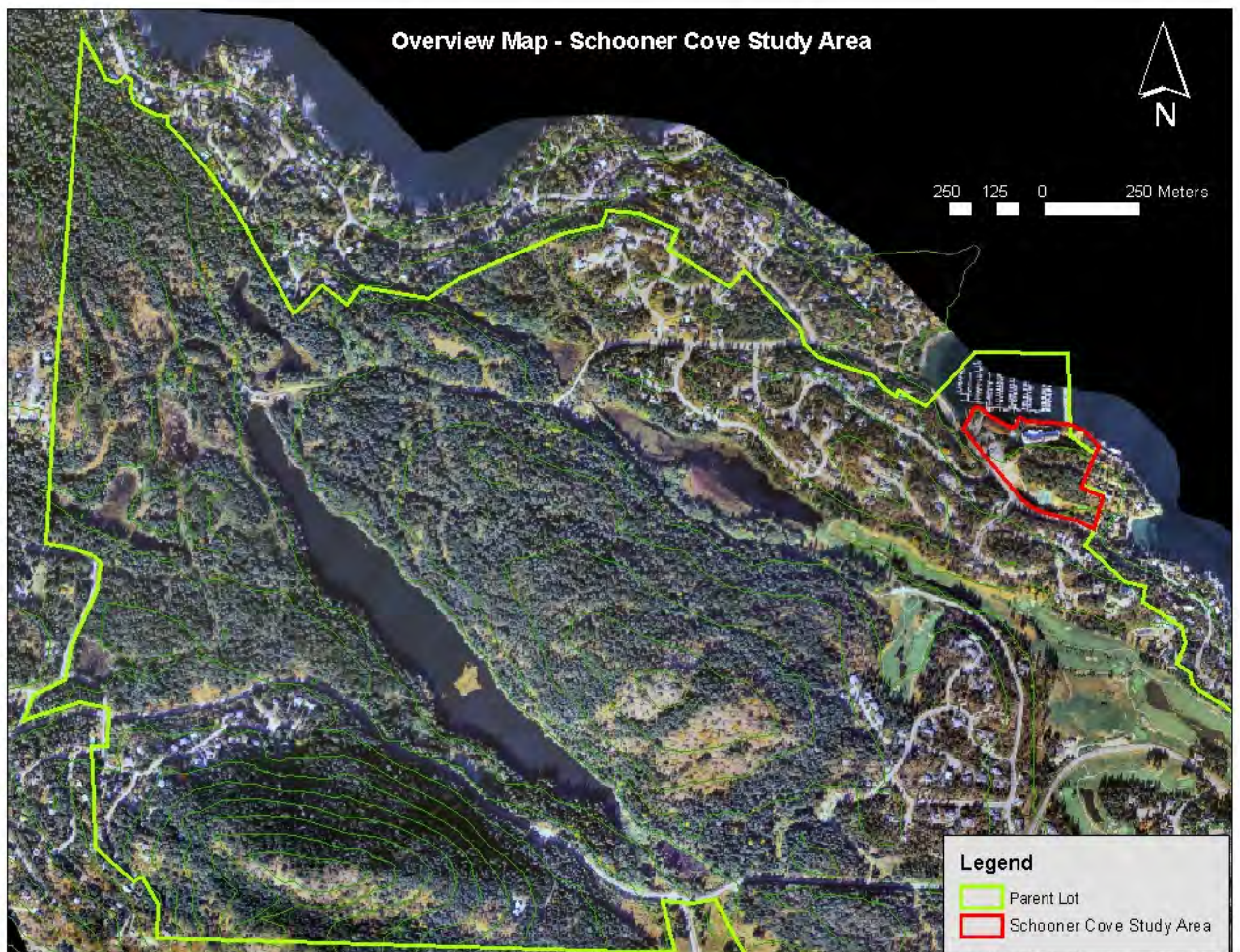
Climate data for the Study Area are available from Environment Canada's Atmospheric Environment Service (AES) and Ministry of Environment (MoE). AES maintains a climate station at the Nanaimo Airport. The data recorded include temperature and precipitation. The following summarizes the weather data obtained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

- 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.
- 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.
- The driest months are in the summer (July and August).

**Figure 1. Site Overview**



## 1.5 METHODOLOGY

### 1.5.1 Identification and Review of Environmental Data

Prior to actual on site investigations of vegetation, wildlife and aquatic communities within the delineated site, 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 the Environment (MoE), 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 site boundaries (Fairwinds Real Estate Management Inc. 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 October 15<sup>th</sup> 2006 and June 30<sup>th</sup>, 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 4 biophysical assessment transects measuring 25m in width were assessed thoroughly as well as a complete site walkthrough resulting in over 100% coverage of the Study Area. In addition, various biophysical assessments of the Study Area were conducted including but not limited to 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 subject property 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.

**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 myrsinities</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 3-day field program. This information was used as the basis for assessing potential impacts and identifying appropriate mitigation measures.

### ***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 site. 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 consisted of the proposed development area plus 10m on either side where feasible. This 10m 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 B.C. Conservation Data Centre, and a review of environmental databases from the Ministry of Water, Land and Air Protection (MWLAP). Internet addresses for these databases are as follows:



- Ministry of Water, Land and Air Protection, BC Conservation Data Center:  
[www.env.gov.bc.ca/cdc/](http://www.env.gov.bc.ca/cdc/)
- 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 conducted field reconnaissance of the site in June 2008 during which time the following tasks were completed.

The vegetation of the site 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 based on a general reconnaissance of the site while a global positioning unit (GPS) 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
- Presence of rare and endangered species

Overall, a total of 4 distinct vegetation communities (fifth 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 – Coastal Bluff
- Quadrat #2 – Douglas fir/Arbutus Forest
- Quadrat #3 – Riparian
- Quadrat #4 – Garry Oak/Arbutus

These 4 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 site 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	19.2%
Garry Oak Ecosystem	3.9%
Riparian Ecosystem	2.9%
Coastal Bluff Ecosystem	0.8%
Disturbed Ecosystem	73.2%

Of the species encountered, none were listed on the Conservation Data Centre: Rare Vascular Plant/Vegetative Communities Tracking List – South Island Forest District (Appendix C). Refer to Appendix D, Biophysical Map for quadrat locations. For a complete list of plants identified in the Study Area, refer to Tables 3-6 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 site as a whole due to seasonal variability in plant species. As areas of



special concern (rocky outcrops, woodland etc.) where often 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 – Coastal Bluff (CB) - Rocky outcrop/ seashore bluff w. grassy**

Slope- 25%    Aspect- 12 degrees    Canopy Closure- 8%

<b>Common Name</b>	<b>Scientific name</b>	<b>Percent cover %</b>
Douglas fir	<i>Psuedotsuga menziesii</i>	13/8 (canopy)
Garry Oak	<i>Quercus garryana</i>	3
Arbutus	<i>Arbutus Menziesii</i>	15
Coastal reindeer lichen	<i>Cladina portentosa</i>	4
Common dandelion	<i>Taraxacum officinale</i>	3
Hairy honeysuckle	<i>Lonicera hispidula</i>	2
Meadow death-camas	<i>Zygadenus venenosus</i>	Trace (Tr)
Oceanspray	<i>Holodiscus discolor</i>	4
Saskatoon berry	<i>Maelanchier alnifolia</i>	5
Scotch broom	<i>Cytisus scoparius</i>	15
Yarrow	<i>Achilea millefolium</i>	2
Moss all sp.	<i>Total cover</i>	7
Grasses al sp.	<i>Total cover</i>	55



Plate #1 – Typical view of coastal bluff ecosystem

Above is a typical view of a coastal bluff polygon within the Study Area. Measuring approximately 689m<sup>2</sup> in area, this ecosystem represents the smallest vegetative community in the Study Area. Although this area has not been disturbed directly by man, much of the area has seen wide spread distribution of Scotch broom. This is having an obvious and direct impact on the native vegetation.

