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## Baseline Bio-Inventory and Conservation Assessment for the Moorecroft Camp Property, Nanoose

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Prepared for:  
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**Baseline Bio-Inventory and Conservation Assessment for the  
Moorecroft Camp Property, Nanoose British Columbia**

**EXECUTIVE SUMMARY**

Moorecroft Camp is a 34 ha (85 acre) property comprised of coastal shoreline, wetland/riparian areas, and upland forest on the northeast coast of the Nanoose Bay Peninsula. It is owned and operated by the United Church of Canada (UCC), which operates the site as a retreat and educational camp. Recent interest by the UCC in selling the property has prompted the Moorecroft Camp Society to enlist the assistance of the Nanaimo and Area Land Trust (NALT) in mounting a campaign to preserve the site. NALT, in turn, has retained Ursus Environmental to perform a baseline environmental inventory of the site and to provide an objective assessment of its ecological values.

The primary objectives of this assignment were to:

- 1) Compile and review existing information sources;
- 2) Ground-truth plant communities to confirm Sensitive Ecosystem Inventory (SEI) classification and boundaries;
- 3) Prepare a plant list and natural features map for the site;
- 4) Conduct wildlife surveys and reconnaissance, with special reference to potential use by Red- and Blue-listed wildlife; and
- 5) Assess the regional importance of vegetation and wildlife resources

Surveys to inventory the flora and fauna of the property were conducted between late May and late July of 2007. The fieldwork ranged from reconnaissance level inspections to formal surveys following Provincial government protocols. Seasonal gaps in the field program were addressed through interviews with knowledgeable members of the local naturalist community.

Based on the material compiled and reviewed, it is our assessment that the Moorecroft Camp property possesses a high overall conservation value. The site rated high or very high for plant diversity (145 native species recorded), vertebrate diversity (at least 98 species noted), and importance to “At-risk” or uncommon wildlife.

Regarding the latter, it was determined that Skipsey Lake is a probable breeding area for Blue-listed Red-legged Frog, while adjacent forest likely serves as “core” habitat for this species. Currently, activity of the Blue-listed Great Blue Heron at the site appears restricted to foraging. However, the site was assessed as having a high potential to support heron nesting in the future, particularly as development proceeds in neighbouring areas. In addition to these listed species, Moorecroft Camp was also found to support nine other bird species that are considered “uncommon or localized” in the Nanaimo - Parksville corridor.

Although no rare or threatened plants were found at the site, it includes several habitat types (e.g. wetlands, rock outcrops, seaspray zones) that may support such plants, and was therefore assigned a moderate rating on this component. The site rates moderately high for capture of sensitive or under-represented ecosystems. It contains two designated SEI Polygons, a Coastal Bluff and a Wetland unit. Seven other areas of the site were found to meet the criteria for SEI designation, including two new Wetland units, two new Riparian units, a new Sparsely Vegetated unit, and a new Coastal Bluff unit.

The following recommendations were offered to protect the key natural resource values of the Moorecroft Camp property:

1. Given the on-going loss and degradation of SEI Polygons units in southeast Vancouver Island, all sensitive ecosystems within the Moorecroft Camp property should be mapped using a differential GPS unit, protected by a buffer of natural vegetation at least 15 m in width, and secured within a conservation covenant.
2. The boundaries of SEI Polygon #N0350C should be expanded to include the surrounding swamp land, while those of SEI Polygon #N0329A should be expanded to the northern property line.
3. New Sensitive Ecosystem units should be designated for the Woodland habitat in the Southeast corner of the site, and the Wetland/Riparian complexes in the east-central and northwest parts of the site.
4. “Core” habitat for the Blue-Listed Red-legged Frog, (and potential nesting habitat for Great Blue Herons) within 200 m of the high wetted perimeter of SEI Polygon #N0350 should be protected within a conservation covenant. Any new road crossings through this area should incorporate amphibian passage tunnels and lead/exclusion fencing to reduce the potential for amphibian road-kills.
5. A buffer of natural vegetation measuring at least 45 m in radius (1.5 tree lengths) should be retained around the Bald Eagle nest tree near the northern property line, and covenanted.
6. Habitat linkages should be maintained between SEI Polygon #N0350 and the newly-identified west-central swamp unit.
7. No clearing or disturbance should occur around the Sitka Spruce tree in the west-central part of the property, or the Douglas-fir tree serving as a Bald Eagle perch tree in the north-central part of the site.

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**Baseline Bio-Inventory and Conservation Assessment for the  
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## **Baseline Bio-Inventory and Conservation Assessment for the Moorecroft Camp Property, Nanoose**

### **1.0 INTRODUCTION**

#### **1.1 Background**

Moorecroft Camp is a 34 ha (85 acre) woodland and waterfront property comprised of three parcels on the northeast coast of the Nanoose Bay Peninsula (Lot 249 foreshore lease; Lot A, Plan 1777, and Lot 1, Plan 31217). From 1934 to 1954 the camp was run by its founder, Gertrude Moore. Since 1954 the camp has been owned and operated by the BC Conference of the United Church of Canada (UCC). It is used to host retreats, tours and youth camps over this period. The community of Nanoose Bay and the Regional District of Nanaimo (RDN) have indicated that they value the Moorecroft Camp property for its protection of green space, hiking trails, foreshore access and programming (RDN 2001). The RDN Park System Plan has identified forest land on Stewart Road, abutting the Moorecroft property, as significant to the community for future nature appreciation and recreation since at least the mid-1990's (RDN 1994 - Schedule A).

The BC Conference of the UCC has recently proposed the sale of the Moorecroft Camp Property as part of its plan to reduce the number of camps under its management. Concerned that disposal of the property could lead to developments potentially impacting upon its ecological integrity, the Moorecroft Camp Society enlisted the assistance of the Nanaimo and Area Land Trust (NALT) to mount a campaign to preserve the site. NALT, in turn, retained Ursus Environmental to perform a baseline environmental inventory of the site and to provide an objective assessment of its ecological values.

A limited amount of existing information was available regarding the site's natural resource values. Two government-designated Sensitive Ecosystem Inventory (SEI) Polygons: a coastal bluff unit (#N0329A) and a wetland unit (#N0350C, see Figure 1) were identified on the property in the late 1990's by government contractors. The 1997 SEI Map covering the site also indicated the presence of a seasonally flooded agricultural field possessing high general biodiversity values (see Figure 1). The Wildlife Tree Stewardship Initiative (WiTS) database showed a number of significant trees on the site that function as nest and perch trees for Bald Eagles.

Authorization to proceed with this study was provided by Gail Adrienne, Executive Director of NALT, on May 18<sup>th</sup>, 2007.

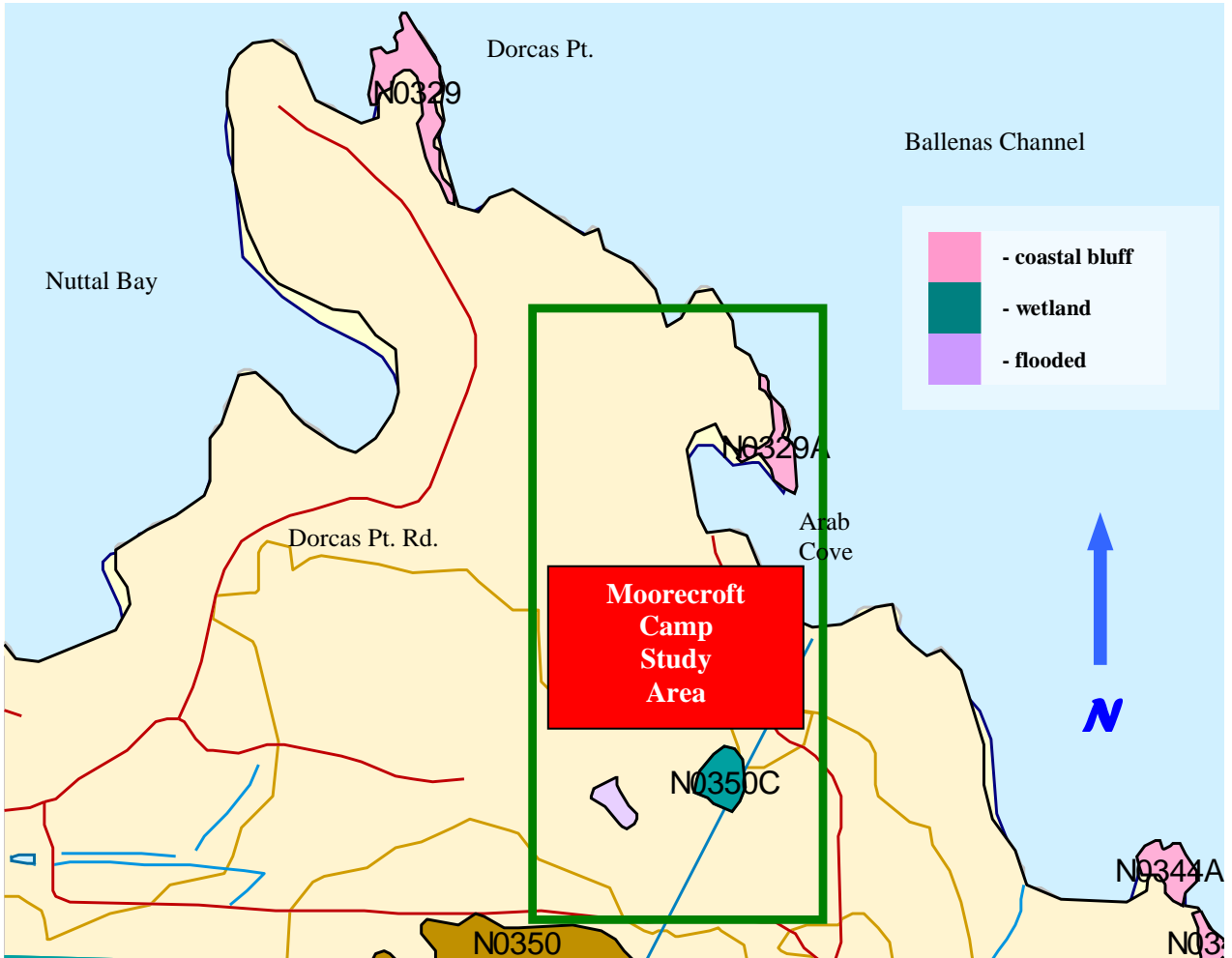


Figure 1. Study Area overview showing mapped SEI polygons in the region.

## **1.2 Scope and Objectives**

Given the site's limited amount of existing information from government sources, the primary objectives of this assignment were to:

- 1) Compile and review all reasonably accessible existing information sources;
- 2) Interview local personnel familiar with the property to document their observations;
- 3) Ground-truth forest, wetland and shoreline vegetation systems to confirm SEI classification/boundaries
- 4) Prepare a plant list and natural features map for the site;
- 5) Conduct wildlife surveys and reconnaissance, with special reference to potential use by Provincially Red-listed (Endangered) and Blue-listed (i.e. Vulnerable) wildlife;
- 6) Assess the importance of vegetation and wildlife resources in a regional context; and
- 7) Provide recommendations for long-term protection of key resources.

## **1.3 Acknowledgements**

Our gratitude is extended to Sandra Gray, WiTS Area Coordinator, and Rhys Harrison, a keen 'birder' with Nanoose Naturalists and property neighbor, for their contributions to the flora and fauna species inventory lists. Thank you to Carla and Valerie in the Moorecroft Camp office, for their warm greetings and access to maps.

This project was financially supported by the Nanaimo Area Land Trust with significant in-kind assistance provided by Ursus Environmental.



## **2.0 THE STUDY AREA**

### **2.1 Environmental Setting**

The Study Area is located on the Nanoose Bay Peninsula, on the east coast of Vancouver Island between Nanaimo and Parksville. The 34 ha (85 ac) site surrounds Arab Cove, which is located southeast of Nuttal Bay and flows into Ballenas Channel within the Strait of Georgia. The Study Area is entirely within the Moist Maritime Variant of the Coastal Douglas-Fir Biogeoclimatic Zone (CDFmm, for short). On Vancouver Island, the CDFmm Variant is restricted to a relatively narrow band along its southeast, and most densely populated, side. It extends from sea level to 150 m. Typical forests in the region are young (<40 years old) or mid-seral (40 - 80 years old) stands composed of Douglas-fir and Big Leaf Maple. Understorey vegetation is usually dominated by Salal, Dull Oregon Grape, Oceanspray and Oregon Beaked Moss (Green and Klinka 1994). Moist sites often support a component of Grand Fir and Western Redcedar, while dry ones typically include a component of Arbutus and/or Shore Pine.

