**Appendix 9**

**Property Adjacent to the Cape Roger Curtis Development – Vegetation Assessment and Ecological Classification (August 2007)**

# Property Adjacent to the Cape Roger Curtis Development Vegetation Assessment and Ecological Classification

**Submitted to:**

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**Summary**
Diamond Head Consulting Ltd. (DHC) was asked to conduct an overview of the vegetation/terrestrial ecology for the adjacent property directly northeast of the Cape Roger Curtis Development.

The objective of the vegetation/terrestrial ecology assessment is to produce an overview description of the existing plant communities and classify these areas according to the Biogeoclimatic Classification System of BC (BEC). In collaboration with the other wildlife and fish studies, this assessment aims to:

- provide an baseline picture of the existing ecological conditions which will ultimately be used to;
    - assess the impacts of the proposed road;
    - develop an environmental management plan to avoid or mitigate potential impacts, and to propose enhancement measures;
- provide sufficient environmental information to begin planning the site in an environmentally sensitive manner; and
- provide the information needed for the review of the development proposal by the relevant regulatory agencies, including the BC Ministry of Water, Land, and Air Protection (MWLAP) and the Department of Fisheries and Oceans (DFO)

The more ecologically significant sites found on this property include some of the rock outcrop areas in Polygon 13. Also of importance are the riparian areas that run throughout the property (buffer of at least 30 meters should be established adjacent to these areas) and the scattered mature growth trees found along the edges of the property.

## Methodology

The forested areas of the project area were delineated into polygons with similar stand and ecological characteristics based off air photo analysis. Within each polygon, representative plots were established for collecting stand and site characteristics. Each plot covers a 20-meter by 20-meter square area. Within this area, forest and tree characteristics were collected including tree species composition, stocking density, diameters and heights, age classes, live crown ratios, and the total crown closure. A soil pit was dug at each plot and information was collected including parent material, soil texture, coarse fragment content, humus type and soil moisture and nutrient regime.

An assessment of understory vegetation within the plot area was taken with the estimated coverage of each species present by layer. This assessment information was used to classify the site according to the Biogeoclimatic Classification System of BC. The methods utilized follow the standards outlined in the Resource Information Standards Committee "Field Manual for Describing Terrestrial Ecosystems Land Management Handbook Number 25" (MoWLAP, MOF 1998)

It is important to understand the limitations of this analysis. The study area is very large and contains a wide range of vegetation communities and ecological features. In addition, many areas are very steep and are inaccessible. Representative plots were established across the study area however not every plant community could be visited on the ground. Air photo interpretation was used to classify areas that were not visited on the ground. The study provides a good overview of the vegetation

communities, however once the development concept has been developed, it is recommended that the areas that are to be developed should be classified in more detail.

## Site Location & Description

The Cape Roger Curtis development site is situated on the southwestern tip of Bowen Island. The property assessed in this report encompassing the area immediately northeast of the proposed development. The property is bordered by small private lots along the western edge and larger private lots along the eastern edge. There is a regional park, water tank and associated road/trail right-of-ways within this area. Several trails and old skid roads run through the property. Some of these trails lead into the proposed Cape Development.

The majority of the property was harvested between 20 to 30 years ago. These recently harvested areas contain dense pole sapling stands (18 to 23 years old) of coniferous and deciduous stands. A smaller portion of the property is composed of young coniferous forest (40 to 80 years old). The terrain is rolling with gentle to moderately steep slopes. The parent material found on the site is primarily bedrock with sandy loam soils and coarse fragment contents ranging from 30 to 80%. Compacted, coarse soils are prominent in disturbed areas. One waterway runs through the southern portion of the property from east to west, but was noted to be dry at this time. There are scattered rock outcrops throughout the property with shallow or no soil. Soil moisture regimes generally range from very dry on the rock outcrops to fresh in the majority of the property.