**Table 4. Quadrat #2 – Douglas fir/Arbutus Ecosystem (DF/AB) - Mixed woodland open canopy 50 years old**

Slope- 35% Aspect- 360 degrees Canopy Closure- 35%

<b>Common Name</b>	<b>Scientific name</b>	<b>Percent cover %</b>
Douglas fir	<i>Psuedotsuga menziesii</i>	22 (canopy)
Garry Oak	<i>Quercus garryana</i>	10 ( understory)
Arbutus	<i>Arbutus Menziesii</i>	13 (canopy)/ 10( understory)
Big-leaf maple	<i>Acer macrophyllum</i>	5
American vetch	<i>Vicia American</i>	2
Baldhip rose	<i>Rosa Gymnocarpa</i>	1
Dull Oregon grape	<i>Mahonia nervosa</i>	4
Hairy honeysuckle	<i>Lonicera hispidula</i>	4
Maidenhair fern	<i>Adiantum pedatum</i>	1
Oceanspray	<i>Holodiscus discolour</i>	5
Prince's pine	<i>Chimaphila umbellate</i>	Trace
Salal	<i>Gaultheria shallon</i>	2
Scotch broom	<i>Cytisus scoparius</i>	5
Sword fern	<i>Polystichum munitum</i>	1
Trailing blackberry	<i>Rubus ursinus</i>	1
Twinflower	<i>Linnaea borealis</i>	1
Wall lettuce	<i>Lactuca muralis</i>	2
Yerba Buena	<i>Satureja douglasii</i>	2
Moss all sp.	Total cover	60
Grasses al sp.	Total cover	10



Plate #2 – Typical view of Douglas fir/Arbutus ecosystem

Above is a typical view of a Douglas fir/Arbutus vegetative community. This polygon makes up the largest ecosystem within the Study Area at approximately 16,474 m<sup>2</sup> and is home to a variety of plant and wildlife species. The ecosystem is typical of the Coastal Douglas Fir – moist maritime (CDFmm) biogeoclimatic zone found on the eastern flanks of Vancouver Island.

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

Slope- 5%      Aspect- 90 degrees      Canopy Closure- 55%		
<b>Common Name</b>	<b>Scientific name</b>	<b>Percent cover %</b>
Red alder	<i>Alnus rubra</i>	35
Garry Oak	<i>Psuedotsuga menziesii</i>	10
Douglas fir	<i>Quercus garryana</i>	10
Pacific water-parsley	<i>Oenanthe sarmentosa</i>	3
Field mint	<i>Mentha arvensis</i>	4



Trailing blackberry	<i>Rubus ursinus</i>	8
Wall lettuce	<i>Lactuca muralis</i>	3
Oceanspray	<i>Holodiscus discolor</i>	5
Grasses all sp.	<i>Total cover</i>	7
Moss all sp.	<i>Total cover</i>	25



Plate #3 – Typical view of Riparian ecosystem ground cover

Above is a typical view of the riparian ecosystem within the Study Area. With a total area measuring approximately 2450 m<sup>2</sup>, the polygon is comprised primarily of alder due to 2 small watercourses, which intercept water from opposite valley walls and maintain a saturated environment all year long.



**Table 6. Quadrat #4 – Garry Oak/Arbutus Ecosystem (GO/AB)**

Slope- 15%    Aspect- 12 degrees    Canopy Closure- 8%

<b>Common Name</b>	<b>Scientific name</b>	<b>Percent cover %</b>
Douglas fir	<i>Psuedotsuga menziesii</i>	15 (canopy)/3 (understory)
Garry Oak	<i>Quercus garryana</i>	20
Arbutus	<i>Arbutus Menziesii</i>	10
Coastal reindeer lichen	<i>Cladina portentosa</i>	3
Common dandelion	<i>Taraxacum officinale</i>	1
Freckle pelt	<i>Peltigera Britannica</i>	1
Hairy honeysuckle	<i>Lonicera hispidula</i>	2
Hymalayan blackberry	<i>Rubus discolor</i>	1
Scotch broom	<i>Cytisus scoparius</i>	5
Trailing blackberry	<i>Rubus ursinus</i>	1
Twinline	<i>Linnaea borealis</i>	5
Wall lettuce	<i>Lactuca muralis</i>	Tr
Wood saxifrage	<i>Saxifraga mertensiana</i>	2
Yerba Buena	<i>Satureja douglasii</i>	6
Yarrow	<i>Achilea millefolium</i>	1
Grasses all sp.	<i>Total cover</i>	60
Moss all sp.	<i>Total cover</i>	20



Plate #4 – Typical view of Garry Oak/Arbutus ecosystem

Above is a typical view of the Garry Oak/Arbutus ecosystem within the Study Area. With a total area measuring approximately 2972 m<sup>2</sup>, the polygon is comprised primarily of Garry Oak and Arbutus with a high diversity of wildflowers. This vegetative community is often favorable to many of Canada's as well as Vancouver Island's rare plants and animals species.

## **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; 86 blue-listed and 78 red-listed (*Appendix B*). 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 site 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; 28 red-listed and 7 blue-listed (Appendix C). Based on site observations, three red listed communities were identified including Douglas fir/Arbutus, Garry Oak/ Arbutus on rocky outcrops and coastal bluff ecosystems. As most of the areas within the above ecosystems are not in a late successional stage of development, the overall ratings are lowered to moderately sensitive. Additionally, these communities are isolated and represent only small, fragmented patches of intact ecosystems. Refer to *Appendix D – Ecosystem Map* for polygon location.

#### ***2.1.4.3 Garry Oak Meadows Within the Fairwinds Schooner Cove Study Area***

Located primarily within three distinct areas of the Study Area over three polygons (refer to Figure 2 below), the Garry Oak meadows cover an area of approximately 3372 square meters (0.83 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 may have a multitude of small to large mammals and can be 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. Due to the relative small size and fragmentation of the Garry Oak polygons within the Study Area, their protection



would be of limited ecological value. Conservation of the larger Garry Oak polygons within the draft neighbourhood plan for the nearby Lakes District offers relatively high habitat values within an interconnected system that can be planned and managed more effectively to have a more significant positive impact upon the region's ecosystems.

**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. 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 site 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 site area (i.e. topographic mapping, aerial photography); and
- Review of target species including 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 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, the Study Area was firstly, broken down into four separate transects which were equally spaced. (Appendix D, Biophysical Assessment Map). Transects were labelled from 1- 4 starting from the northwest to the southeast in an attempt to cross section the properties wide points. Further to the assessments along these transects, individual point count stations were set up at key locations along the transect ensuring that each section of the Study Area would be surveyed/inventoried from a different angle (location) and therefore, thoroughly covered using protocols of “standwatch” and roadside call playback methodology. It also sampled the different vegetational structure and their stages. Additionally, the methodology ensured that all areas of 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 portions of the Study Area where the proposed building footprints and roads are contemplated. 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 6-8

#### **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 Station (OCS) #1, (*Appendix D, Biophysical Map*). Call playbacks were played at the OCS 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 site by conducting a herpetifaunal survey of reptiles and amphibians along any watercourse and/or wetland on the property. Additionally, areas of greatest impact (through wetlands) on herpetifauna by proposed building footprints and roads were surveyed with greater intensity.

This survey involved a two-part methodology:

- An office background information search; and
- A field study preparation with site 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 Study 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 site 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 herpetofauna 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 on the study site 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 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.
- Attention was paid to potential road kills and any herpetifauna/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 site. Randomly chosen sections of Watercourse #1 and Watercourse #2 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;

- 2 MT sites for a period of 72 hrs, 10 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 MWLAP 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 the targeted examination area(s) within this Study Area;
- Stratify examination 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 7 locations – SMT1 -7). The number of traps along the transect was dependent on the potential species, estimated population levels and also informed by 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 site was sampled using this methodology and traps were placed in homogeneous habitat (Appendix D, Biophysical Assessment Map);
- Universal Transverse Mercator (UTM), 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.; and

- 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 Procedure**

- 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 potential habitat based; 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 species list 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 also 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 Area's 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 sites general vegetative structure, and field surveys.

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

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.

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 (January 2009) 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 are not likely to nest on the subject property, however have been observed on-site.

#### **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 not 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 subspecies/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). Habitat in the study site is not considered suitable for breeding and/or foraging for this species.

## **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 on 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, infrequently 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. Barn owls are not considered likely to occur in the Study Area.

## 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 (April 2001). It is a target species for the survey.

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). It does not have a good chance of occurring in the Study Area as old growth deciduous trees are limited. Being quite adaptive in nature in urban and residential areas it frequents orchards, parks and gardens. Nesting of this species is likely found at elevations above 540 metres (Campbell *et. al.* 1990).

As a result, these owls are not expected in the Study Area.

### **\*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.

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 km<sup>2</sup> (Kirley and Springer 1980).

Non-migratory, 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, open woodlots bordering lakes and streams. Nests have been discovered from sea level to approximately 1,220 m (Campbell *et. al.* 1990).