Situated in the rain-shadow of the Beaufort Range, the region possesses a relatively dry summer climate. However, winters are usually wet, though mild. Mean annual precipitation ranges from about 600 to 1200 mm. Mean monthly temperatures range from 1.6 to 18°C with 1700 to 2100 growing degree-days (Green and Klinka 1994). Snowfall occurs infrequently and accumulations rarely persist for more than a week or two.

The Nanoose Bay Peninsula supports a number of wetlands, marine intertidal waters and lakes, some of which occur in proximity to the Moorecroft Camp property. Surrounding land uses are mostly rural residential and small-scale agricultural. Sizeable areas in the region are currently within either the Agricultural or Forest Land Reserve. More densely settled subdivisions occur along the waterfront and in the interior of the Peninsula, the largest being the Fairwinds Development several kilometers to the south of the site.

There are three main protected areas on the Peninsula, but all are relatively small. Notch Hill is an informal Garry Oak ecosystem reserve located on Dept. of National Defense (DND) lands at the southern end of the Peninsula. Enos Lake is part of the network of BC Ecological Reserves, and was established to protect a rare species of fish. It is located to the southeast of the study area. Beachcomber Park is a small RDN Park located in the southeast corner of the Peninsula that provides public access to the beaches and viewscapes north of the DND lands. Due to the preponderance of privately held lands, the total proportion of Electoral Area E (Nanoose Bay) formally protected as park space is only about 1 % (RDN 2001).

Terrain in the region is for the most part subdued, with elevations ranging from sea level to a high point of approximately 240 m at Notch Hill. Most of the Nanoose Bay Peninsula, including the Study Area, is below 80 m in elevation.

### **3.0 METHODS AND INFORMATION SOURCES**

#### **3.1 Field Investigation**

Fieldwork for the bio-inventory component of the study was carried out between May 25<sup>th</sup> and July 27<sup>th</sup>, 2007. It involved reconnaissance-level site inspections as well as vegetation plots, songbird point-counts, diurnal and nocturnal raptor call-playback surveys, and amphibian encounter transects and area-constrained searches.

Site visits were conducted to compile a plant list for the site (Appendix A) and to ground-verify SEI Polygons #N0329A and #N0350C and the area noted as 'seasonally flooded' on the SEI map (Figure 1). They were carried out between June 1 and July 27, 2007. A total of 21 vegetation surveys (Figure 2) and 10 vegetation plots (Figure 3) were completed on the Moorecroft Camp property. At each vegetation plot, measuring 5 m in radius, the percent cover of species comprising the tree, shrub and herb strata was visually estimated using comparison charts from Green and Klinka (1994). Sites with high herbage cover were described using five 1 m x 1 m quadrats to capture the full range of plant diversity present (samples in Appendix C). Inferences about soil moisture and nutrient levels were made primarily on the basis of indicator plants described in Green and Klinka (1994). Vegetation surveys involved brief site inspections to note general vegetation patterns, with the purpose of delineating the plant community boundaries for the Natural Features map.

In assessing the property, surveys specific to the following Provincially Red-listed and Blue-listed vertebrates were conducted using the following methods:

- Great Blue Heron (Blue-listed): shoreline stand-watches;
- Northern Goshawk (Red-listed): diurnal call-playback survey;
- Western Screech-owl (Blue-Listed): nocturnal call-playback survey;
- Red-legged Frog (Blue-listed): amphibian encounter transects.

Songbird and raptor call-playback surveys were performed at nine stations (Figure 4) on June 3 and June 8, 2007. Raptor calls were broadcast on a Stewart 612 Professional Wildlife Caller in three directions covering 360° at each survey station. Listening periods of 2 minutes duration were conducted before the first broadcast, with those of 30 seconds duration occurring between broadcasts. Amphibian surveys occurred at the seven stations shown in Figure 4, through wetland perimeter and coarse woody debris searches.

In addition to the above, opportunistic wildlife observations were recorded in field noted during all site visits.

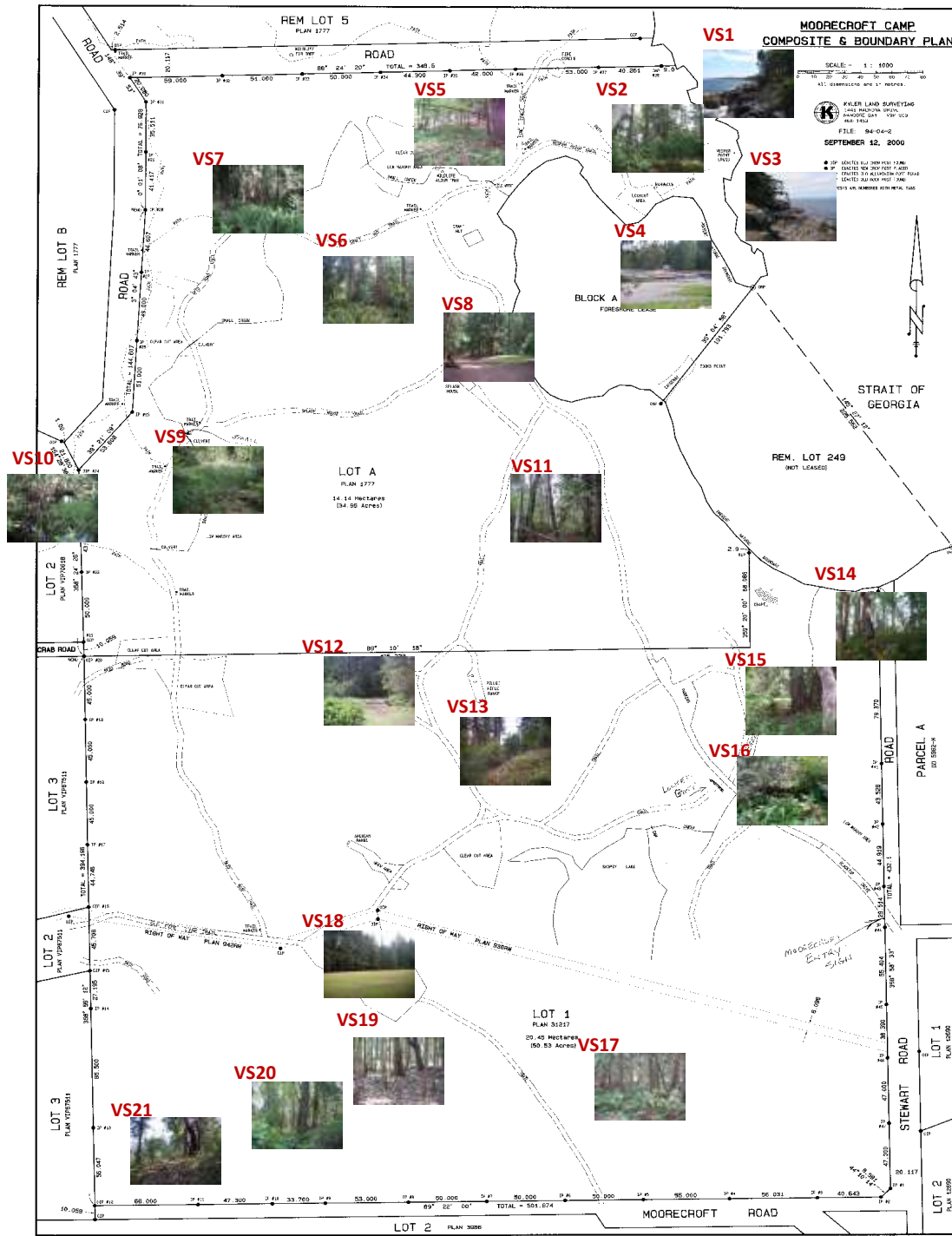


Figure 2. Vegetation Survey locations at Moorecroft Camp.

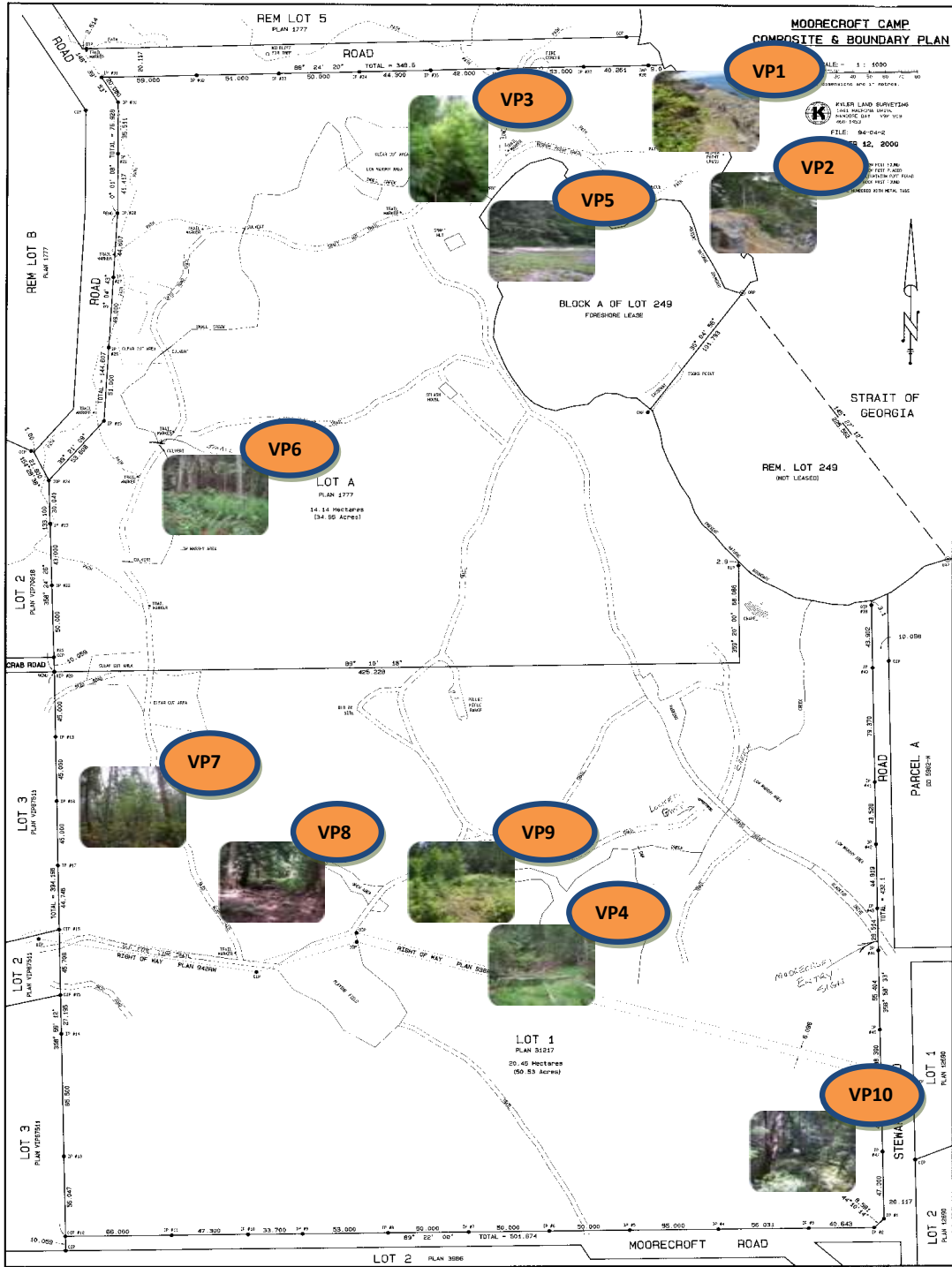


Figure 3. Location of Vegetation Plots at Moorecroft Camp.