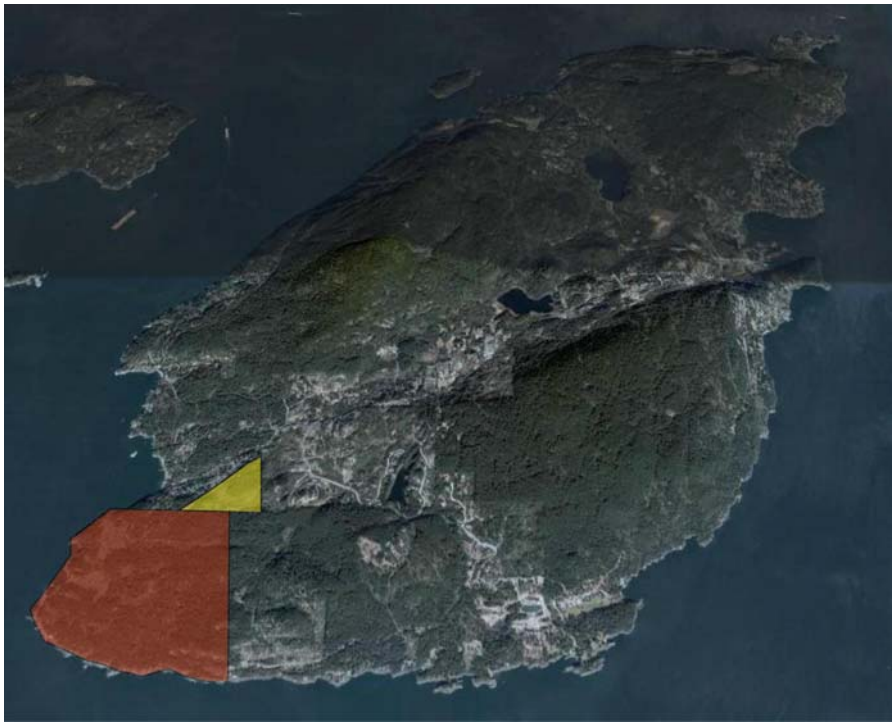

Figure 1. Approximate property location (in yellow) adjacent to Cape Development (in red) (courtesy Google Earth™)

## Cape Roger Curtis – A Rare Ecosystem

Cape Roger Curtis (CRC) is located in a heavily developed biogeoclimatic zone:

- the Coastal Western Hemlock Zone (CWHxm) (Grey in the map below)

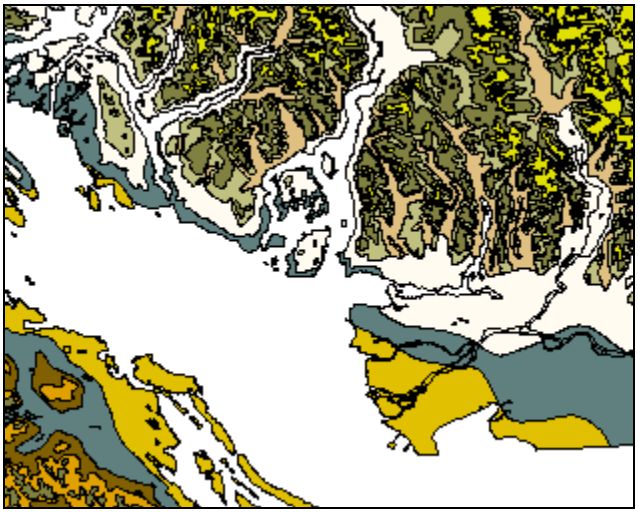

Figure 2. Extent of CRC's ecosystem type within British Columbia

## Vegetation and Terrestrial Ecology

The property lies in the Georgia Lowlands ecosection of the Georgia Depression eco-province and is located Coastal Western Hemlock very dry (CWH xm) biogeoclimatic subzone. Pole sapling forests (15-25 years) dominate the landscape with a lesser component of young forest (40-80 years). The majority of the site was logged 20 to 30 years ago.