Great-horned owls might use the Study Area for foraging, however, their presence may only occur periodically as more suitable habitat is available nearby.

**\*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 (April 2001).

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. Primarily a cavity nester, historically, all nests discovered in BC have been in old woodpecker holes of coniferous trees including Douglas-fir, western hemlock, and western larch. It has a low potential of occurring on-site due to the absence 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 in 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 in the Study Area.

### **\*Northern Saw-whet Owl (*Aegolius acadicus*), NSW**

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 low potential of occurring on-site due to the absence of suitably sized trees.

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

#### **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 (2003).

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 some potential of occurring in the Study Area but is not expected because of an absence of suitable habitat.

### **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 (2003).

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 are 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.



This species has a low potential of occurring in our Study Area due to habitat requirements.

## 2.2.2 Assessment Results

### 2.2.2.1 Bird Inventory

The bird survey was conducted on various dates in June 2008. The night/nocturnal surveys were completed on the evening of January 15<sup>th</sup> 2007. A total of 18 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 is a result of the transect/point count and roadside call playback surveys performed on the delineated Study Area in June 2008. Refer to Table 7 below.

**Table 7. Summary Table of Passerine Bird Survey**

Transect #	Date	Total Species Encountered Along Each Transect	Red/Blue Species Encountered
1	May - October 2008	3	0
2	May - October 2008	4	0
3	May - October 2008	6	0
4	May - October	9	0



	2008		
<b>TOTAL</b>		<b>22</b>	<b>0</b>

Detailed information on species observed is presented below in Table 8 and 9.

**Table 8. Species Abundance and Diversity Along Each Transect**

Transect	No. of Individuals Observed at Each Station
1	7
2	5
3	10
4	14
<b>Grand Total</b>	<b>36</b>

**Table 9 Avian Species List**

Common name	Scientific Name
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
American robin	<i>Turdus Migratorius</i>
Brown creeper	<i>Certhia Americana</i>
Chestnut-backed chickadee	<i>Poecile sclateri</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Downy woodpecker	<i>Picoides pubescens</i>
Great blue heron	<i>Ardea herodias</i>
House Wren	<i>Troglodytes aedon</i>
Northwestern Crow	<i>Corvus caurinus</i>
Winter Wren	<i>Troglodytes troglodytes</i>
Turkey Vulture	<i>Cathartes aura</i>
Great Horned Owl	<i>Bubo virginianus</i>
Varied Thrush	<i>Ixoreus naevius</i>
Unidentified Gulls	<i>N/a</i>
Stellars' Jay	<i>Cyanocitta stelleri</i>

Northern Flicker	<i>Colaptes auratus</i>
Common Nighthawk	<i>Chordeiles minor</i>

#### Diurnal Stand Watch/Point Counts

The greatest number of individuals and species diversity was observed along transect 4 and the lowest was along transect 1. No heronry/rookery attributes were noted within the Study Area during the survey despite meticulous searching with a high powered/anchored spotting scope. The site does however have the potential to provide low-moderate 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 15<sup>th</sup> 2007 at one raptor/owl calling station (OCS #1) 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 a Great Horned-Owl. The arrival of the owl from the west (approximately 20 minutes after the initiation of calls) indicates that they are likely nesting outside of the Study Area.

#### ***2.2.2.2 Amphibian Survey***

The amphibian survey was conducted on various dates in June 2008.

A total of 2 roughskin newts and numerous 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 4 hrs. of survey time was spent searching the following locations and habitats throughout the Study Area:

- All ephemeral drainages and wetted depressions

#### Auditory Survey Results



One night was spent performing the auditory surveys (January 15<sup>th</sup> 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 hundreds of breeding Pacific Tree Frogs (*Hyla regalis*) in various locations throughout the Study Area.

#### Time Constraint and Systematic Search Results

This survey methodology was the most productive for amphibian encounters. A total of 12 individuals were found during the survey. A majority of effort was spent in the riparian ecosystem as well as along watercourses labelled 1 and 2. Here the survey focused on frogs and salamanders.

The Pacific tree frogs as well as the roughskin newt were the only species encountered during our survey and was located in both the stream as well as in the isolated wetted depression. Species assessed are presented in *Table 10 below*:

**Table 10. 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

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

### 2.2.2.3 Small Mammal Survey

Six (Havahart) traps (Small Mammal Traps – SMT 1 - 6) were set at various homogeneous vegetative areas along the proposed site (*Appendix D, Biophysical Assessment Map*) and each habitat type was sampled where possible. As well, 2 larger traps (MMT1) (*Appendix D, Biophysical Assessment Map*) was set at one location along the center of the Study Area. The traps were recovered after a period of 48 hrs. (checked every 24 hr. period). Out of all the traps, one raccoon and 4 deer mice were caught. Please refer to Table 11 below:

**Table 11. Results of Live Small and Medium Mammal Trapping**

Trap Site Number	Species Captured
SMT #1	1 deer mouse
SMT #2	1 deer mouse
SMT #3	0

Trap Site Number	Species Captured
SMT #4	1 deer mouse
SMT #5	0
SMT #6	1 deer mouse
MMT #1	1 raccoon

#### 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 4 transects was performed in conjunction with the bird survey. *Table 12* presents an overview of incidental wildlife sightings.

**Table 12. Incidental Wildlife Sightings**

Species	Evidence	Location
Blacktail Deer	Visual	Various
Turkey Vulture	Visual	Various
Grey Squirrel	Visual	End of Transect #1
Red Squirrel	Visual	T3
Bald Eagle	Visual	Various
Red-tailed Hawk	Visual	Various
Eastern Cottontail	Carcass	Transect #2
Bald Eagle	Visual	Various
Raccoon	Visual	Midway T4
American robin	Visual	T1
Brown creeper	Visual	T4
Chestnut-backed chickadee	Visual	T4
Dark-eyed junco	Visual	T1, T4
Downy woodpecker	Visual	T4
Great blue heron	Visual	T2
House Wren	Visual	T3, T4
Northwestern Crow	Visual	Various
Winter Wren	Visual	T3, T4

## **2.3 AQUATIC RESOURCES**

### **2.3.1 Watercourses**

There are two small first order watercourses within the Study Area that do not meet the definition of a stream as described in the Fish/Stream Identification Guidebook (1998). In both cases, the watercourses have minimal scour and mineral alluvium however; do not meet the minimum lengths of 100m of continuous channel. Further, the final 50m of flow prior to entering the ocean, appears to be underground and therefore is considered a barrier to upstream fish migration from the ocean. The two watercourses are therefore considered non fish bearing and are not subject to the Riparian Areas Regulations (RAR) legislation. That being said, the two watercourses do provide riparian and ecological functions due to tree composition and structure. Refer to Appendix F map for watercourse locations.

### **2.3.2 Fisheries Resources**

#### ***2.3.2.1 Background***

No fisheries data info exists for any of the watercourses within our delineated Study Area (FISS 2008).

#### ***2.3.2.2 Surface Water Use***

Site, information on water quality and water licenses is non-existent and therefore not included in this report.



### **2.3.3 Survey Methodology**

#### ***2.3.3.1 Office Study***

A review of the following environmental databases was undertaken. Internet addresses for these databases are as follows:

Ministry of Environment

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 Ministry of Environment/Department of Fisheries and Oceans 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 Biophysical Results**

Waterbodies within the Study Area boundaries include two first order watercourses located at opposite toes of slope within a disturbed area and which eventually meet at the eastern edge of the Study Area. Both watercourses were constructed in order to provide drainage to the adjacent flat excavated area. The locations of these waterbodies are presented in Appendix F, Waterbodies Map, and discussed below in further detail.

#### ***2.3.4.1 Watercourse #1 (W#1)***

Watercourse #1 originates from ground water at the base of Dolphin Drive immediately southeast of the existing tennis court. With a total length of 113m, the watercourse travels west to east before going underground and eventually into the ocean. With a bankfull width (Wb) of 0.46m and an average gradient of 4%, the watercourse exhibits riffle-pool morphology. Flows at the time of survey were minimal with 100% wetted connectivity through its length with an average wetted depth of 0.05cm. The instream substrate consisted primarily of fines with a lesser extent of gravel. Canopy closure at the time of survey was approximately 55% with alder in the pole sapling stage of development dominating the overstory. Please refer to Plates #5 and #6 below for typical photographs of Watercourse #1.