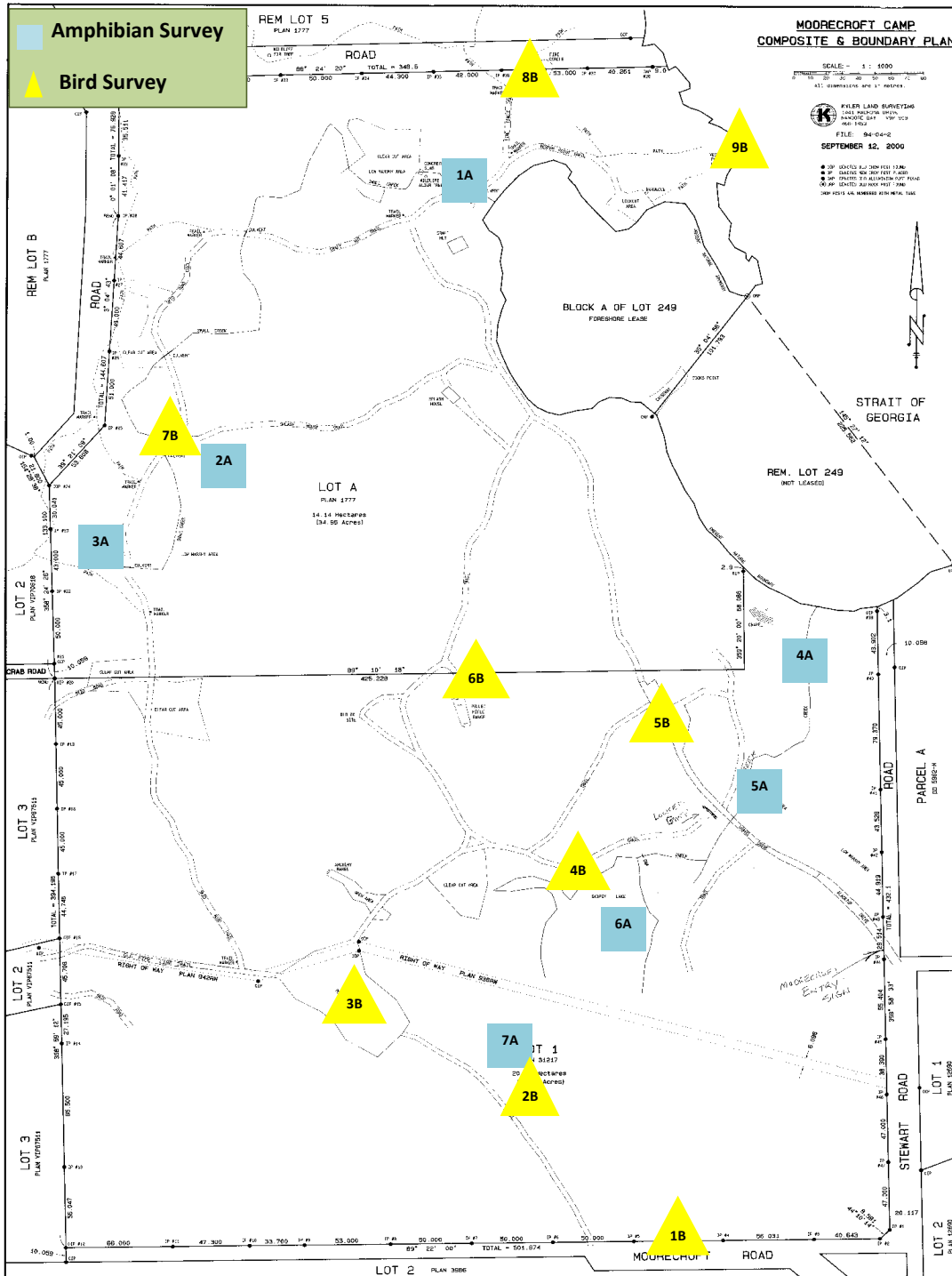


Figure 4. Location of bird (triangles) and amphibian (squares) survey stations at Moorecroft Camp.

### 3.2 Information Sources

On-site observations were augmented with information from the following sources:

- B.C. Conservation Data Centre. 2007. BC Species and Ecosystems Explorer. <http://srmapps.gov.bc.ca/apps/eswp>.
- Christmas Bird Count Survey- Nanoose Bay. 2006-7. <http://www.birdsource.org>.
- Community Mapping Network. 2007. Sensitive Ecosystem Inventory. <http://www.shim.bc.ca/atlas/sei/seimain.html>.
- Government of Canada. 2007. Species at Risk Act Public Registry. <http://www.sararegistry.gc.ca>
- Gray, Sandra. 2007 *personal communication*. WiTS (Wildlife Inventory Tree Stewardship) Area Coordinator.
- Green and Klinka. 1994. A Field Guide to Site Identification for the Vancouver Forest Region.
- Harrison, Rhys. 2007 *personal communication*. Moorecroft neighbor and member of Nanoose Naturalists.
- Regional District of Nanaimo. 2001. A Parks and Open Space Plan for Nanoose Bay.
- Walshe, Patrick. 2007 *personal communication*. Coastal Revelations Nature Tours.
- Ward et al. 1998. Sensitive Ecosystem Inventory: East Vancouver Island and Gulf Islands.

## 4.0 RESULTS

### 4.1 Flora and Plant Communities

As indicated in Appendix A, a compilation of observations made by Ursus Environmental and local naturalist Sandra Gray, the Moorecroft Camp property supports at least 160 species of vascular plants. The list includes 108 herbaceous plants, 32 shrubs, 15 trees, and 5 ferns. None of the plants identified on the site appear on the Conservation Data Centre Tracking Lists of Red- or Blue-listed species for the South Island Forest District.

A variety of plant communities were documented at Moorecroft Camp, including: coastal bluffs, small wetland/riparian areas, and young and mid-seral upland forests. Several of the plant communities on the site the criteria for inclusion as Sensitive Ecosystems as described in Ward et al. (1998). These are highlighted in red font in Tables 1 and 2 below.

**Table 1. General site descriptions of Vegetation Plots at Moorecroft Camp.**

<b>Vegetation Plot #</b>	<b>Location (Figure 3)</b>	<b>General Ecosystem Classification &amp; Description</b>
VP1	Northwest corner of property	<b>Coastal Bluff:</b> Garry Oak, Douglas-fir, Indian Plum, Arbutus, Seablush, Gumweed, Alumroot.
VP2	Northeast tip of Arab Cove, Vespers Point	<b>Coastal Bluff:</b> Garry Oak, Douglas-fir, Grass sp., Seablush, Gumweed, Foamflower, Nodding Onion.
VP3	West of Arab Cove, North of 1997 clearcut	<b>Riparian: Young Forest:</b> seasonal flow *‘lowest’ point on site- Red Alder, Grand Fir, Salmonberry, juv. Cedar, Salal, Slough Sedge, Sword Fern.
VP4	Southeast quadrant of property Skipsey Lake	<b>Wetland: Shallow Water:</b> sizeable (75 x 110 m) & wet year round- Grand Fir, Douglas-fir, Red Alder, Red-Osier Dogwood, Salmonberry, Skunk Cabbage, Sword Fern, Horsetail, Grass sp.
VP5	Arab Cove shoreline	<b>Sparsely Vegetated:</b> Baldhip Rose, Tall Oregon Grape, Dunegrass, Glasswort, Skunk Cabbage, Gumweed.
VP6	Southwest of Sitka Spruce on Skid Road Trail	<b>Young Douglas/Grand Fir - Oregon Grape (CDFmm/04):</b> borders small ephemeral wetland (slough sedge)- Grand Fir, Red Alder, Douglas-fir, Salal, Dull Oregon Grape, Sword Fern, Bracken Fern.
VP7	Southwest quadrant of property	<b>Young Fir/Lodgepole Pine - Arbutus (CDFmm/02):</b> ~30x30m*rocky raised area-Arbutus, Douglas-fir, Grand Fir, Salal, Oceanspray, Rose, Bitter Cherry, Sword Fern, Prince’s Pine.
VP8	Northwest of Playing Field, on east of Skid Row Trail	<b>Mature Douglas/Grand Fir - Oregon Grape (CDFmm/04):</b> Cedar, Douglas-fir, Cottonwood, Salal, Maple, Sword Fern, Vanilla Leaf.
VP9	Northeast of Playing Field, across from Archery	<b>White Pine Plantation:</b> juvenile White Pine, Red Alder, Scotch Broom , Oceanspray, Bracken Fern, Pearly Everlasting, Thistle.
VP10	Southeast corner of property	<b>Woodland:</b> Douglas-fir, Grand Fir, Arbutus, Garry Oak, Salal, Saskatoon, Oceanspray, Sword Fern.

**Table 2. General site descriptions of Vegetation Surveys at Moorecroft Camp.**

<b>Vegetation Survey#</b>	<b>Location (Figure 2)</b>	<b>General Ecosystem Classification &amp; Description</b>
VS1	NE corner, on shoreline	<b>Coastal Bluff:</b> similar vegetation as noted in VP1.
VS2	NE edge of property	<b>Coastal Bluff:</b> Garry Oak, Arbutus, Douglas-fir, Indian Plum, Oceanspray.
VS3	NE shoreline at Vesper Point	<b>Coastal Bluff:</b> similar vegetation as VP1 and VP2.
VS4	Arab Cove	<b>Sparsely Vegetated:</b> similar vegetation to VP5.
VS5	West side of Fire Circle Trail	<b>Mid-Seral Douglas/Grand Fir - Oregon Grape (CDFmm/04):</b> young Douglas-fir, Cedar & Maple, some large Maple, dominant Oregon Grape understory.
VS6	South side of Craft Hut Trail	<b>Mid-Seral Cedar/Grand Fir - Foamflower (CDFmm/06):</b> Cedar & Maple, few Douglas-fir & Red Alder, Sword Fern dominant, Salal, Dull Oregon Grape.
VS7	NW of Skid Road and Craft Hut Trail intersection	<b>Mid-Seral Cedar/Grand Fir - Foamflower (CDFmm/06):</b> Cedar (20-40cm), few Douglas-fir, Red Alder and Maple, Sword Fern dominant
VS8	Cabin Camp	<b>Mid-Seral Douglas-fir - Salal (CDFmm/01) -</b> Cedar, Arbutus, Douglas-fir, sparse Salal & Oregon Grape.
VS9	Behind Sitka Spruce on Skid Road Trail	<b>Wetland: Shallow Water:</b> <10 cm standing water (summer), dense Slough Sedge, Skunk Cabbage, Horsetail, R-O. Dogwood, Red Alder, Salmonberry.
VS10	Adjacent property- west	<b>(Off-site) Wetland:</b> large & deep, Skunk Cabbage, Sedges, Rushes -‘footings’ for dock set in pond.
VS11	North of Pelletry, South of Cabin #6, on East of trail	<b>Mid-Seral Douglas-fir - Salal (CDFmm/01):</b> Cedar, some Douglas-fir, Arbutus & Maple, Salal, Sword Fern.
VS12	Old RV Site West of Pelletry	<b>Developed:</b> grass area surrounded by Maple, Cedar, Douglas-fir & Arbutus, Oceanspray, Alder, Saskatoon.
VS13	SE of Old RV site, East side of Trail	<b>Mid-Seral Fir/Lodgepole Pine - Arbutus (CDFmm/02):</b> raised topography area, Arbutus, Mountain Ash, Douglas-fir, Oceanspray, Salal, Broom, Sword Fern.
VS14	Eastern point of South end of Arab Cove	<b>Coastal Bluff:</b> raised topo, rocky substrate, Arbutus, Douglas-fir, Maple, Oceanspray, Salal.
VS15	South of Cove, on small creek	<b>Riparian: Young Forest:</b> low summer flows, medium-sized (30-40cm) Cedar & Douglas-fir, Alder, Maple, Salal, Sword Fern.
VS16	NE corner of marshy area East of camp entry area	<b>Wetland: Swamp:</b> Cedar, Alder, Salmonberry, Skunk Cabbage, Sword Fern, Salal.
VS17	South of Skipsey Lk	<b>Mid-Seral Cedar/Grand Fir - Foamflower (CDFmm/06):</b> SE of Skunk Cabbage area- Cedar, some Maple, Sword Fern, some Salal.
VS18	Playing Field	<b>Developed:</b> 40 x 80 m grassed field, bordered with Douglas-fir, Cedar, Salal, Oceanspray.
VS19	South of Playing Field	<b>Mid-Seral Douglas-fir - Salal (CDFmm/01):</b> medium-sized (to 30cm) Arbutus & Maple, Cedar, some Douglas-fir, open/dry understory, Salal, Step moss.
VS20	Southwest of Playing Field	<b>Mid-Seral Douglas-fir - Salal (CDFmm/01):</b> younger Douglas-fir stand, Lg Maple, Arbutus, thick Salal, Oceanspray, Rattlesnake Plantain.
VS21	Southern corner of property	<b>Mid-Seral Fir/Lodgepole Pine - Arbutus (CDFmm/02):</b> Arbutus (to 35cm), Douglas-fir, lowCedar sparse understory, high leaf litter, Honeysuckle, Salal, Mosses



### *Sensitive Ecosystems*

Fieldwork verified the presence of the two SEI Polygons on the site and identified several new ones meeting the criteria for sensitive ecosystem designation (Figure 5). The Seasonally Flooded Agricultural Field Polygon shown on SEI maps was determined to have been misclassified, and does not possess the noted biodiversity values.