The more recently harvested areas are dominated by a mix of red alder (*Alnus rubra*) and Douglas-fir (*Pseudotsuga menziesii*) with lesser components of western hemlock (*Tsuga heterophylla*), western redcedar (*Thuja plicata)*, and bigleaf maple (*Acer macrophyllum*). The older areas of young forest are dominated by Douglas-fir with lesser components of western hemlock, western redcedar, red alder and shorepine (*Pinus contorta*). Dense stands of red alder occur in disturbed sites with old skid roads and trails and exhibit characteristics of richer sites.

Overall the property is dominated by zonal sites with lesser components of slightly richer sites as well as dry sites on the open rock outcrops.

The following plant communities found on the property are considered rare according to Sensitive Ecosystems Inventory of British Columbia:

**Table 1.** Rare plant communities found within the property.

| Scientific Name | Common Name | BGC Association | BC Status |
|---|---|---|---|
| *Tsuga heterophylla / Plagiothecium undulatum* | western hemlock / flat-moss | CWHdm/01 | BLUE |
| *Pseudotsuga menziesii - Tsuga heterophylla / Gaultheria shallon* | Douglas-fir - western hemlock / salal | CWHdm/03 | BLUE |
| *Pseudotsuga menziesii -* | Douglas-fir - lodgepole | CWHdm/02 | RED |

| Scientific Name | Common Name | BGC Association | BC Status |
|---|---|---|---|
| *Pinus contorta* / *Holodiscus discolor* / *Cladina spp.* | pine / oceanspray / reindeer lichens | | |
| *Thuja plicata* / *Polystichum munitum* | western redcedar / sword fern | CWHdm/05 | BLUE |

Based on the vegetation assessment, 14 polygons in the project area have been identified that contain similar stand and ecological characteristics (See Figure 3). Detailed descriptions of these polygons, including their important features, are outlined below, with the site assessment data and site photos included in the appendices.