Plate #5 – Watercourse #1-Upstream view of substrate composition



Plate #6 – Watercourse #1 - Upstream view of channel

#### **2.3.4.2 Watercourse #2 (W#2)**

Watercourse #2 originates from ground water 17m east of the northeast corner of the existing tennis courts located at 3521 Dolphin Drive. With a total length of 131m, the watercourse travels west to east before turning south and joining watercourse #1 along the southeastern corner of the Study Area. With a bankfull width ( $W_b$ ) of 0.23m and an average gradient of 3%, the watercourse exhibits riffle-pool morphology. Flows at the time of survey were minimal with 100% wetted connectivity through its length with an average wetted depth of 0.05cm. The instream substrate consisted primarily of fines with a lesser extent of gravel. Canopy closure at the time of survey was approximately 75% with alder in the pole sapling stage of development dominating the overstory. Please refer to Plate #7 below for typical photograph of Watercourse #2.





Plate #7 – Watercourse #2-Upstream view of channel and substrate composition

### **2.3.5 Minnow Trap Assessment Summary**

Ten minnow traps baited with cat food and set in 2 separate locations (five traps at each location) (Appendix D, Biophysical Assessment Map) were monitored over the course of three days (checked once a day). The results of our assessment are presented below in Table 13.

**Table 13. Minnow Trap Sampling Summary Table**

<b>Minnow Trap #.</b>	<b>Total Time</b>	<b>Location</b>	<b>Results</b>
1	72hrs.	Watercourse #1	3 Rough skinned newt (RSN) 3 Pacific tree frogs
2	72hrs.	Watercourse #2	3 Pacific tree frogs

## **2.4 MARINE ENVIRONMENT**

At the time of writing of this report, a nearshore marine biology study is being undertaken by Archipelago Marine Research Ltd., which includes coastal portions of the Study Area including the complete length of the breakwater. Once complete, the report will be added as an addendum to this report.

## **2.5 CULTURALLY MODIFIED TREES**

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

## **3.0 ENVIRONMENTAL IMPACTS & MITIGATION MEASURES**

### **3.1 AQUATIC RESOURCES**

The following represents a list of potential impacts to aquatic life and aquatic habitat within the Study Area. Of the waterbodies identified, both watercourse #1 and #2 are considered non fish bearing and therefore do not have fisheries values either instream and/or in downstream habitat. As the watercourses are isolated, instream habitat is limited to aquatic animals such as frogs, salamanders and newts. Where disturbance occurs, similar habitat will be created in and around the Study Area in consultation with the Ministry of Environment (MoE) if stream segments need to be reconfigured. Please refer to the Impact Summary Table below (Table 14) for a complete list of impacts and mitigation solutions.

### **3.2 WILDLIFE**

Wildlife issues within the Study Area includes a loss of habitat for various animals presently utilizing this parcel of land. They include deer, rabbits, raccoons, squirrels, numerous birds and various raptors identified in our assessment, which utilize this parcel of land primarily for foraging. Of particular importance however, are the locations of several Garry Oak polygons within the proposed eastern boundary of the Study Area identified in *Appendix E, Ecosystems Map*. The polygons provide habitat for a variety of animals including several species of reptiles and have a high propensity for wildflowers. As well, special attention should also be given to the riparian ecosystem identified on the ecosystems map as they provide water to numerous bird and animal species during the dry summer months. This area appears to be the only freshwater source within a 500m radius of the Study Area. In summary, although construction activities will undoubtedly affect and remove present habitat within select areas, the overall percentage of disturbed land within the Study Area and the Lakes District included collectively is expected to be low and therefore, 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 14) for a complete list of impacts and mitigation solutions.

### **3.3 VEGETATION**

Our assessment in June 2008 resulted in the identification of >30 plant species in 4 different vegetative communities. Of the four identified, the greatest diversity of plants was along the Douglas Fir/Arbutus community quadrat. Our assessment 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 is evident by the topography of the Study Area, this area will undoubtedly be affected by construction activities as it has by far the best building site within the lot as well as being the most practical. As a result, it is recommended that areas outside of those required for a building, be further disturbed as little as possible. This includes adding high visibility snow fencing to reduce construction related impacts as well as educating future homeowners/business owners on areas of concern including invasive species introduction and Scottish Broom management. The management of introduced species will have an overall positive effect on the natural areas that remain post construction. Direct impacts related to the construction in the Study Area will result in the removal of most species along building footprints and driveway/road locations. Due to the impacts associated with the removal of present vegetative communities, it is proposed that as a mitigative measure, areas outside of those needed for the building footprint and associated areas dedicated to construction be disturbed as little as possible and that native trees and shrubs be used for landscape planting. Please refer to the Impact Summary table below (Table 14) for a complete list of impacts and mitigation solutions.



**Table 14. Impact Summary Table**

<b>Environmental Parameter</b>	<b>Potential Impacts</b>	<b>Mitigative Measures</b>	<b>Residual Impacts</b>
<b><i>Vegetation</i></b>	Loss of natural vegetation currently existing on site along proposed development footprints	<p>Riparian removal will be limited to the fullest extent possible. If required to be removed/reconfigured, areas equal in size and characteristics will be created an/or set aside nearby as protected areas.</p> <p>Garry Oak ecosystems removal will be limited where feasible.</p> <p>Reclamation of unpaved disturbed areas with native trees and shrubs. Removal of Scottish Broom in areas not proposed for development</p>	<p>Loss of vegetation in the area immediately required to accommodate the development footprint</p> <p>Loss of small isolated Garry Oak polygons</p> <p>Positive impacts resulting from revegetation with native species as well as invasive species control.</p>
<b><i>Aquatic Life and Habitat</i></b>	Loss of riparian buffers along low-moderate value habitat associated with the proposed development	Retain stormwater in ponds as drinking source for wildlife	Increase in stormwater runoff and instream flows
<b><i>Wildlife</i></b>	<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>Ensure some 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 (BC CDC).</p> <p>Stress to wildlife caused by increases in human encounters including foot and road traffic</p>	<p>species found to breed within 30 m of the proposed road, driveway or building sites.</p> <p>None</p>	<p>Potential disturbance to wildlife</p> <p>Minimal stress associated with increases in traffic</p>
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### 3.4 MONITORING

All construction activities within areas identified as sensitive are to be monitored by a Professional Biologist. These include works alongside the Garry Oak ecosystem, coastal bluff ecosystems and riparian polygons. As well, it is recommended that a detailed sediment control plan be implemented prior to fall/winter rains.

### 3.5 SITE CONSTRAINTS

As part of a Development Impact Assessment, a site constraints map was developed to help identify areas of particular concern related to topography, hydrology, sensitive ecosystems and associated buffers. The overall goal of this exercise was to develop a working map on which developers, interested parties, construction managers etc. could allow for changes to the development plan during the initial phases of the project when sensitive components were identified during the biophysical assessment stage of the project. As a result, options have been explored in regards to building footprint placement, road placement that provide for alternative layout/design structures that adapt to the need for habitat protection. From this map, it is mandatory that all future works within identified sensitive habitats be assessed by a professional biologist prior to permits



being granted. Please refer to Appendix G, 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 the project biologist so that overall negative impacts are reduced.



### **3.6 ENVIRONMENTAL IMPACTS SUMMARY**

Overall, disturbances associated with the development of the Study Area are anticipated to be minimal regionally as extensive areas adjacent in the nearby Lakes District including riparian and sensitive ecosystems are to be protected as park/covenant areas through a larger scale comprehensive development plan. This dedication, along with sound environmental practices during construction activities as well as the proposed mitigation, will undoubtedly reduce the overall environmental impacts associated with the development of the Study Area.