SEI Polygon #N0329A, a Coastal Bluff unit, is located in the northeast corner of Moorecroft Camp, covering the Vesper Point area (Figure 1). Vegetation plots conducted in this area (VP2-Figure 3, Appendix B and C) indicated that the semi-open canopy is composed of Garry Oak and Douglas-fir, with younger Garry Oak dominating the well-developed shrub layer. Herbaceous plants cover ranged from 12 to 48% of the 1m<sup>2</sup> quadrats. Species noted in coastal bluff areas of Moorecroft Camp, but not elsewhere include: Seablush, Nodding Onion, Foamflower, Gumweed and Consumption Plant at this site. Vegetation plot #1 (VP1-Figure 3, Table 1) located to the north of SEI Polygon #N0329A has a similar tree stratum as VP2. The canopy is comprised of Garry Oak and Douglas-fir. As in the previous area, Garry Oak and Indian Plum dominate the shrub layer, though total shrub cover was slightly lower here (Appendix C). Within these 1 m<sup>2</sup> quadrats, herbaceous plant cover ranged from 12- 67 %. Herb species are similar to those of VP2. Given the similarity, it is reasonable to have SEI Polygon #N0329A extended northward along the shoreline area, to the northern property line.

SEI Polygon #N0350C, located in the southeast quadrant of the Moorecroft Camp property (Figure 1), is a small (<1 ha) wetland known locally as Skipsey Lake. It fits the description of a Shallow Water type of Wetland. It drains down to tidewater through areas labeled VS16 and VS 15 on Figure 2. In the vegetation plot on the margins of Skipsey Lake (VP4-Figure 3, Table 1, Appendix B and C) most of the sparse tree cover is Grand Fir. The majority of the dense shrub layer is comprised of Red-Osier Dogwood (25%), Salmonberry (13%) and young Red Alder trees (10%). Herbaceous cover within the 1m<sup>2</sup> quadrats ranged from 46 to 89%. Skunk Cabbage made up 25-75% of the cover in each quadrat. Based on the above data, areas immediately adjacent to Skipsey Lake should be designated as an ecologically sensitive Swamp type of wetland (WN: sp). A second smaller Swamp unit was identified downstream (northeast) of Skipsey Lake, on the east side of the Main Access road, while a third was discovered in the west-central part of the site.

Two narrow bands of Young Riparian Forest (Code RI:5 in Figure 5) were identified leading out of the swamps in the west-central and east-central parts of the site. Though at the gross level of analysis, these areas seem little different from adjacent upland forest, the presence of seasonal flows there would support some distinctive herbs, such as sedges and Stream Violet. The seasonal presence of water there might also have implications for use by native lentic and terrestrial amphibians.

A small band of the Sparsely Vegetated (SV) sensitive ecosystem type was described along the northern shores of Arab Cove. It supports thin patches of Dunegrass, Glasswort, and Gumweed growing on coarse gravel substrates near the intertidal zone.

**Legend**

**Sensitive Plant Communities**

**CB = Coastal Bluff**

**RI:5 = Young Forested Riparian**

**SV = Sparsely Vegetated**

**WD = Mixed Woodland**

**WN: sw = Shallow Water Wetland**

**WN: sp = Tree/Shrub-dominated Swamp**

**Non-sensitive Plant Communities**

**01 = Douglas-fir - Salal**

**02 = Douglas-fir & Lodgepole Pine - Arbutus**

**04 = Douglas-fir & Grand Fir - Oregon Grape**

**06 = Western Redcedar & Grand Fir - Foamflower**

- y = Young Seral Stage Modifier

- m = Mid-Seral Stage Modifier

**DEV = Developed/Disturbed**

**Figure 5. General distribution of plant communities and natural features on the Moorecroft Camp property.**

The Moorecroft Camp property has a number rock outcrop areas that fit the basic criteria for designation as sensitive Terrestrial Herbaceous (HT) units. However, all of these were too small in area to be mapped as stand-alone units. The largest examples of the sensitive HT community type are complexed with the Coastal Bluff SEI unit in the Northeast corner of the property. Inspections in other areas such as VS5, VS13, VS14 and VS21 (Figure 3) revealed smaller raised areas of exposed or shallowly buried bedrock. In these situations, HT communities were interspersed within a newly identified Woodland sensitive ecosystem unit and the three areas supporting young or mid-seral Douglas-fir & Lodgepole Pine - Arbutus (FdPI- Arbutus) ecosystems. While mature and older seral stages of FdPI-Arbutus are clearly of high conservation value, young and mid-seral stages complexed with HT units may also be of conservation interest given their desirability as building sites in the region.

Finally, the polygon labeled as a ‘seasonally flooded’ area to the west of SEI Polygon #N0350C was found to be a dry playing field (see VS18-Figure 2). It is a level, seeded field bordered with Douglas-fir, Cedar, Salal and Oceanspray (Table 2). There were no observations of indicator plants associated with standing or strongly fluctuating water levels (e.g. Horsetail, Hardhack, Reed Canary Grass, sedges).

### *Veteran trees*

Several outstanding Douglas-fir specimens with diameters exceeding 80 cm occur on the Moorecroft property. Two of these are documented Bald Eagle perch trees (Figure 5). A single Sitka Spruce specimen occurs near the intersection of the Splash House and Skid Road Trails, in the west-central part of the site. While there are some disjunct Sitka Spruce specimens in the general Parksville - Qualicum region, there are generally very few within the relatively dry CDFmm Variant as a whole.

## **4.2 Wildlife Occurrence**

Nearly 100 vertebrate species have been noted on the Moorecroft Camp Property including: 83 birds, 9 mammals, 4 amphibians and 2 reptiles (see Appendices D and E). Due to seasonality constraints and limited time on-site, wildlife observations made by Ursus Environmental were supplemented with those of two local naturalists, Sandra Gray and Rhys Harrison.

### *Birds*

A list of ‘expected’ bird species was derived from local knowledge of species occurring in the region, the Nanaimo Field Naturalist Bird Checklist, and Christmas Bird Count data for the Nanoose Bay Count Area (Appendix F). Only four of the 87 bird species for which apparently suitable habitats exist at the site have yet to be recorded at the Moorecroft Camp property. These are the Cedar Waxwing, Western Tanager, Yellow Warbler, and Ruffed Grouse. The latter is considered uncommon in the Nanaimo area, likely as a result of historical pesticide use and its favoured status as a game bird. Species groups with strong representation in the bird assemblage of the site include raptors, woodpeckers, sparrows, and wood warblers.

In addition to nesting Bald Eagles, there is strong evidence that Barred Owls nest in the southwest corner of the property. The frequency of Sharp-shinned Hawk observations by area residents suggests they may nest in or near the Moorecroft property as well. Great Horned Owls have also been noted hunting on the property, but it is unlikely that they nest there, as that species has a low tolerance for Barred Owls within their nesting territories.

Shoreline and near-shore habitats are responsible in large part for the high diversity of the Moorecroft Camp bird assemblage. Shoreline habitats support foraging by corvids, gulls, Black Oystercatchers, Black Turnstones, Black-bellied plovers, and Surfbirds. Near-shore waters are important foraging habitats for Great Blue Herons year-round. In winter, Arab Cove would be particularly important as a refuge for water birds during storm events. A variety of mergansers, grebes, cormorants, loons, scoters, alcids and Harlequin ducks may take shelter in Arab Bay under winter storm conditions.

No Red- or Blue-listed birds were observed on or near the site during the spring 2007 fieldwork. Review of nest information for Northern Goshawks indicates the nearest known goshawk nest occurs in the upper reaches of the Nanaimo River, over 25 km to the south of the Study Area. The nearest known Great Blue Heron nest in Ministry of Environment records occurs near Craig Bay, approximately 4 km to the west. There is also a heronry documented in the Beachcomber area of Nanoose Bay (RDN 2001). Although we did not encounter them, Rhys Harrison has observed Great Blue Herons using Arab Cove in all seasons. Given the site's close proximity to rich foraging areas (eel grass beds and estuaries), and the low level of human presence in parts of the site, it retains a high potential to support nesting by herons in the future.

Raptor call-back surveys did not solicit responses from either Northern Goshawks or Western Screech-owls. However, Barred Owl responses were recorded in both the southwestern corner of the property, and at the neighbouring playing field (Table 3). There is a well-established Eagle nest in the northeast part of the property; and it is routinely monitored by WiTS (Wildlife Inventory Tree Stewardship) volunteers. The WiTS database also indicates the presence of an alternate eagle nest to the northwest of the site, just beyond the northern property boundary.

**Table 3. Moorecroft Camp owl call-playback survey results.**

<b>Fig. 4 Survey Station</b>	<b>Response Elicited</b>	<b>No. of Individuals</b>
<b>1</b>	<b>Barred Owl (<i>Strix varia</i>)</b>	<b>1</b>
2	no response	0
<b>3</b>	<b>Barred Owl (<i>Strix varia</i>)</b>	<b>2(duetting)</b>
4	no response	0
5	no response	0
6	no response	0
7	no response	0
8	no response	0
9	no response	0

Nine of the bird species recorded at Moorecroft Camp are noted as being of “uncommon or localized” occurrence on the Nanaimo Field Naturalist Bird Checklist. They include three raptors (Sharp-shinned Hawk, Great Horned Owl, Barred Owl), three woodpeckers (Pileated Woodpecker, Hairy Woodpecker, Red-breasted Sapsucker), two shorebirds (Black Turnstone and Surf-bird), and a warbler (Townsend’s Warbler).

### *Mammals*

Vancouver Island as a whole is somewhat depauperate in terms of mammal diversity. In the Island context then, the site has a fairly impressive mammal assemblage. A total of nine mammal species were observed on the Moorecroft Camp property during the 2007 fieldwork (Appendix A), two were known only from anecdotal reports (Cougar, Mink), and three others could reasonably be expected to occur in suitable habitats (e.g. Deer Mouse, Townsend’s Vole, shrews). Cougar sightings are reported in most years by area residents (*pers. comm.* Harrison), while Moorecroft Camp staff routinely observe Beavers damming the outlet of Skipsey Lake. Black-tailed deer trails, bedding spots (Appendix E), and browsing sign was encountered throughout the property during the 2007 fieldwork. Despite low densities in some managed forests in the mid-Island region, deer populations are very healthy around the rural fringes of the Nanoose Bay Peninsula.

### *Amphibians and Reptiles*

Though the timing of the 2007 fieldwork was sub-optimal for amphibian inventory, it was possible to verify the presence of four species at Moorecroft Camp (Table 4, Appendix D). Breeding by the Long-toed Salamander (Appendix E), an early pond-breeder capable of using seasonal wetlands, was documented in a small wetland on the west side of Skid Row Trail (Figures 5 and 6). This wetland is only about 15 m<sup>2</sup> in total area, and appears to be of anthropogenic origin. Water levels there decrease from about 40 cm to < 5 cm over the spring and summer, suggesting it is unsuitable for Red-legged Frog breeding. However, our observations suggest it functions as a moist refuge for Red-legged Frogs and other amphibian species.