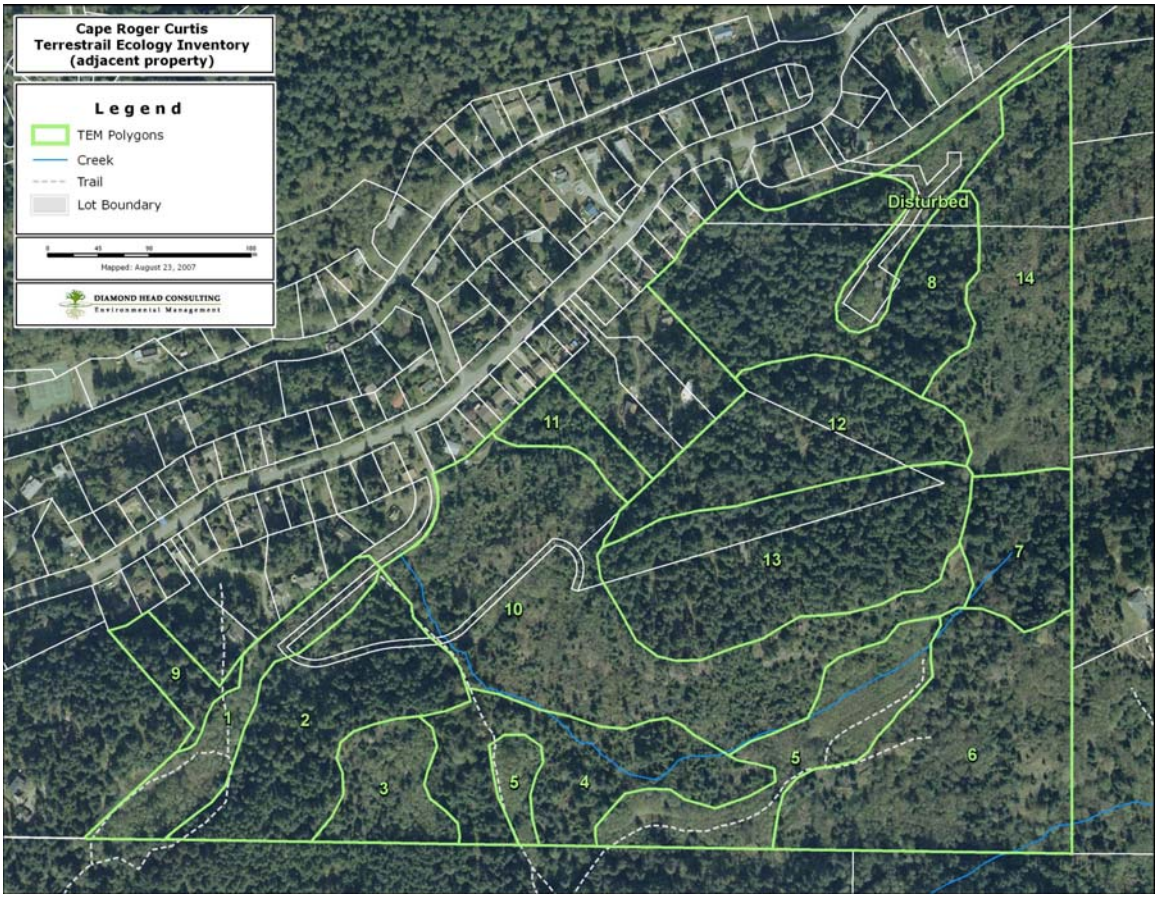


Figure 3. Ecosystem Polygons.

## **Polygon 1 –** Site Series 05, Disturbed

This area is located on the southwestern edge of the property. It supports a dense, even-aged stand of pole sapling red alder. There is a road running through the polygon.

The area has been severely disturbed and exhibits course and compacted soils. The ecology is fresh with a rich nutrient regime.

The understory vegetation is dominated by sword fern with lesser components of foxglove and wall-lettuce.

**Polygon 2 -** Site Series 01

This polygon is located in the southwestern corner of the property, characterized by rocky slopes with large boulders. The stand is dominated by young Douglas-fir with lesser components of western hemlock, western redcedar and bigleaf maple in the intermediate and suppressed layers.

Soils are sandy loams with 70% coarse fragment content. The humus layer averages 2 cm in depth and is classified as a moder. The ecology is slightly dry with a medium nutrient regime.

The understory is dominated by salal, with minor components of spiny wood fern, ocean-spray, dull Oregon-grape, sword fern, trailing blackberry, red huckleberry, and broad-leaved starflower.

**Polygon 3 –** Site Series 01

Located along the southern edge of the property, this area was harvested within the past 20-30 years and as a result is a mix of new plantation, open rock, and dense red alder. Many areas have been heavily compacted and disturbed. Heavy browsing is also evident. The stand is dominated by dense, even-aged, pole sapling red alder with scattered dominant Douglas-fir and lesser components of western hemlock and Douglas-fir in the intermediate, suppressed and regeneration layers. Open rock outcrops are found along the western edge adjacent to Polygon 2.

Soils are sandy loams with a humus layer that averages 2cm in depth and is classified as a moder. The ecology is slightly dry to fresh with a medium nutrient regime.

Salal dominates the understory, with lesser components of ocean-spray, dull Oregon-grape and sword fern. In additon, minor components of grass are present.

**Polygon 4 -** Site Series 01(03)

This polygon is located along the southern edge of the property and was harvested in the past 20-30 years. Heavy deer browsing is evident. The stand is a mix of pole sapling Douglas-fir and western hemlock at low to moderate densities with a lesser component of red alder. Open rock outcrops are scattered throughout the polygon.

Soils are sandy loams with a humus layer that averages 2cm in depth and is classified as mor. The ecology is moderately dry to fresh with a medium nutrient regime.

Salal is prevalent in the understory, with lesser components of ocean-spray, dull Oregon-grape, sword fern, baldhip rose, trailing blackberry, red huckleberry, foxglove and bracken fern. Grass and lichen species are present on rock outcrops. Himalayan blackberry was found at low densities scattered throughout the polygon.

**Polygon 5 -** Site Series 05

Located along the southern edge of the property, this polygon has been heavily compacted and heavily browsed. The polygon follows a trail that may have been an old skid road. Several very large diameter western redcedar stumps are present. The stand is dominated by dense, even-aged pole sapling red alder.