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# Appendix A

Scientific Name	English Name	RISC Code	Global Rank	Prov Rank	Prov Rank Review Date	Prov Rank Change Date
<i>Accipiter gentilis laingi</i>	Northern Goshawk, <i>laingi</i> subspecies	B-NOGO-LA	G5T2	S2B	November 29,2005	June 16,1997
<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
<i>Ardea herodias fannini</i>	Great Blue Heron, <i>fannini</i> subspecies	B-GBHE-FA	G5T4	S3B,S4N	November 29,2005	April 24,2002
<i>Asio flammeus</i>	Short-eared Owl	B-SEOW	G5	S3B,S2N	November 29,2005	June 01,1996
<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
<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 eryphon sheltonensis</i>	Western Pine Elfin, <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' Elfin, <i>mossii</i> subspecies	IL-CALMOS-MO	G4T4	S2S3	November 20,2006	January 15,2007
<i>Carychium occidentale</i>	Western Thorn	IM-CAROCC	G3G4	S2S3		
<i>Cercyonis 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
<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>Contia tenuis</i>	Sharp-tailed Snake	R-COTE	G5	S1	December 03,2007	June 30,1998
<i>Copablepharon fuscum</i>	Sand-verbena Moth	IL-COPFUS	G1G2	S1	April 07,2006	April 07,2006
<i>Corynorhinus 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
<i>Dermochelys coriacea</i>	Leatherback	R-DECO	G2	S1S2N	December 03,2007	January 31,1992
<i>Enallagma hageni</i>	Hagen's Bluet	IO-ENAHAG	G5	S3S4	January 04,2004	
<i>Epiheca 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
<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 insulanus</i>	Large Marble, <i>insulanus</i> subspecies	IL-EUCAUS-IN	G5T1	SX	November 20,2006	December 06,1999
<i>Eumetopias jubatus</i>	Steller Sea Lion	M-EUJU	G3	S2S3B,S3N	December 08,2006	January 15,2007
<i>Euphydryas editha taylori</i>	Edith's Checkerspot, <i>taylori</i> subspecies	IL-EUPEDI-TA	G5T1	S1	November 20,2006	January 15,2007
<i>Euphyes vestris</i>	Dun Skipper	IL-EUPVES	G5	S3	November 20,2006	October 04,2001
<i>Falco peregrinus anatum</i>	Peregrine Falcon, <i>anatum</i> subspecies	B-PEFA-AN	G4T4	S2B	November 29,2005	June 30,1998
<i>Falco peregrinus pealei</i>	Peregrine Falcon, <i>pealei</i> subspecies	B-PEFA-PE	G4T3	S3B	November 29,2005	June 30,1998
<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 sp. 2</i>	Enos Lake Limnetic Stickleback		G1	S1	January 12,2004	January 31,1992
<i>Gasterosteus sp. 3</i>	Enos Lake Benthic Stickleback		G1	S1	January 12,2004	January 31,1992
<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
<i>Hemphillia dromedarius</i>	Dromedary Jumping-slug	IM-HEMDRO	G3G4	S2		
<i>Hemphillia glandulosa</i>	Warty Jumping-slug	IM-HEMGLA	G3G4	S2S3		
<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-WTPT-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
<i>Marmota vancouverensis</i>	Vancouver Island Marmot	M-MAVA	G1	S1	December 08,2006	June 30,1998

<i>Megascops kennicottii kennicottii</i>	Western Screech-Owl, <i>kennicottii</i> subspecies	B-WSOW-KE	G5T4	S3	November 29,2005	February 21,2003
<i>Melanerpes lewis</i>	Lewis's Woodpecker	B-LEWO	G4	S2B	November 29,2005	November 29,2005
<i>Melanerpes lewis</i> pop. 1	Lewis's Woodpecker (Georgia Depression population)	B-LEWO	G5TXQ	SXB	November 29,2005	December 05,2000
<i>Monadenia fidelis</i>	Pacific Sideband	IM-MONFID	G4G5	S3S4	March 15,2005	March 15,2005
<i>Mustela erminea anguinae</i>	Ermine, <i>anguinae</i> subspecies	M-MUER-AN	G5T3	S3	December 08,2006	November 30,1995
<i>Myotis keenii</i>	Keen's Myotis	M-MYKE	G2G3	S1S3	December 08,2006	January 15,2007
<i>Nearctula</i> sp. 1	Threaded Vertigo	IM-NEASP1	G3G5	S2	March 15,2005	March 15,2005
<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>Parnassius smintheus olympiannus</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
<i>Phalacrocorax penicillatus</i>	Brandt's Cormorant	B-BRCO	G5	S1B,S4N	November 29,2005	June 01,1996
<i>Physella heterostropha</i>	Pewter Physa	IM-PHYHET	G5Q	S1S3	April 20,2004	April 20,2004
<i>Physella integra</i>	Ashy Physa	IM-PHYINT	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	R-PICA-CA	G5T5	SX	December 03,2007	June 30,1998
<i>Plebejus icarioides blackmorei</i>	Boisduval's Blue, <i>blackmorei</i> subspecies	IL-PLEICA-BL	G5T3	S3	November 20,2006	April 26,2001
<i>Plebejus saepiolus insulanus</i>	Greenish Blue, <i>insulanus</i> subspecies	IL-PLESAE-IN	G5TH	SH	November 20,2006	December 06,1999
<i>Poocetes gramineus affinis</i>	Vesper Sparrow, <i>affinis</i> subspecies	B-VESP-AF	G5T3	S1B	November 29,2005	June 30,1998
<i>Pristiloma johnsoni</i>	Broadwhorl Tightcoil	IM-PRIJOH	G2G3	S2S3		
<i>Progne subis</i>	Purple Martin	B-PUMA	G5	S2S3B	November 29,2005	November 29,2005
<i>Promenetus umbilicatellus</i>	Umbilicate Sprite	IM-PROUMB	G4	S3S4		
<i>Prophysaon coeruleum</i>	Blue-grey Taildropper	IM-PROCOE	G3G4	S1		
<i>Prophysaon vanattae</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
<i>Rana pipiens</i>	Northern Leopard Frog	A-RAPI	G5	S1	December 03,2007	June 01,1996
<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
<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