Strong evidence of breeding by the Red-legged Frog, as well as the Pacific Treefrog and Rough-skinned Newt, was found at Skipsey Lake (Appendix E). Other entirely terrestrial salamanders (i.e. *Ensatina*, Wandering Salamander and Western Red-backed Salamander) are expected to also be present on the property, but were not found during the searches. *Ensatina*s likely inhabit fir-dominated stands at the site possessing a mossy ground cover, while Western Red-backed Salamanders should be common in riparian forests around the site.

The reptile assemblage of the site is typical of the region. A single alligator lizard was sighted to the West of Vesper Point (VP2, VS3). Alligator lizards are associated with dry forests near open rocky areas and abundant woody debris. Common Garter Snakes were observed in the northeast part of the site (north of Vesper Point Trail to the East of Fire Circle Trail), and in its southwest corner, near VS21 (Figure 2, Appendix E). This species, along with the Northwestern Garter Snake, are common and widespread in the region.

Table 4. Moorecroft amphibian survey results.

Amphibian Survey Station	Observed Species	Number of Individuals
1		
2		
3	Pacific Tree Frog ( <i>Hyla regilla</i> ) Red-Legged Frog ( <i>Rana aurora</i> ) Long-toed Salamander ( <i>Ambystoma macrodactylum</i> )	2 2 multiple-larvae
4	Rough-skinned Newt ( <i>Taricha granulosa</i> )	1
5		
6	Pacific Tree Frog ( <i>Hyla regilla</i> ) Red-Legged Frog ( <i>Rana aurora</i> ) Rough-skinned Newt ( <i>Taricha granulosa</i> )	multiple 3 multiple
7		



Figure 6. Small seasonal wetland on West side of Skid Row Trail near VS9 marsh area (in Figure 2).

## **5.0 CONSERVATION ASSESSMENT**

The approach employed in assessing conservation values at this site involved identifying its primary Valued Ecosystem Components (or VEC's) and rating the site's importance to them. Though a complete bio-inventory was beyond the scope of this assignment, it was considered sufficient to rate the VEC's discussed below.

### **5.1 Vascular Plant Diversity**

The juxtaposition of upland, wetland and shoreline plant communities across the 34 ha of Moorecroft Camp has resulted in a site with very high floral diversity. Excluding the non-native plants recorded on the site, Moorecroft Camp still supports over 140 species. The floral diversity here is about 25 % higher than that recorded across the 210 ha of Mt. Benson Regional Park, a site which is considered regionally important for (among other things) its floral diversity.

### **5.2 Capture of Rare / Threatened Plants**

With no documented observations of Red- or Blue-Listed plants, it would be seem to be fairly straightforward to assess this site as low for this VEC. However, because Moorecroft Camp contains several habitats capable of supporting rare plants (e.g. wetlands, woodlands, rock outcrops, and salt spray zones) it is reasonable to rank this site as at least moderately important to the persistence of rare plants in the region.

### **5.3 Capture of Sensitive / Under-represented Plant Communities**

Moorecroft Camp encompasses a number of plant communities that are, or should be, considered Sensitive Ecosystems. Areas of sensitive Woodland, Coastal Bluff, Sparsely Vegetated, Wetland, and Riparian ecosystems are interspersed with patches of young and mid-seral forest across the site. Given their patchy distribution, their poor representation in protected areas of the Nanoose Bay Peninsula, and their desirability as building sites, mid-seral stands of Douglas-fir - Arbutus may be considered somewhat threatened at the local, if not regional, scale. Two such stands are captured in the southern part of the Moorecroft Camp property. Overall, the site is highly rated for encompassing sensitive and threatened ecosystems.

### **5.4 Importance to "At-risk" and Regionally Uncommon Wildlife**

Habitat conditions at Skipsey Lake (i.e. stable water levels, moderate depth, some cover by emergent vegetation) and the observation of adult Red-legged Frogs around its margins strongly suggests this wetland is a breeding area for this Blue-listed species. This frog, like most other native amphibians, is vulnerable to traffic-related mortality, particularly when migrating to and from breeding ponds. The fact that only one vehicular access is regularly used on the site is probably of considerable benefit to the frog population here. Since adult Red-legged Frogs spend much of their time foraging in forests away from ponds, it is also significant that the site contains considerable "core"

(or non-breeding) habitat surrounding the presumed breeding pond. It is also noteworthy that, in its present state Moorecroft Camp, has forest cover connecting Skipsey Lake to other neighbouring wetland/riparian areas.

Although Great Blue Herons, another Blue-listed species, do not currently nest on the site or use Arab Bay and site wetlands intensively, Moorecroft Camp remains an important area for their long-term persistence in the region. This is because all the primary heron nesting requirements are met on the property, which exists in a setting where development pressures are expected to remain strong for many years. The Moorecroft Camp property is in close proximity (< 3 km) to rich foraging areas, supports trees at least 15 m in height, and has areas of very limited or no human presence (herons may be extremely sensitive to human disturbance near the nest).

In addition to these listed species, the Moorecroft Camp property supports nine other bird species that are considered regionally uncommon or localized. Given the above, the importance of the site to regional faunal diversity has been assessed as high.

### **5.5 Faunal Diversity**

As a consequence of the variety and juxtaposition of habitats present at the Moorecroft Camp property, the site possesses a very rich and interesting bird assemblage (at least 83 species). In the Vancouver Island context, the mammal assemblage of the site (9 species observed; 3 expected) is also considered to be fairly rich. Though amphibian inventory effort was limited, that amphibian assemblage appears to possess above-average diversity as well (four of six possible pond-breeders are present). Considering the factors, overall faunal diversity at Moorecroft Camp has been assessed as high.

### **5.6 Landscape-level Connectivity**

The spatial distribution of wetlands, riparian areas, and upland forest on the site provide for several forms of habitat linkages at the local scale (e.g. shoreline-to-upland, wetland-to-upland, and wetland-to-wetland connectivity).

At the landscape level of analysis, the site does not appear at first glance to possess strategic importance in terms of providing a regionally important landscape linkages, particularly given the low level of park space dedicated within Electoral Area E. However, when considered in light of neighbouring Forest Reserve and Agricultural Land Reserve Lands, the site has considerable potential to contribute to part of a larger regional network of natural areas. However, it remains to be seen whether the public or the RDN will be mobilized to pursue such a network. For this reason, the site has been assessed as moderately important to landscape-level connectivity.



## 6.0 CONCLUSIONS AND RECOMMENDATIONS

### 6.1 Summary of Moorecroft Camp Conservation Values

Based on the material compiled and reviewed, it is our assessment that the Moorecroft Camp property possesses a high overall conservation value. A breakdown of the site’s importance with respect to individual Valued Ecosystem Components is provided in Table 5 below.

**Table 5. Regional Importance ratings of the Moorecroft Camp property for selected VEC’s.**

Valued Ecosystem Component	Regional Importance Rating	Rating Rationale
1. Vascular Plant Diversity	Very High	- over 145 native plant species recorded.
2. Capture of Rare / Threatened Plants	Moderate	- no Red- or Blue-listed plants observed on site, but includes several habitats which may support rare plants.
3. Capture of Sensitive / Under-represented Plant Communities	Moderate-High	- contains 2 designated SEI Polygons (CB & WN units). 7 others meet SEI criteria, including 2 WN units; 2 RI units, 1 SV unit, and 1 CB unit.
4. Importance to “At-risk” & Regionally Uncommon Wildlife	High	- Skipsey Lk probable breeding area for Blue-listed frog; adj. forest “core” Red-legged frog habitat; high potential for heron nesting. Supports 9 bird species considered “uncommon or localized”.
5. Faunal Diversity	High	- 83 birds, 9 mammals, 4 amphibians and 2 reptiles noted on or near site. At least 3 other mammals, 1 other amphibian and 1 reptile are expected to occur there.
6. Landscape-Level Connectivity	Moderate	- site provides shoreline-to-upland, and wetland-to-wetland habitat linkages. With neighbouring Forest Reserve Lands, considerable potential to serve as part of a regional network of natural areas.
<b>Overall Conservation Value</b>	<b>High</b>	

## 6.2 Recommendations

At the time of writing, the fate of the Moorecroft Camp property was in question. If the campaign to preserve the site in its entirety proves to be unsuccessful, the following recommendations are offered to protect its key natural resource values.

1. Given the on-going loss and degradation of SEI Polygons units in southeast Vancouver Island, all sensitive ecosystems within the Moorecroft Camp property should be mapped using a differential GPS unit, protected by a buffer at least 15 m in width, and secured within a conservation covenant.
2. The boundaries of SEI Polygon #N0350C should be expanded to include the surrounding swamp land (WN: sp) as indicated in Figure 5 of this report.
3. The boundaries of SEI Polygon #N0329A should be expanded to the northern property line as indicated in Figure 5.
4. New Sensitive Ecosystem units should be designated for the Woodland habitat in the Southeast corner of the site, and the Wetland/Riparian complexes in the east-central and northwest parts of the site (see Figure 5).
5. “Core” habitat for the Blue-Listed Red-legged Frog, (and potential nesting habitat for Great Blue Herons) within 200 m of the high wetted perimeter of SEI Polygon #N0350 should be protected from development by inclusion in a conservation covenant. Any new roads crossing through this area should require amphibian passage tunnels and lead/exclusion fencing to reduce the potential for amphibian road-kills.
6. A buffer of natural vegetation measuring at least 45 m in radius (1.5 tree lengths) should be retained around the Bald Eagle nest tree near the northern property line and covenanted.
7. Habitat linkages should be maintained between SEI Polygon #N0350 and the west-central swamp unit shown on Figure 5.
8. No clearing or disturbance should occur around the Sitka Spruce tree in the west-central part of the property, or the Douglas-fir tree serving as a Bald Eagle perch tree in the north-central part of the site.

## 7.0 REFERENCES

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**APPENDIX A**

**Summary of Vegetation Observed at Moorecroft Camp, Nanoose BC.**

<i>Latin Name</i>	<b>Common Name</b>	<b>Observations</b>	
		<b>Ursus</b>	<b>Gray</b>
<b>TREES (15 species)</b>			
<i>Abies grandis</i>	<b>Grand Fir</b>	√	
<i>Acer macrophyllum</i>	<b>Big-leaf Maple</b>	√	√
<i>Arbutus menziesii</i>	<b>Arbutus</b>	√	√
<i>Malus fusca</i>	<b>Pacific Crabapple</b>	√	
<i>Picea monticola</i>	<b>Western White Pine</b>	√	√
<i>Picea sitchensis</i>	<b>Sitka Spruce</b>	√	√
<i>Pinus contorta</i> var. <i>latifolia</i>	<b>Lodgepole Pine</b>	√	√
<i>Populus balsamifera</i> ssp. <i>tricarpa</i>	<b>Black Cottonwood</b>	√	
<i>Populus tremuloides</i>	<b>Trembling Aspen</b>		√
<i>Prunus emarginata</i>	<b>Bitter Cherry</b>	√	
<i>Pseudotsuga menziesii</i> ssp. <i>menziesii</i>	<b>Douglas-Fir</b>	√	√
<i>Quercus garryana</i>	<b>Garry Oak</b>	√	√
<i>Rhamnus purshiana</i>	<b>Cascara</b>		√
<i>Thuja plicata</i>	<b>Western Red Cedar</b>	√	√
<i>Tsuga heterophylla</i>	<b>Western Hemlock</b>	√	√
		□	
<b>SHRUBS (32 species)</b>			
		□	□
<i>Alnus rubra</i>	<b>Red Alder</b>	√	√
<i>Amelanchier alnifolia</i>	<b>Saskatoon</b>	√	
<i>Apocynum androsaemifolium</i>	<b>Spreading Dogbane</b>	√	
<i>Arctostaphylos columbiana</i>	<b>Hairy Manzanita</b>		√
<i>Arctostaphylos uva-ursi</i>	<b>Kinnickinnick</b>	√	√
<i>Cladothamnus pyroliflorus</i>	<b>Copperbush</b>	√	
<i>Cornus stolonifera</i>	<b>Red-osier Dogwood</b>	√	√
<i>Cytisus scoparius</i>	<b>Scotch Broom</b>	√	
<i>Gaultheria shallon</i>	<b>Salal</b>	√	
<i>Holodiscus discolor</i>	<b>Oceanspray</b>	√	
<i>Ilex aquifolium</i>	<b>Holly</b>	√	
	<b>Western Trumpet</b>		
<i>Lonicera ciliosa</i>	<b>Honeysuckle</b>	√	√
<i>Lonicera hispidula</i>	<b>Hairy Honeysuckle</b>	√	
<i>Mahonia aquifolium</i>	<b>Tall Oregon Grape</b>	√	√
<i>Mahonia nervosa</i>	<b>Dull Oregon Grape</b>	√	√
<i>Oemleria cerasiformis</i>	<b>Indian Plum</b>	√	√