Soils are sandy loams with a humus layer that averages 1cm in depth and is classified as moder. The ecology is fresh with a medium to rich nutrient regime.

Sword fern is slightly more prevalent than the following understory components: salal, ocean-spray, dull Oregon-grape, bracken fern, baldhip rose, trailing blackberry, red huckleberry and foxglove. In addition, minor components of grass and English holly were present.

**Polygon 6 -** Site Series 01(05)

This polygon is located in the southeast corner of the property and was harvested in the past 20-30 years. The stand is dominated by moderate density, pole sapling red alder and Douglas-fir with a lesser component and western hemlock. Heavey browsing is evident.

Soils are sandy loams with a humus layer that averages 2cm in depth and is classified as moder. The ecology is slightly dry to fresh with a medium to rich nutrient regime.

Salal and swordfern are slightly more prevalent in the understory than the lesser components of spiny wood fern, ocean-spray, dull Oregon-grape, bracken fern, baldhip rose, trailing blackberry, red huckleberry and red-flowering currant.

**Polygon 7 -** Site Series 01

This polygon is located on the eastern edge of the property. The stand is fairly open and dominated by young Douglas-fir with lesser components of western redcedar, red alder and western hemlock.

Soils are sandy loams with a humus layer that averages 2cm in depth and is classified as mor. The ecology is slightly dry with a medium nutrient regime. Very few wildlife trees are present, composed primarily of western redcedar.

Salal dominates the understory, with lesser components of ocean-spray, dull Oregon-grape, sword fern, bracken fern, baldhip rose, trailing blackberry, red huckleberry, and red-flowering currant.

**Polygon 8 -** Site Series 01(05,03)

This polygon is located in the northern end of the property. There are private lots at the bottom of the slope along the northwestern edge and a water tank located midslope. The stand is fairly open and dominated by young Douglas-fir with lesser components of western redcedar, western hemlock, red alder and bigleaf maple.

Soils are sandy loams with a humus layer that averages 2cm in depth and classified as a mor. The ecology is slightly dry with a medium nutrient regime.

The understory is dominated by salal, with lesser components of sword fern and red huckleberry. Trailing blackberry, bracken fern and ocean spray compose minor components on the site.

**Polygon 9 -** Site Series 05

Polygon 9 is the small parcel on the western most edge of the property adjacent to private lots. The stand is composed of a mix of young, low density Douglas-fir, western red cedar and western hemlock.

Soils are sandy loams with a humus layer that averages 8cm in depth and is classified as moder. The ecology is fresh with a medium nutrient regime.

The understory is well developed and dominated by with lesser components of deer fern, salal and red huckleberry.

**Polygon 10-** Site Series 03(01,02)

This polygon is located along the western edge of the property and extends east almost all the way to the eastern edge of the property. It was harvested in the past 20 to 30 years. There are scattered open rock outcrops mixed with dense pole sapling stands of Douglas-fir and lesser components and western hemlock and red alder. A small patch of arbutus and veteran Douglas-fir is located in the northern corner of the polygon. Deer trails and browsing were evident.

Soils are sandy loams with a humus layer that averages 13cm in depth and is classified as mor. The ecology is slightly dry with a medium nutrient regime.

The understory is dominated by salal, while lesser components are comprised of ocean-spray, sword fern, red huckleberry, and salmonberry. Himalayan blackberry is scattered throughout this polygon as well as non-native grasses on site series 03.

**Polygon 11 -** Site Series 01(03,02)

Polygon 11 is a small area along the western edge of the property between private lots and the park parcel. The stand was harvested in the past 20 to 30 years and is dominated by Douglas-fir with lesser components of western hemlock and red alder. Deer useage was noted.

Soils are sandy loams with a humus layer that averages 9cm in depth and is classified as mor. The ecology is slightly dry with a poor nutrient regime.

Salal is slightly more prevalent in the understory than the lesser components of ocean-spray and dull Oregon-grape.