Scientific Name	English Name	RISC Code	Global Rank	Prov Rank	Prov Rank Review Date	Prov Rank Change Date	COSEWIC
<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 20)
<i>Acaulon muticum</i> var. <i>rufescens</i>		ACAUMUT1	G4G5T4	S1	March 28,1997	March 28,1997	
<i>Agrostis pallens</i>	dune bentgrass	AGROPAL	G4G5	S3	November 28,2005	October 17,2001	
<i>Allium amplexens</i>	slimleaf onion	ALLIAMP	G4	S3	April 09,2001	March 07,2001	
<i>Allium crenulatum</i>	Olympic onion	ALLICRE	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 adulterinum</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 20)
<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	BALSDEL	G5	S1	January 15,2005	May 14,2001	E (May 20)
<i>Bartramia stricta</i>	apple moss	BARTSTR	GU	S1	December 01,2000	December 01,1996	E (May 20)
<i>Bidens amplissima</i>	Vancouver Island beggarticks	BIDEAMP	G3	S3	April 09,2001	March 07,2001	SC (Nov 2)
<i>Bolboschoenus fluviatilis</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>Bulbostylis 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	CALLLON	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 20)
<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 ramosissima</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 20)
<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 20)
<i>Castilleja victoriae</i>	Victoria owl-clover	CASTVIC	G1	S1	August 29,2007	January 26,2007	
<i>Centaureum muehlenbergii</i>	Muhlenberg's centaury	CENTMUH	G5?	S1	December 29,2000	April 30,1996	E (Mar 20)
<i>Cephalanthera austiniiae</i>	phantom orchid	CEPHAUS	G4	S2	December 29,2000	April 30,1996	T (May 20)
<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)
<i>Crassula aquatica</i>	pigmyweed	CRASAQU	G5	S3	April 09,2001	March 07,2001	
<i>Crassula connata</i> var. <i>connata</i>	erect pygmyweed	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	DRABLON3	G5T3	S2S3	December 29,2000	April 30,1996	
<i>Dryopteris arguta</i>	coastal wood fern	DRYOARG	G5	S2S3	December 29,2000	April 30,1996	SC (Nov 2)
<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	ENTOFAS	G4G5	S2S3	September 10,2007	October 30,2007	SC (May 2)
<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 2004)
<i>Epilobium glaberrimum</i> ssp. <i>fastigiatum</i>	smooth willowherb	EPILGLA1	G5T4T5	S2S3	December 29,2000	April 30,1996	
<i>Epilobium halleanum</i>	Hall's willowherb	EPILHAL	G5	S2S3	December 29,2000	April 30,1996	
<i>Epilobium leptocarpum</i>	small-fruited willowherb	EPILLEP	G5	S2S3	December 29,2000	April 30,1996	
<i>Epilobium oregonense</i>	Oregon willowherb	EPILORE	G5	S2S3	November 28,2001	November 28,2001	
<i>Epilobium torreyi</i>	brook spike-primrose	EPILTOR	G5	SX	August 30,2004	August 30,2004	E (Apr 2004)
<i>Erysimum arenicola</i> var. <i>torulosum</i>	sand-dwelling wallflower	ERYSARE1	G4G5T3T5	S3	October 18,2006	October 18,2006	
<i>Erythronium montanum</i>	white glacier lily	ERYTMON	G4	S2S3	December 29,2000	April 30,1996	
<i>Fraxinus latifolia</i>	Oregon ash	FRAXLAT	G5	S1	December 29,2000	April 30,1996	
<i>Githopsis specularioides</i>	common bluecup	GITHSPE	G5	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	G3	S2S3	December 29,2000	April 30,1996	
<i>Hedysarum occidentale</i>	western hedysarum	HEDYOCC	G5	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	G5	S3	March 15,2002	March 07,2001	
<i>Heterodermia sitchensis</i>	seaside centipede	HETESIT	G2G3	S1	August 15,2007	August 15,2007	E (Apr 2007)
<i>Hippuris tetraphylla</i>	four-leaved mare's-tail	HIPPTET	G5	S2S3	November 28,2001	November 28,2001	
<i>Hutchinsia procumbens</i>	hutchinsia	HUTCPRO	G5	S1	December 29,2000	April 30,1996	
<i>Hydrocotyle ranunculoides</i>	floating water pennywort	HYDRRAN	G5	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	G3	S1			T (Mar 2004)
<i>Idahoia scapigera</i>	scalegod	IDAHSCA	G5	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	E (May 2004)
<i>Juncus occidentalis</i>	western rush	JUNCOCC	G5	S2S3	November 28,2005	November 28,2005	
<i>Juncus oxymeris</i>	pointed rush	JUNCOXY	G5	S2S3	December 29,2000	April 30,1996	
<i>Lasthenia glaberrima</i>	smooth goldfields	LASTGLA	G5	S1	August 01,2003	August 01,2003	E (Mar 2004)
<i>Lasthenia maritima</i>	hairy goldfields	LASTMAR	G4	S2S3	December 29,2000	April 30,1996	
<i>Lathyrus littoralis</i>	grey beach peavine	LATHLIT	G5	S2	December 11,2003	December 11,2003	
<i>Lepidium oxycarpum</i>	sharp-pod peppergrass	LEPIOXY	G4	SX	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	G2	S2	August 07,2007	November 28,2005	T (Nov 2005)
<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	G5	S1	December 29,2000	April 30,1996	
<i>Lotus formosissimus</i>	seaside birds-foot trefoil	LOTUFOR	G4	S1	December 29,2000	April 30,1996	E (May 2004)
<i>Lotus pinnatis</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 2004)
<i>Lupinus lepidus</i>	prairie lupine	LUPILEP	G5	S1	December 29,2000	April 30,1996	E (May 2004)
<i>Lupinus oregonus</i> var. <i>kincaidii</i>	Kincaid's lupine	LUPIORE1	G5T2	SX	December 29,2000	December 30,2000	
<i>Lupinus rivularis</i>	streambank lupine	LUPIRIV	G2G4	S1	December 29,2000	April 30,1996	E (Nov 2004)
<i>Madia minima</i>	small-headed tarweed	MADIMIN	G4	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	G5	S1	September 10,2007	February 20,2003	
<i>Meconella oregana</i>	white meconella	MECOORE	G2G3	S1	January 15,2005	November 25,2004	E (May 2004)
<i>Megalodonta 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	G5	S2S3	October 30,2006	October 30,2006	
<i>Microseris bigelovii</i>	coast microseris	MICRBIG	G4	S1	December 29,2000	October 06,2000	E (Apr 2004)
<i>Microseris lindleyi</i>	Lindley's microseris	MICRLIN	G5	S1	December 29,2000	April 30,1996	E (Mar 2004)
<i>Mimulus dentatus</i>	tooth-leaved monkey-flower	MIMUDEN	G5	S2	August 19,2003	August 19,2003	
<i>Minuartia pusilla</i>	dwarf sandwort	MINUPUS	G5	S1	December 29,2000	April 30,1996	E (May 2004)
<i>Mitella caulescens</i>	leafy mitrewort	MITECAU	G5	S2S3	November 28,2001	November 28,2001	
<i>Montia chamissoi</i>	Chamisso's montia	MONTCHA	G5	S2S3	November 28,2001	November 28,2001	

<i>Montia diffusa</i>	branching montia	MONTDIF	G4	S1	August 28,2001	August 28,2001	
<i>Myrica californica</i>	California wax-myrtle	MYRICAL	G5	S3	March 03,2003	March 03,2003	
<i>Myriophyllum quitense</i>	waterwort water-milfoil	MYRIQUI	G4?	S2S3	December 29,2000	April 30,1996	
<i>Myriophyllum ussuriense</i>	Ussurian water-milfoil	MYRIUSS	G3	S3	January 15,2002	March 07,2001	
<i>Navarretia intertexta</i>	needle-leaved navarretia	NAVAIN	G5	S2	December 29,2000	April 30,1996	
<i>Ophioglossum pusillum</i>	northern adder's-tongue	OPHIPUS	G5	S2S3	December 29,2000	October 06,2000	
<i>Orobanche pinorum</i>	pine broomrape	OROBPIN	G4	S1	September 24,2001	December 30,2000	
<i>Orthocarpus bracteosus</i>	rosy owl-clover	ORTHBRA	G3?	S1	December 29,2000	October 06,2000	E (May 20
<i>Orthocarpus imbricatus</i>	mountain owl-clover	ORTHIMB	G5	S1	December 29,2000	April 30,1996	
<i>Oxalis oregana</i>	redwood sorrel	OXALORE	G5	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 20
<i>Plagiobothrys tenellus</i>	slender popcornflower	PLAGTEN	G4G5	S2	December 29,2000	April 05,2000	
<i>Pleuricospora fimbriolata</i>	fringed pinesap	PLEUFIM	G4	SH	December 29,2000	April 30,1996	
<i>Pleuropogon refractus</i>	nodding semaphoregrass	PLEUREF	G4	S3	September 15,2001	April 12,2001	
<i>Polygonum hydropiperoides</i>	water-pepper	POLYHYR	G5	S2S3	December 29,2000	April 30,1996	
<i>Polygonum paronychia</i>	black knotweed	POLYPAR	G5	S3	November 28,2005	January 09,2003	
<i>Potamogeton oakesianus</i>	Oakes' pondweed	POTAOAK	G4	S2S3	November 28,2001	November 28,2001	
<i>Potentilla gracilis</i> var. <i>gracilis</i>	graceful cinquefoil	POTEGRA3	G5T5	S2S3	October 30,2006	October 30,2006	
<i>Prosartes smithii</i>	Smith's fairybells	PROSSMI	G5	S3	December 29,2000	April 30,1996	
<i>Pseudocypbellaria rainierensis</i>	Oldgrowth Specklebelly	PSEURAI	G3G4	S1			SC (May
<i>Psilocarphus elatior</i>	tall woolly-heads	PSILELA	G4Q	S1	December 29,2000	April 30,1996	E (May 20
<i>Psilocarphus tenellus</i> var. <i>tenellus</i>	slender woolly-heads	PSILTEN1	G4T4	S3	October 30,2006	October 30,2006	NAR (May
<i>Pyrola elliptica</i>	white wintergreen	PYROELL	G5	S2S3	December 29,2000	January 21,1999	
<i>Ranunculus alismifolius</i> var. <i>alismifolius</i>	water-plantain buttercup	RANUALI1	G5T5	S1	December 29,2000	April 30,1996	E (May 20
<i>Ranunculus californicus</i>	California buttercup	RANUCAL	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 20
<i>Sanicula bipinnatifida</i>	purple sanicle	SANIBIP	G5	S2	December 29,2000	April 30,1996	T (May 20
<i>Schoenoplectus americanus</i>	Olney'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 20
<i>Sparganium fluctuans</i>	water bur-reed	SPARFLU	G5	S2S3	December 29,2000	January 21,1999	
<i>Syntrichia laevipila</i>	twisted oak moss	TORTLAE2	GNR	S2S3	September 10,2007	October 30,2007	SC (May 20
<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 20
<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 20
<i>Triteleia howellii</i>	Howell's triteleia	TRITHOW	G3G4	S1	March 24,2005	August 18,2003	E (May 20
<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 20
<i>Wolffia columbiana</i>	Columbian water-meal	WOLFCOL	G5	S1	December 29,2000	April 30,1996	
<i>Woodwardia fimbriata</i>	giant chain fern	WOODFILM	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