<i>Physocarpus capitatus</i>	Pacific Ninebark	√	√
<i>Ribes lacustre</i>	Black Gooseberry	√	√
<i>Ribes sanguineum</i>	Red Flowering Currant	√	√
<i>Rosa gymnocarpa</i>	Baldhip Rose	√	
<i>Rosa nutkana</i>	Nootka Rose	√	
<i>Rubus chamaemorus</i>	Cloud Berry	√	
<i>Rubus discolor</i>	Himalayan Blackberry	√	√
<i>Rubus leucodermis</i>	Blackcap Raspberry	√	
<i>Rubus parviflorus</i>	Thimbleberry	√	
<i>Rubus spectabilis</i>	Salmonberry	√	
<i>Rubus ursinus</i>	Trailing Blackberry	√	
<i>Salix lucida</i> ssp. <i>lasiandra</i>	Pacific Willow	√	
<i>Sambucus racemosa</i> ssp. <i>pubens</i>	Red Elderberry		√
<i>Sorbus sitchensis</i>	Sitka Mountain Ash	√	
<i>Spiraea douglasii</i> ssp. <i>douglassii</i>	Hardhack	√	
<i>Vaccinium parvifolium</i>	Red Huckleberry	√	
		□	
<b>FERNS (5 species)</b>		□	□
<i>Athyrium filix-femina</i>	Lady Fern	√	
<i>Blechnum spicant</i>	Deer Fern	√	
<i>Dryopteris expansa</i>	Spiny Wood Fern	√	
<i>Polystichum munitum</i>	Sword Fern	√	
<i>Pteridium aquilinum</i>	Bracken Fern	√	
<b>HERBS (108 species)</b>		□	□
<i>Achillea millefolium</i>	Yarrow	√	√
<i>Achlys triphylla</i>	Vanilla Leaf	√	√
<i>Adenocaulon bicolor</i>	Pathfinder	√	
<i>Agrostis capillaris</i>	Colonial Bentgrass	√	
<i>Agrostis exarata</i>	Spike Bentgrass	√	
<i>Allium acuminatum</i>	Hooker's Onion		√
<i>Allium cernuum</i>	Nodding Onion	√	
<i>Anaphalis margaritacea</i>	Pearly Everlasting	√	
<i>Antennaria microphylla</i>	Rosy Pussytoes		√
<i>Anthoxanthum odoratum</i>	Sweet Vernalgrass	√	
<i>Aquilegia formosa</i>	Red Columbine	√	√
<i>Aster</i> sp.	Aster		√
<i>Bellis perennis</i>	English Daisy	√	
<i>Boschniakia</i> sp.	Groundcone		√
<i>Camassia quamash</i>	Common Camas		√

<i>Campanula rotundifolia</i>	<b>Common Harebell</b>	√	√
<i>Campanula scouleri</i>	<b>Scouler's Harebell</b>	√	
<i>Cardamine oligosperma</i> or <i>occidentalis</i>	<b>Bittercress</b>	√	
<i>Carex obnupta</i>	<b>Slough Sedge</b>	√	
<i>Carex</i> sp.	<b>Sedge</b>	√	
<i>Cerastium arevense</i>	<b>Field Chickweed</b>	√	√
<i>Chimaphila umbellata</i>	<b>Princes Pine</b>	√	
<i>Circaea alpina</i>	<b>Enchanter's-Nightshade</b>	√	
<i>Cirsium arvense</i>	<b>Canada Thistle</b>	√	
<i>Cirsium edule</i>	<b>Edible Thistle</b>	√	
<i>Claytonia perfoliata</i>	<b>Miner's-lettuce</b>	√	√
<i>Clintonia uniflora</i>	Queens Cup		√
<i>Coraloshiza</i> sp.	Coralroot		√
<i>Cornus canadensis</i>	Bunchberry		√
<i>Cynosurus echinatus</i>	<b>Hedgehog Dogtail</b>	√	
<i>Daucua carota</i>	Wild Carrot		√
<i>Delphinium menziesii</i>	Menzies' Larkspur	□	√
<i>Deschampsia cespitosa</i> ssp. <i>beringensis</i>	<b>Tufted Hairgrass</b>	√	
<i>Dicentra formosa</i>	Pacific Bleeding Heart		√
<i>Digitalis purpurea</i>	<b>Foxglove</b>	√	
<i>Elymus mollis</i>	<b>Dunegrass</b>	√	
<i>Epilobium angustifolium</i>	<b>Fireweed</b>	√	
<i>Epilobium minutum</i>	<b>Small Flowered Willowherb</b>	√	
<i>Epilobium ciliatum</i>	<b>Purple-leaved Willowherb</b>	√	
<i>Equisetum arevense</i>	<b>Common Horsetail</b>	√	
<i>Equisetum hyemale</i>	<b>Scouring-rush</b>	√	
<i>Erythronium oregonum</i>	White Fawn Lily		√
<i>Festuca occidentalis</i>	<b>Western Fescue</b>	√	
<i>Fragaria chiloensis</i>	<b>Coastal Strawberry</b>	√	√
<i>Fritillaria camschatcensis</i>	Northern Rice Root		√
<i>Fritillaria lanceolata</i>	Columbia Lily		√
<i>Galeopsis tetrahit</i>	<b>Hemp-Nettle</b>	√	√
<i>Galium aparine</i>	<b>Cleavers</b>	√	
<i>Galium triflorum</i>	<b>Sweet scented Bedstraw</b>	√	√
<i>Geranium molle</i>	<b>Dovefoot Geranium</b>	√	√
<i>Geranium robertianum</i>	<b>Herb-Robert</b>	√	√
<i>Geum macrophyllum</i>	<b>Large-leaved Avens</b>	√	√
<i>Goodyera oblongifolia</i>	<b>Rattlesnake-plantain</b>	√	√
<i>Grindelia integrifolia</i>	<b>Entire-leaved Gumweed</b>	√	
<i>Heuchera micrantha</i>	<b>Small Flowered Alumroot</b>	√	√

<i>Hieracium albiflorum</i>	<b>White- flowered Hawkweed</b>	√	
<i>Holcus lanatus</i>	<b>Common Velvet-grass</b>	√	
<i>Hypochaeris radicata</i>	<b>Hairy Cat's-Ear</b>	√	
<i>Iris pseudoacorus</i>	<b>Yellow-flowered Iris</b>	√	
<i>Juncus ensifolius</i>	<b>Dagger-leaved Rush</b>	√	
<i>Lactuca muralis</i>	<b>Wall Lettuce</b>	√	
<i>Lathyrus japonicus</i>	<b>Beach Pea</b>	√	
<i>Lathyrus nevadensis</i>	<b>Purple Peavine</b>	√	
<i>Lomatium utriculatum</i>	Spring-gold		√
<i>Lomium nudicale</i>	<b>Indian Consumption Plant</b>	√	
<i>Luzula parviflora</i>	<b>Small-flowered Wood-rush</b>	√	
<i>Lysichiton americanum</i>	<b>Skunk Cabbage</b>	√	
<i>Maianthemum dilatatum</i>	False Lily-of-the-valley		√
<i>Mentha arvensis</i>	Field Mint		√
<i>Mimulus guttatus</i>	<b>Yellow Monkey-flower</b>	√	√
<i>Monotropa uniflora</i>	Indian Pipe		√
<i>Montia parvifolia</i>	<b>Small-leaved Montia</b>	√	√
<i>Myosotis laxa</i>	<b>Small Flowered Forget-me-not</b>	√	
<i>Opuntia fragilis</i>	Brittle Pricky-Pear Cactus		√
<i>Orobanche uniflora</i>	Naked Broomrape		√
<i>Plantago lanceolata</i>	<b>Ribwort</b>	√	√
<i>Plantago major</i>	<b>Common Plantain</b>	√	√
<i>Plantago maritima ssp. juncooides</i>	<b>Sea Plantain</b>	√	√
<i>Plectritis congesta</i>	<b>Sea Blush</b>	√	√
<i>Polygonum douglasii</i>	Douglas' Knotweed		√
<i>Prunella vulgaris</i>	<b>Self Heal</b>	√	√
<i>Ranunculus occidentalis</i>	<b>Western Buttercup</b>	√	√
<i>Ranunculus repens</i>	<b>Creeping Buttercup</b>	√	√
<i>Rumex acetosella</i>	<b>Sheep Sorrel</b>	√	
<i>Rumex occidentalis</i>	<b>Curled Dock</b>	√	√
<i>Salicornia virginica</i>	<b>American Glasswort</b>	√	√
<i>Sanicula crassicaulis</i>	<b>Pacific Sanicle</b>	√	
<i>Satureja douglasii</i>	<b>Yerba Buena</b>	√	√
<i>Saxifraga sp.</i>	Saxifrage		√
<i>Scutellaria galericulata</i>	<b>Marsh Skullcap</b>	□	
<i>Sedum sp.</i>	Stonecrop		√
<i>Sisyrinchium idahoense var. macounii</i>	Blue-eyed-grass		√
<i>Stachys cooleyae</i>	<b>Cooley's Hedge-nettle</b>	√	
<i>Stachys mexicana</i>	<b>Mexican Hedge-Nettle</b>	√	
<i>Symphoricarpos albus</i>	<b>Snowberry</b>	√	√

<i>Taraxacum officinale</i>	<b>Common Dandelion</b>	✓	
<i>Tellima grandiflora</i>	<b>Fringecup</b>	✓	✓
<i>Tiarella trifoliata</i>	<b>Foamflower</b>	✓	✓
<i>Tolmiea menziesii</i>	Piggy-back Plant		✓
<i>Trientalis latifolia</i>	<b>Broad-leaved Starflower</b>	✓	✓
<i>Trillium ovatum</i>	Western Trillium		✓
<i>Typha latifolia</i>	<b>Cattail</b>	✓	
<i>Urtica dioica</i>	<b>Stinging Nettle</b>	✓	✓
<i>Veronica beccabunga ssp. americana</i>	<b>American Brooklime</b>	✓	
<i>Vicia americana</i>	<b>American Vetch</b>	✓	
<i>Viola sp.</i>	Violets		✓
<i>Zygadenus venenosus</i>	Meadow Death-Camas		✓
	<b>Grass sp</b>	✓	✓