Scientific Name	English Name	Global Rank	Prov Rank	Prov Rank Review Date	Prov Rank Change Date	BC Status	I
<i>Abies amabilis</i> - <i>Picea sitchensis</i> / <i>Oplopanax horridum</i>	amabilis fir - Sitka spruce / devil's club	GNR	S3	March 31,2001	March 31,2001	Blue	
<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	
<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	
<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	
<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	
<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	
<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	
<i>Abies amabilis</i> - <i>Tsuga mertensiana</i> / <i>Streptopus lanceolatus</i>	amabilis fir - mountain hemlock / rosy twistedstalk	G4G5	S4		September 29,1994	Yellow	
<i>Abies grandis</i> / <i>Mahonia nervosa</i>	grand fir / dull Oregon-grape	G1	S1	June 15,2000	June 15,2000	Red	
<i>Abies grandis</i> / <i>Tiarella trifoliata</i>	grand fir / three-leaved foamflower	G1	S1	June 15,2000	June 15,2000	Red	
<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	
<i>Alnus rubra</i> / <i>Lysichiton americanus</i>	red alder / skunk cabbage	GNR	S2S3	June 22,2004	October 30,1991	Blue	
<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	
<i>Anaphalis margaritacea</i> - <i>Aster foliaceus</i>	pearly everlasting - leafy aster	G2	S2	July 11,2002	July 11,2002	Red	
<i>Arbutus menziesii</i> / <i>Arctostaphylos columbiana</i>	arbutus / hairy manzanita	G2	S2		July 26,2002	Red	
<i>Artemisia campestris</i> - <i>Festuca rubra</i> / <i>Racomitrium canescens</i>	northern wormwood - red fescue / grey rock-moss	GNR	S1			Red	
<i>Calamagrostis purpurascens</i> Herbaceous Vegetation	purple reedgrass Herbaceous Vegetation	G2	S2		June 15,2000	Red	
<i>Carex lasiocarpa</i> - <i>Rhynchospora alba</i>	slender sedge - white beak-rush	G2	S2			Red	
<i>Carex lyngbyei</i> Herbaceous Vegetation	Lyngbye's sedge herbaceous vegetation	GNR	S3			Blue	
<i>Carex macrocephala</i> Herbaceous Vegetation	large-headed sedge Herbaceous Vegetation	G1G2	S1S2		July 26,2002	Red	
<i>Carex sitchensis</i> - <i>Oenanthe sarmentosa</i>	Sitka sedge - Pacific water-parsley	G3	S3			Blue	
<i>Carex sitchensis</i> / <i>Sphagnum</i> spp.	Sitka sedge / peat-mosses	G2	S2			Red	
<i>Chamaecyparis nootkatensis</i> / <i>Sphagnum</i> spp.	yellow-cedar / peat-mosses	GNR	S4?	April 02,1993	April 02,1993	Yellow	
<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	
<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	
<i>Deschampsia cespitosa</i> - <i>Sidalcea hendersonii</i>	tufted hairgrass - Henderson's checker-mallow	G2	S1S2	May 26,1992	September 20,1991	Red	
<i>Deschampsia cespitosa</i> ssp. <i>beringensis</i> - <i>Aster subspicatus</i>	tufted hairgrass - Douglas' aster	G3	S3			Blue	



<i>Deschampsia cespitosa</i> ssp. <i>beringensis</i> - <i>Hordeum brachyantherum</i>	tufted hairgrass - meadow barley	G3	S3				Blue
<i>Distichlis spicata</i> var. <i>spicata</i> Herbaceous Vegetation	seashore saltgrass Herbaceous Vegetation	G5	S1S2				Red
<i>Dulichium arundinaceum</i> Herbaceous Vegetation	three-way sedge	GNR	S2				Red
<i>Eleocharis palustris</i> Herbaceous Vegetation	common spike-rush	GNR	S3				Blue
<i>Eriophorum angustifolium</i> / <i>Sphagnum</i> spp.	narrow-leaved cotton-grass / peat-mosses	G3G4	S3S4				Yellow
<i>Festuca idahoensis</i> ssp. <i>roemeri</i> - <i>Koeleria macrantha</i>	Roemer's fescue - junegrass	G1	S1	April 29,1993	June 15,2000		Red
<i>Juncus arcticus</i> - <i>Plantago macrocarpa</i>	arctic rush - Alaska plantain	GNR	S1				Red
<i>Ledum groenlandicum</i> / <i>Kalmia</i> <i>microphylla</i> / <i>Sphagnum</i> spp.	Labrador tea / western bog-laurel / peat-mosses	G4	S3				Blue
<i>Leymus mollis</i> ssp. <i>mollis</i> - <i>Lathyrus</i> <i>japonicus</i>	dune wildrye - beach pea	GNR	S1S2				Red
<i>Menyanthes trifoliata</i> - <i>Carex lasiocarpa</i>	buckbean - slender sedge	G3	S3		July 31,2002		Blue
<i>Myosurus minimus</i> - <i>Montia</i> spp. - <i>Limnanthes macounii</i>	tiny mousetail - montias - Macoun's meadow-foam	G2	S1		June 15,2000		Red
<i>Myrica gale</i> / <i>Carex sitchensis</i>	sweet gale / Sitka sedge	G3	S2				Red
<i>Phlox diffusa</i> - <i>Selaginella wallacei</i>	spreading phlox - Wallace's selaginella	GNR	S2		July 11,2002		Red
<i>Picea sitchensis</i> / <i>Calamagrostis</i> <i>nutkaensis</i>	Sitka spruce / Pacific reedgrass	G3G5	S3	July 11,2002	July 11,2002		Blue
<i>Picea sitchensis</i> / <i>Carex obnupta</i>	Sitka spruce / slough sedge	G2G3	S2S3	September 29,1994	September 29,1994		Blue
<i>Picea sitchensis</i> / <i>Eurhynchium oregonum</i>	Sitka spruce / Oregon beaked-moss	GNR	S3	June 15,2000	June 15,2000		Blue
<i>Picea sitchensis</i> / <i>Gaultheria shallon</i>	Sitka spruce / salal	GNR	S4	June 15,2000	June 15,2000		Yellow
<i>Picea sitchensis</i> / <i>Maianthemum dilatatum</i> Very Wet Hypermaritime 1	Sitka spruce / false lily-of-the-valley Very Wet Hypermaritime 1	G1G2	S1S2	September 29,1994	September 29,1994		Red
<i>Picea sitchensis</i> / <i>Malus fusca</i>	Sitka spruce / Pacific crab apple	GNR	S3		June 15,2000		Blue
<i>Picea sitchensis</i> / <i>Polystichum munitum</i>	Sitka spruce / sword fern	G3	S3	September 29,1994	September 29,1994		Blue
<i>Picea sitchensis</i> / <i>Rubus spectabilis</i> Very Dry Maritime	Sitka spruce / salmonberry Very Dry Maritime	G3	S2	June 26,1992	June 26,1992		Red
<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
<i>Picea sitchensis</i> / <i>Trisetum canescens</i>	Sitka spruce / tall trisetum	G1G2	S1S2	June 15,2000	June 15,2000		Red
<i>Pinus contorta</i> - <i>Chamaecyparis</i> <i>nootkatensis</i> / <i>Racomitrium lanuginosum</i>	lodgepole pine - yellow-cedar / hoary rock-moss	G4	S4	June 15,2000	March 22,2007		Yellow
<i>Pinus contorta</i> / <i>Sphagnum</i> spp.	lodgepole pine / peat-mosses	GNR	S4S5	November 17,1993	January 05,1993		Yellow
<i>Pinus contorta</i> / <i>Sphagnum</i> spp. CDFmm	lodgepole pine / peat-mosses CDFmm	GNR	S1	May 12,1992	May 12,1992		Red
<i>Pinus contorta</i> / <i>Sphagnum</i> spp. Very Dry Maritime	lodgepole pine / peat-mosses Very Dry Maritime	GNR	S3	June 17,2000	June 15,2000		Blue

<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	
<i>Plantago maritima</i> - <i>Puccinellia pumila</i>	sea plantain - dwarf alkaligrass	G2	S2			Red	
<i>Poa macrantha</i> Herbaceous Vegetation	dune bluegrass Herbaceous Vegetation	GNR	S1			Red	
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> - <i>Alnus rubra</i> / <i>Rubus spectabilis</i>	black cottonwood - red alder / salmonberry	GNR	S3	September 29,1994	September 29,1994	Blue	
<i>Populus balsamifera</i> ssp. <i>trichocarpa</i> / <i>Salix sitchensis</i>	black cottonwood / Sitka willow	GNR	S2S3	July 11,2002	July 11,2002	Blue	
<i>Populus tremuloides</i> / <i>Malus fusca</i> / <i>Carex</i> <i>obnupta</i>	trembling aspen / Pacific crab apple / slough sedge	G1G2	S1S2		July 26,2002	Red	
<i>Pseudotsuga menziesii</i> - <i>Arbutus</i> <i>menziesii</i>	Douglas-fir - arbutus	GNR	S2	July 31,2002	July 31,2002	Red	
<i>Pseudotsuga menziesii</i> / <i>Mahonia nervosa</i>	Douglas-fir / dull Oregon-grape	G2	S2	June 15,2000	June 15,2000	Red	Y
<i>Pseudotsuga menziesii</i> / <i>Melica subulata</i>	Douglas-fir / Alaska oniongrass	G1	S1	June 15,2000	June 15,2000	Red	Y
<i>Pseudotsuga menziesii</i> - <i>Pinus contorta</i> / <i>Cladina</i> spp.	Douglas-fir - lodgepole pine / reindeer lichens	GNR	S2	June 15,2000	June 15,2000	Red	
<i>Pseudotsuga menziesii</i> - <i>Pinus contorta</i> / <i>Racomitrium canescens</i>	Douglas-fir - lodgepole pine / grey rock-moss	GNR	S2	June 15,2000	June 15,2000	Red	
<i>Pseudotsuga menziesii</i> / <i>Polystichum</i> <i>munitum</i>	Douglas-fir / sword fern	G2G4	S2	June 18,1992	June 18,1992	Red	
<i>Pseudotsuga menziesii</i> - <i>Tsuga</i> <i>heterophylla</i> / <i>Gaultheria shallon</i> Dry Maritime	Douglas-fir - western hemlock / salal Dry Maritime	G3G4	S2S3	June 15,1992	June 15,1992	Blue	
<i>Pseudotsuga menziesii</i> - <i>Tsuga</i> <i>heterophylla</i> / <i>Gaultheria shallon</i> Moist Maritime	Douglas-fir - western hemlock / salal Moist Maritime	GNR	S3	June 15,2000	June 15,2000	Blue	
<i>Quercus garryana</i> - <i>Arbutus menziesii</i>	Garry oak - arbutus	G1	S1	June 15,2000	June 15,2000	Red	
<i>Quercus garryana</i> / <i>Bromus carinatus</i>	Garry oak / California brome	G1	S1	July 03,1992	July 03,1992	Red	
<i>Quercus garryana</i> / <i>Holodiscus discolor</i>	Garry oak / oceanspray	G1	S1	June 15,2000	June 15,2000	Red	
<i>Ruppia maritima</i> Herbaceous Vegetation	beaked ditch-grass Herbaceous Vegetation	GNR	S2			Red	
<i>Salicornia virginiana</i> - <i>Glaux maritima</i>	American glasswort - sea-milkwort	G3G4	S2			Red	
<i>Salix reticulata</i> Community	net-veined willow Community	GNR	SNR			Yellow	
<i>Salix sitchensis</i> / <i>Carex sitchensis</i>	Sitka willow / Sitka sedge	G3	S3			Blue	
<i>Salix sitchensis</i> - <i>Salix lucida</i> ssp. <i>lasiandra</i> / <i>Lysichiton americanus</i>	Sitka willow - Pacific willow / skunk cabbage	G2	S2			Red	
<i>Sidalcea hendersonii</i> Tidal Marsh	Henderson's checker-mallow Tidal Marsh	G1	S1	July 10,2000	July 10,2000	Red	
<i>Spiraea douglasii</i> / <i>Carex sitchensis</i>	hardhack / Sitka sedge	G4	S4			Yellow	
<i>Thuja plicata</i> / <i>Achlys triphylla</i>	western redcedar / vanilla leaf	G1	S1	July 15,2002	July 15,2002	Red	
<i>Thuja plicata</i> / <i>Carex obnupta</i>	western redcedar / slough sedge	GNR	S2S3	June 26,1992	June 26,1992	Blue	
<i>Thuja plicata</i> - <i>Chamaecyparis</i> <i>nootkatensis</i> / <i>Coptis aspleniifolia</i>	western redcedar - yellow-cedar / spleenwort-leaved goldthread	G4G5	S4S5	September 29,1994	September 29,1994	Yellow	

<i>Thuja plicata</i> - <i>Chamaecyparis nootkatensis</i> / <i>Coptis aspleniifolia</i> Moist Maritime 2	western redcedar - yellow-cedar / spleenwort-leaved goldthread Moist Maritime 2	G4G5	S2S3	July 16,2002	July 16,2002	Blue
<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
<i>Thuja plicata</i> / <i>Lonicera involucrata</i>	western redcedar / black twinberry	GNR	S2	June 26,1992	June 26,1992	Red
<i>Thuja plicata</i> / <i>Oemleria cerasiformis</i>	western redcedar / Indian-plum	G1	S1	July 15,2002	July 11,2002	Red
<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
<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
<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
<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
<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
<i>Thuja plicata</i> - <i>Pseudotsuga menziesii</i> / <i>Eurhynchium oreganum</i>	western redcedar - Douglas-fir / Oregon beaked-moss	GNR	S1	July 15,2002	July 15,2002	Red
<i>Thuja plicata</i> / <i>Rubus spectabilis</i>	western redcedar / salmonberry	GNR	S1S2	June 25,1992	June 26,1992	Red
<i>Thuja plicata</i> / <i>Symphoricarpos albus</i>	western redcedar / common snowberry	GNR	S1	May 26,1992	June 15,1992	Red
<i>Thuja plicata</i> / <i>Tiarella trifoliata</i> Very Dry Maritime	western redcedar / three-leaved foamflower Very Dry Maritime	G3	S2	June 15,2000	June 15,2000	Red
<i>Thuja plicata</i> - <i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i>	western redcedar - western hemlock / salal	GNR	S4	September 29,1994	March 31,2001	Yellow
<i>Thuja plicata</i> - <i>Tsuga heterophylla</i> / <i>Polystichum munitum</i>	western redcedar - western hemlock / sword fern	GNR	S3?	September 29,1994	September 29,1994	Blue
<i>Trichophorum alpinum</i> / <i>Scorpidium revolvens</i>	Hudson Bay clubrush / rusty hook-moss	G2	S2			Red
<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
<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
<i>Tsuga heterophylla</i> - <i>Abies amabilis</i> / <i>Rhytidiopsis robusta</i>	western hemlock - amabilis fir / pipecleaner moss	G3	S3	November 16,1993	June 16,1992	Blue
<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
<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
<i>Tsuga heterophylla</i> - <i>Picea sitchensis</i> / <i>Rhytidiadelphus loreus</i>	western hemlock - Sitka spruce / lanky moss	GNR	S3	September 29,1994	March 31,2001	Blue
<i>Tsuga heterophylla</i> - <i>Pinus contorta</i> / <i>Cladina rangiferina</i>	western hemlock - lodgepole pine / grey reindeer lichen	G3G5	S3S5	June 15,2000	March 22,2007	Yellow
<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
<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
<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
<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
<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

<i>Tsuga mertensiana</i> - <i>Abies amabilis</i> / <i>Phyllodoce empetrififormis</i>	mountain hemlock - amabilis fir / pink mountain-heather Moist Maritime 1	G5	S4		September 29,1994	Yellow
<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
<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
<i>Tsuga mertensiana</i> - <i>Chamaecyparis</i> <i>nootkatensis</i> / <i>Blechnum spicant</i>	mountain hemlock - yellow-cedar / deer fern	GNR	S4	March 25,1993	March 31,2001	Yellow
<i>Tsuga mertensiana</i> - <i>Chamaecyparis</i> <i>nootkatensis</i> / <i>Sphagnum capillifolium</i>	mountain hemlock - yellow-cedar / common red peat-moss	GNR	S5		March 25,1993	Yellow
<i>Typha latifolia</i> Marsh	common cattail Marsh	G5	S3			Blue



# Appendix D



Biophysical Map - Schooner Cove Study Area

- Legend**
- Parent Lot
  - Schooner Cove Study Area
  - vegetation quadrats
  - X owl calling station
  - wildlife transects
  - 🐟 minnow trap site
  - small mammal traps
  - 🐭 medium mammal traps

40 20 0 40 Meters





# Appendix E





# Appendix F





# Appendix G