## APPENDIX B

### Images of Vegetation Inventory Plots at Moorecroft Camp, Nanoose BC.



**VP1 General**



**VP1 Centre**



**VP1 North**



**VP1 East**



**VP1 South**



**VP1 West**



**VP2 General**



**VP2 Centre**



**VP2 North**



**VP2 East**



**VP2 South**



**VP2 West**



**VP3 General**



**VP3 Wet areas**



**VP3 Marked Wildlife Tree**



**VP4 General**



**VP4 Centre**



**VP4 North**



**VP4 East**

no photo

**VP4 South**



**VP4 West**



**VP5 General**



**VP5 Centre**



**VP5 North**



**VP5 East**



**VP5 South**



**VP5 West**



**VP6 Sitka Spruce**



**VP6 General**



**VP6 Wetland**



**VP7 General**



**VP7 General**



**VP8 General**



**VP8 General**



VP9 General



VP9 General



VP10 General



VP10 General



VP10 General

**APPENDIX C**

**Sample Vegetation Plot Field Sheets (VP1, VP2 and VP4).**

**Moorecroft Sensitive Ecosystem Ground-truthing Form**

PROJECT	Moorecroft Camp – Nanoose			
DATE (mm/dd/yy)	06/01/07	PERSONNEL	CF	
PLOT ID	VP1	TYPE OF PLOT		
LOCATION	~ 15 m SE of #38 metal tag- Rock Bluff			
GROUND PHOTO	Overall & plots			
GPS POSITION	xxxxxx N	FC POLYGON DESCR		
	xxxxxxx E			
ELEV		ASPECT	East	
SLOPE POSITION		SLOPE (°)	16° 27%	
LANDFORM	Rock outcrop/Shoreline	SURFACE MAT.	Rock	
MOISTURE REGIME	Dry – Rock outcrop	NUTRIENT REGIME		
BGC ZONE/ VAR		SITE SERIES		
STRUCTURAL STG				
COMMENTS	Coastal Rock bluff			
A. Tree Layer	20x20		D. Ground Cover	% Cover
23	% Cover	DBH Range	Bryophytes	4
Douglas Fir	5	3-24	Leaf litter	4
Garry Oak	10	18-32	Woody debris	nil
			Exp. rock/soil	45
			Total	53
			(C + D = 100 %)	100
Total Tree	15			
B. Shrub Layer	20x20		HABITAT VALUES	
Species	% Cover	Utilization	Browse	G. Oak
Garry oak	4		Snags/stubs	0
Doug fir	3		Surf. Complexity	Med
Ind Plum	8		Berries	Low
arbutus	2		Herbage	High
kinnkinnick	T		Arboreal lichen	0
Oreg grap	T		CWD	Low
Bald rose	2		MAMU Nesting	
Black cap	T		Cover Values	
Total Shrub	20		Hiding	Low
C. Herb Layer			Thermal:	Low
Species			Snow Int.	Low
Yarrow	T		Travel	high
Grass sp	40		WILDLIFE	
Rosa acic	T		OBSERVATIONS	
Field chickwee	0.5			
gumweed	2			
sorrel	T			
Sw scent bed	3			
Wh flow hawk	T			
Alumroot	t			
seablush	1			
Miners lettuce	1			
Total Plot	48			

C1. Herb Layer	Centre Plot	<u>1x1</u>	
Species	% Cover	HERB %	23
gumweed	1	ROCK %	52
yarrow	1	LEAF %	18
Field chickwe	T	BRYO%	6
Grass sp	20	WOOD%	1
			100%
Total Plot	23		
C2. Herb Layer	North Plot	<u>1x1</u>	
Species	% Cover	HERB %	16
Grass sp	4	ROCK %	70
gumweed	12	LEAF %	14
		BRYO%	10
		WOOD%	0
			100%
Total Plot	16		
C3. Herb Layer	East Plot	<u>1x1</u>	
Species	% Cover	HERB %	12
Gumweed	8	ROCK %	82
Grass sp	4	LEAF %	1
		BRYO%	5
		WOOD%	0
			100%
Total Plot	12		
C4. Herb Layer	South Plot	<u>1x1</u>	
Species	% Cover	HERB %	12
Field Chickwe	6	ROCK %	82
Sorrel	1	LEAF %	1
Grass sp	8	BRYO%	5
yarrow	1	WOOD%	0
			100%
Total Plot	12		
C5. Herb Layer	West Plot	<u>1x1</u>	
Species	% Cover	HERB %	67
Kinnikinnick	1	ROCK %	2
Garry oak	20	LEAF %	15
bedstraw	t	BRYO%	2
Grass sp	46	WOOD%	4
			100%
Total Plot			

**Moorecroft Sensitive Ecosystem Ground-truthing Form**

PROJECT	Moorecroft Camp – Nanoose		
DATE (mm/dd/yy)	06/01/07	PERSONNEL	CF
PLOT ID	VP2	TYPE OF PLOT	
LOCATION	Approx 20 m N of Vespers Point cross		
GROUND PHOTO	Overall & plots		
GPS POSITION	xxxxxx N	FC POLYGON DESCR	NO329A
	xxxxxxx E		
ELEV		ASPECT	East
SLOPE POSITION		SLOPE (°)	43° 92%
LANDFORM	Rock outcrop/Shoreline	SURFACE MAT.	
MOISTURE REGIME	Dry – Rock outcrop	NUTRIENT REGIME	
BGC ZONE/ VAR		SITE SERIES	
STRUCTURAL STG			
COMMENTS	Coastal Rock bluff		
A. Tree Layer	20x20		D. Ground Cover
Species	% Cover	DBH Range	% Cover
Douglas Fir	23	5-20	Bryophytes
Garry Oak	12	14-27	Leaf litter
			Woody debris
			Exp. rock/soil
			Total
			(C + D = 100 %)
Total Tree	35		
B. Shrub Layer	5x5		HABITAT VALUES
Species	% Cover	Utilization	Browse
Garry Oak	30		Low – med
Indian Plum	1		Snags/stubs
Dull Org Grape	1		Nil
Twinflower	T		Surf. Complexity
Arbutus	1		Med
Rosa gymno	T		Berries
			Low
			Herbage
			Low-med
			Arboreal lichen
			Nil
			CWD
			Low
			MAMU Nesting
			Cover Values
Total Shrub	33		Hiding
			Med
			Thermal:
			Med
			Snow Int.
			med
			Travel
			high
			WILDLIFE
			OBSERVATIONS
C1. Herb Layer	Centre Plot	1x1	
Species	% Cover	HERB %	12
Yarrow	2	ROCK %	82
foamflower	2	LEAF %	2
Yerba beuna	1	BRYO%	4
Grass	2	WOOD%	0
Oak shrub 12%	Trail blk 1%	Dull org gr 4%	100%
Total Plot	12		

C2. Herb Layer	North Plot	<u>1x1</u>	
Species	% Cover	HERB %	48
Grass sp	40	ROCK %	25
foamflower	2	LEAF %	20
Nod onion	2	BRYO%	6
Sea blush	2	WOOD%	1
Hairy cats ear	2		100%
Total Plot	48		
C3. Herb Layer	East Plot	<u>1x1</u>	
Species	% Cover	HERB %	10
Nodding Onion	1	ROCK %	82
Trail blackb	3	LEAF %	6
Consumption plant	1	BRYO%	2
Colonial bentgr	2	WOOD%	0
Yerba beuna	2		100%
Total Plot	10		
C4. Herb Layer	South Plot	<u>1x1</u>	
Species	% Cover	HERB %	20
Field Chickwe	1	ROCK %	18
Sorrel	1	LEAF %	46
Grass sp	4	BRYO%	16
yarrow	10	WOOD%	0
Hedgehog dog	1		100%
Hairy cats ear	1		
Total Plot	20		
C5. Herb Layer	West Plot	<u>1x1</u>	
Species	% Cover	HERB %	45
sorrel	4	ROCK %	0
Grass sp (incl	41	LEAF %	15
Hedge hog gr)		BRYO%	30
Oak shrub 20%	Twinflow 1%	WOOD%	10
			100%
Total Plot	45		



Moorecroft Sensitive Ecosystem Ground-truthing Form

PROJECT	Moorecroft Camp – Nanoose			
DATE (mm/dd/yy)	06/15/07	PERSONNEL	CF	
PLOT ID	VP4	TYPE OF PLOT		
LOCATION	Edge Skipsey Lk- NE of bridge @ S end			
GROUND PHOTO	Overall & plots			
GPS POSITION	xxxxxx N	FC POLYGON DESCR	NO350C	
	xxxxxxx E			
ELEV		ASPECT		
SLOPE POSITION		SLOPE (°)	1° 2%	
LANDFORM		SURFACE MAT.		
MOISTURE REGIME	moist	NUTRIENT REGIME		
BGC ZONE/ VAR		SITE SERIES		
STRUCTURAL S				
COMMENTS	Riparian/wetland			
A. Tree Layer	20x20		D. Ground Cover	% Cover
Species	% Cover	DBH Range	Bryophytes	
Grand Fir	2	10-28	Leaf litter	
Doug fir	1	15-45	Woody debris	
Red alder	1	25	Exp. rock/soil	
			Total	
			(C + D = 100 %)	
Total Tre	4			
B. Shrub Laye	10x10		HABITAT VALUES	
Species	% Cover	Utilization	Browse	High
Red alder	10		Snags/stubs	Low
Red osier	25		Surf. Complexity	Med
Salmonberry	13		Berries	High
Juv cedar	4		Herbage	High
Salal	2		Arboreal lichen	Nil
Trail black	1		CWD	High
			MAMU Nesting	
			Cover Values	
Total Shru	55		Hiding	High
			Thermal:	Med-high
			Snow Int.	low
			Travel	High
			WILDLIFE	
			OBSERVATIONS	
			Beaver use of pond	
C1. Herb Layer	Centre Plot	WATER %	35	
Species	% Cover	HERB %	46	
Skunk cabb	45	ROCK %		
Sword fern	1	LEAF %	1	
		BRYO%	8	
		WOOD%	2	
			100%	
Total Plot	46			
C2. Herb Layer	North Plot			

Species	% Cover	HERB %	89
Skunk cabb	25	ROCK %	
Equisetum	18	LEAF %	1
Grass sp	46	BRYO%	
		WOOD%	10
			100%
Total Plot	89		
C3. Herb Layer	East Plot		
Species	% Cover	HERB %	98
Skunk cabb	481	ROCK %	
Deer fern	1	LEAF %	
bedstraw	T	BRYO%	
Horsetail	4	WOOD%	2
Grass sp	45		100%
Total Plot	98		
C4. Herb Layer	South Plot	WATER %	30
Species	% Cover	HERB %	67
Skunk cabb	67	ROCK %	
		LEAF %	1
		BRYO%	
		WOOD%	2
Total Plot	67		100%
C5. Herb Layer	West Plot	WATER %	13
Species	% Cover	HERB %	75
Skunk cabb	75	ROCK %	
		LEAF %	
		BRYO%	10
		WOOD%	2
			100%
Total Plot	75		

## APPENDIX D

### Summary of Wildlife Observations at Moorecroft Camp, Nanoose BC.

Species	Observed			Comments
	Ursus	Gray	Harrison	
<b>BIRDS (83 species)</b>				
American goldfinch			√	A few may over-winter here.
<b>American robin</b>	√		√	Widespread and abundant thrush.
<b>American widgeon</b>			√*	*Small winter flocks around Arab Cove
<b>Bald eagle</b>	√	√	√	Nest north end of site.
<b>Band-tailed pigeon</b>	√			
<b>Barred owl</b>	√	√	√	Probably nests in SW corner
Barrow's goldeneye			√	Wintering only
Belted kingfisher			√*	*Common in Arab Cove area
<b>Bewick's wren</b>	√		√	Common resident nesting in shrubs.
Black oystercatcher			√*	*Common in Arab Cove area
Black scoter			√*	*Occasional in SurfScoter raft
Black turnstone			√*	*Common on shoreline roske with Surfbirds
Black-bellied plover			√*	*Shoreline rocks
<b>Black-throated gray warbler</b>	√			
Brandt's cormorant			√*	*Winter offshore good location for them
Brant			√*	*Winter offshore
<b>Brown creeper</b>	√		√*	*Common resident
Bufflehead			√	Wintering only, nest in BC Interior.
Bushtit			√*	*Resident
Canada goose			√*	*In Arab Cove
Caspian Tern			√*	*Offshore in fall
<b>Cassin's vireo</b>	√		√*	*Summer visitor
Cedar waxwing				A few may over-winter in region.
<b>Chestnut-backed chickadee</b>	√		√	Cavity-nester.
Common goldeneye			√	Wintering only
Common loon			√	Wintering only
Common merganser			√*	*Arab Cove, mostly winter
Common murre			√*	*Offshore in winter
<b>Common raven</b>	√		√	Common and abundant.
Cooper's hawk		√		May forage in forest patches.
<b>Dark-eyed junco</b>	√		√	Common and abundant sparrow.
Double-crested cormorant			√*	*Common near & offshore, rock perches
Downy woodpecker			√*	*Resident
Fox sparrow			√*	*Common in winter
Glaucous-winged gull			√*	*Common all year, but no gull roosts or loafing areas

Golden-crowned kinglet			√	Most abundant in winter months.
Golden-crowned sparrow			√*	*Cabin area
Great blue heron			√*	*Arab Cove area yearround
Great horned owl		√	√	
<b>Hairy woodpecker</b>	√		√	Few suitable snags for nesting.
Harlequin duck			√	Wintering only
Hermit thrush			√*	*Good spot for them in winter
Horned grebe			√	Wintering only
House finch			√	Common resident
Killdeer			√*	*Arab Cove
Mallard			√	Nest in forests near open water.
<b>Northern flicker</b>	√		√	Common woodpecker in region.
Northern pygmy owl		√		
<b>Northwestern crow</b>	√		√*	*Large roost on Gerald II across from Moorecroft
<b>Orange-crowned warbler</b>	√		√	Summer visitant
Pacific loon			√*	*Winter offshore
<b>Pacific-slope flycatcher</b>	√		√	Summer visitant in coniferous forest.
Pelagic cormorant			√*	*Common near & offshore, rock perches
Pied-billed grebe			√*	*Arab Cove- 1 record
Pigeon guillemot			√*	*Common offshore all winter
<b>Pileated woodpecker</b>	√		√	Feeding excavations seen on logs.
Pine siskin			√	Irruptive, follows large cone crops.
<b>Purple finch</b>	√		√	
Red-breasted merganser			√	Wintering only
<b>Red-breasted nuthatch</b>	√		√	Cavity-nester.
<b>Red-breasted sapsucker</b>	√		√	Cavity nester, generally lg. stems
Red-necked grebe			√	Wintering only
<b>Red-winged blackbird</b>	√		√	Winters in region, breeds in marshes.
Rock sandpiper			√*	*Shoreline below Moss Hill & SE of Arab Cove. Rare.
Ruby-crowned kinglet			√*	*Resident, mostly winter
Ruffed grouse				Mixed woodlands
<b>Rufous hummingbird</b>	√		√	Summer visitant
Sharp-shinned Hawk		√	√*	*May nest
<b>Song sparrow</b>	√		√	Common in and around wetlands.
<b>Spotted towhee</b>	√		√	Common resident species.
Steller's jay			√	More abundant in winter.
Surfbird			√*	*Shoreline rocks
SurfScoter			√*	*Small rafts offshore winter
<b>Swainson's thrush</b>	√		√	Summer visitant
Thayer's gull			√*	*Winter

<b>Townsend's warbler</b>	√		√	Summer visitant of upland forests.
Tree swallow			√*	*Clayton Cres area
<b>Turkey vulture</b>	√		√*	*Fly over
Varied thrush			√	Mostly over-winters here.
Violet-green swallow			√	Summer visitant
Western tanager				Summer visitant in coniferous forest.
<b>White-crowned sparrow</b>	√		√	
White-winged scoter			√*	*Small winter rafts offshore
Willow flycatcher	√		√	
<b>Winter wren</b>	√		√	Common in mesic forests.
Yellow warbler				Summer visitant of riparian habitats.
<b>Yellow-rumped warbler</b>	√		√	Summer visitant: late migration

#### MAMMALS (9 species)

<b>Beaver</b>	√	√		Foraging, damming evidence at wetland.
Black bear	√			Feeding sign around old stumps.
<b>Black-tailed deer</b>	√			Numerous tracks & droppings & beds on site.
Cougar			√*	*Local resident reports 1-2 sighting each year
Deer mouse				Widespread and abundant.
Dusky / Vagrant shrew				Higher densities in moist areas.
<b>Eastern cottontail</b>	√			
Mink		√		Frequents wetland margins / shallows.
<b>Muskrat</b>	√	√		In wetlands with high emergent cover.
<b>Raccoon</b>	√	√		Tracks seen around wetland margins.
<b>Red Squirrel</b>	√	√		Middens and cone foraging evidence. Auditory calls.
<b>River otter</b>	√	√		

#### Amphibians and Reptiles (7 species)

<b>Common garter snake</b>	√	√		Common around wetland margins.
<b>Long-toed Salamander</b>	√			Visual observation
<b>Northern alligator lizard</b>	√	√		Visual observation
<b>Northwestern garter snake</b>	√	√		Often most common snake in area.
Northwestern Salamander				
<b>Pacific treefrog</b>	√	√		Can breed in ephemeral ponds.
<b>Red-legged frog</b>	√	√		Breeds in moderately deep ponds, especially bog-type wetlands.
<b>Rough-skinned newt</b>	√	√		Common in open fir stands.
Western Red-backed salamander				Moist forest with high leaf litter.

**APPENDIX E**

**Images of Wildlife Observed at Moorecroft Camp, Nanoose BC.**



Bald Eagle



Alligator Lizard



Red-legged Frog



White-crowned Sparrow



Garter Snake



Rough-skinned Newt



Long-toed Salamander



Bedding spot



Bedding spot (Columbia Black-tailed Deer)

**APPENDIX F**

**Christmas Bird Count Results Sample – 2006-7, Nanoose BC.**

**Nanoose Bay Christmas Bird Count 2006-7**

<b>species.ID</b>	<b>species.commonName</b>	<b>year</b>	<b>number</b>	<b>numberPerHour</b>	<b>hours</b>	<b>flags</b>
gwfgoo	Greater White-fronted Goose	107	1	0.018018018	55.5	
lacgoo	(large forms) Canada Goose	107	387	6.972972973	55.5	
mutswa	Mute Swan	107	3	0.054054054	55.5	
truswa	Trumpeter Swan	107	6	0.108108108	55.5	LC
gadwal	Gadwall	107	1	0.018018018	55.5	
eurwig	Eurasian Wigeon	107	5	0.09009009	55.5	
amewig	American Wigeon	107	704	12.68468468	55.5	
mallar	Mallard	107	332	5.981981982	55.5	
norpin	Northern Pintail	107	160	2.882882883	55.5	
agwtea	American Green-winged Teal	107	34	0.612612613	55.5	
rinduc	Ring-necked Duck	107	50	0.900900901	55.5	
gresca	Greater Scaup	107	31	0.558558559	55.5	
harduc	Harlequin Duck	107	27	0.486486486	55.5	
sursco	Surf Scoter	107	573	10.32432432	55.5	
whwsco	White-winged Scoter	107	111	2	55.5	
blksco	Black Scoter	107	124	2.234234234	55.5	
lotduc	Long-tailed Duck	107	2	0.036036036	55.5	
buffle	Bufflehead	107	310	5.585585586	55.5	
comgol	Common Goldeneye	107	41	0.738738739	55.5	
bargol	Barrow's Goldeneye	107	97	1.747747748	55.5	
hoomer	Hooded Merganser	107	42	0.756756757	55.5	HC
commer	Common Merganser	107	49	0.882882883	55.5	LC
rebmer	Red-breasted Merganser	107	144	2.594594595	55.5	HC
calqua	California Quail	107	56	1.009009009	55.5	
retloo	Red-throated Loon	107	1	0.018018018	55.5	
pacloo	Pacific Loon	107	120	2.162162162	55.5	LC
comloo	Common Loon	107	72	1.297297297	55.5	
pibgre	Pied-billed Grebe	107	2	0.036036036	55.5	LC
horgre	Horned Grebe	107	83	1.495495495	55.5	
rengre	Red-necked Grebe	107	13	0.234234234	55.5	
wesgre	Western Grebe	107	21	0.378378378	55.5	
						LC
bracor	Brandt's Cormorant	107	0	0	55.5	CW
doccor	Double-crested Cormorant	107	91	1.63963964	55.5	
pelcor	Pelagic Cormorant	107	142	2.558558559	55.5	
grbher	Great Blue Heron (Blue form)	107	16	0.288288288	55.5	

baleag	Bald Eagle	107	140	2.522522523	55.5	HC
shshaw	Sharp-shinned Hawk	107	3	0.054054054	55.5	
coohaw	Cooper's Hawk	107	5	0.09009009	55.5	
rethaw	Red-tailed Hawk	107	12	0.216216216	55.5	
merlin	Merlin	107	8	0.144144144	55.5	
perfal	Peregrine Falcon	107	1	0.018018018	55.5	
virrai	Virginia Rail	107	3	0.054054054	55.5	
killde	Killdeer	107	4	0.072072072	55.5	
blkoy	Black Oystercatcher	107	38	0.684684685	55.5	
sptsan	Spotted Sandpiper	107	1	0.018018018	55.5	US
blktur	Black Turnstone	107	6	0.108108108	55.5	LC
surfbi	Surfbird	107	51	0.918918919	55.5	
dunlin	Dunlin	107	0	0	55.5	CW
wilsni1	Wilson's Snipe	107	2	0.036036036	55.5	
bongul	Bonaparte's Gull	107	431	7.765765766	55.5	HC
mewgul	Mew Gull	107	433	7.801801802	55.5	
hergul	Herring Gull	107	2	0.036036036	55.5	
thagul	Thayer's Gull	107	120	2.162162162	55.5	
glwgul	Glaucous-winged Gull	107	518	9.333333333	55.5	
gull	gull sp.	107	909	16.37837838	55.5	
						LC
commur	Common Murre	107	0	0	55.5	CW
piggui	Pigeon Guillemot	107	0	0	55.5	CW
marmur	Marbled Murrelet	107	13	0.234234234	55.5	LC
rhiauk	Rhinoceros Auklet	107	3	0.054054054	55.5	
rocpig	Rock Pigeon	107	1	0.018018018	55.5	
batpig	Band-tailed Pigeon	107	62	1.117117117	55.5	
grhowl	Great Horned Owl	107	2	0.036036036	55.5	
brdowl	Barred Owl	107	2	0.036036036	55.5	
nswowl	Northern Saw-whet Owl	107	1	0.018018018	55.5	
annhum	Anna's Hummingbird	107	6	0.108108108	55.5	HC
belkin	Belted Kingfisher	107	13	0.234234234	55.5	
rebsap	Red-breasted Sapsucker	107	1	0.018018018	55.5	
dowwoo	Downy Woodpecker	107	10	0.18018018	55.5	
haiwoo	Hairy Woodpecker	107	5	0.09009009	55.5	
resfli	Northern (Red-shafted) Flicker	107	140	2.522522523	55.5	HC
pilwoo	Pileated Woodpecker	107	4	0.072072072	55.5	
hutvir	Hutton's Vireo	107	2	0.036036036	55.5	
stejay	Steller's Jay	107	58	1.045045045	55.5	
norcro	Northwestern Crow	107	1555	28.01801802	55.5	
comrav	Common Raven	107	56	1.009009009	55.5	
chbchi	Chestnut-backed Chickadee	107	228	4.108108108	55.5	
bushti	Bushtit	107	42	0.756756757	55.5	



rebnut	Red-breasted Nuthatch	107	13	0.234234234	55.5	LC
brncre	Brown Creeper	107	12	0.216216216	55.5	
bewwre	Bewick's Wren	107	14	0.252252252	55.5	
winwre	Winter Wren	107	59	1.063063063	55.5	
marwre	Marsh Wren	107	1	0.018018018	55.5	
gockin	Golden-crowned Kinglet	107	285	5.135135135	55.5	
ruckin	Ruby-crowned Kinglet	107	52	0.936936937	55.5	
towsol	Townsend's Solitaire	107	2	0.036036036	55.5	
herthr	Hermit Thrush	107	3	0.054054054	55.5	
amerob	American Robin	107	1462	26.34234234	55.5	
varthr	Varied Thrush	107	192	3.459459459	55.5	
eursta	European Starling	107	369	6.648648649	55.5	
cedwax	Cedar Waxwing	107	14	0.252252252	55.5	LC
towwar	Townsend's Warbler	107	2	0.036036036	55.5	
spotow	Spotted Towhee	107	130	2.342342342	55.5	
foxspa	Fox Sparrow	107	35	0.630630631	55.5	
sonspa	Song Sparrow	107	103	1.855855856	55.5	
linspa	Lincoln's Sparrow	107	1	0.018018018	55.5	
whcspa	White-crowned Sparrow	107	19	0.342342342	55.5	
gocspa	Golden-crowned Sparrow	107	44	0.792792793	55.5	
orejun	Dark-eyed (Oregon) Junco	107	440	7.927927928	55.5	
rewbla	Red-winged Blackbird	107	5	0.09009009	55.5	
brebla	Brewer's Blackbird	107	83	1.495495495	55.5	
pingro	Pine Grosbeak	107	39	0.702702703	55.5	HC
purfin	Purple Finch	107	42	0.756756757	55.5	
houfin	House Finch	107	83	1.495495495	55.5	
pinsis	Pine Siskin	107	165	2.972972973	55.5	LC
amegfi	American Goldfinch	107	3	0.054054054	55.5	
houspa	House Sparrow	107	38	0.684684685	55.5	