**Polygon 12** - Site Series 01(05,03)

This polygon is located centrally within the property and includes the northern portion of the park parcel. The stand is dominated by young, moderate to high density Douglas-fir with lesser components of lodgepole pine, western red cedar and western hemlock. Deer trails and browsing were evident.

Soils are sandy loams with a humus layer that averages 10cm in depth and is classified as mor. The ecology is slightly dry with a medium nutrient regime.

The understory has greater components of salal, complimented by lesser components of sword fern, ocean-spray, dull Oregon-grape and red huckleberry.

**Polygon 13** - Site Series 03(02,01)

This polygon includes the southern edge of the park parcel, extending south into the property. The stand is composed of low density, young Douglas-fir and a lesser component of lodgepole pine. There are scattered open rock outcrops.

Soils are sandy loams with a humus layer that averages 6cm in depth and is classified as moder. The ecology is moderately dry with a medium nutrient regime.

Salal is slightly more prevalent in the understory than the lesser components of ocean-spray, dull Oregon-grape and red huckleberry.

**Polygon 14** - Site Series 05,03,01

This polygon is located along the northeastern edge of the property. It was harvested in the past 20 to 30 years. The stand is very dense and composed of pole sapling red alder, Douglas-fir, western hemlock and lesser amounts of red cedar.

Soils are sandy loams with a humus layer that averages 6cm in depth and is classified as moder.

## Closing Remarks and Recommendations

This property contains a mix of recently harvested, young Douglas-fir plantations with numerous alder dominated trails and skid roads with the edges of the property remaining young forests dominated with conifer tree species. Many of the rock outcrops within this site contain plant communities that are considered rare within the province. Consequently, development should be done in a very sensitive manner.

The more ecologically significant sites found on this property include the rock outcrop areas in Polygon 13. Also of importance are the riparian areas that run throughout the property (buffer of at least 30 meters should be established adjacent to these areas) and the scattered mature growth trees found along the edges of the property.

This property has a long history of disturbance including harvesting, settlement, recreation, fire and windfall. Many of these disturbed areas contain fresh to dry soil moisture and/or dense deciduous stands. Most of these areas should be considered the primary areas for development.

The majority of trees on the site have grown in relatively dense second growth stands and as such, it is difficult to retain individual trees on these sites. Efforts to retain trees should therefore focus on protecting larger groups of trees and treating their edges to ensure they are windfirm. These areas should include riparian areas along the creek and as well as the areas that are dominated by mature coniferous species. In some areas, there are a number of large windfirm trees that are well above the surrounding canopies. Efforts should be made to preserve some of these individual trees throughout the development, considering the location of other tree retention areas.

The following is a summary of recommendations that should be considered in the planning process prior to developing this property:

1. Develop a tree retention plan. This should include identifying and prioritizing stands and individual trees that are windfirm. This information should be considered in the placement of structures and utilities across the site. Once areas are identified install tree protection fencing or other barriers prior to any development.
2. Develop a fire management plan that incorporates information regarding important natural and cultural features. It should be developed in conjunction with the tree retention plan.

3. Identify and mark appropriate riparian buffer zones around the edge of seepage areas and creeks. This boundary should be located along the best windfirm edge of existing trees.
4. When clearing and grubbing the areas considered suitable for development, topsoils should be stripped and stored. These soils should be used for the rehabilitation of degraded areas and for landscaping on the site following its initial development.
5. In areas to be developed, native plants should be transplanted and stored (on site if possible) so that they can be used later for rehabilitation of degraded areas and landscaping.
6. Areas identified to be protected in the planning process (riparian, treed areas, individual plants etc) should have fencing and/or other barriers to identify and protect them from being damaged or destroyed during the development process. These barriers should be installed prior to any machinery entering the property.
7. Consider developing vegetation covenants throughout the property to protect critical ecosystems.

## Limitations

This assessment was conducted so that it could be used for a broad scale planning process and should not be used as a site-specific tool without further investigations.

Only the subject property was inspected and no other areas.

Sketches, diagrams and photographs contained in this report, being intended as visual aids, should no be construed as engineering reports or legal surveys.

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# APPENDIX 1 – Additional Ecological Information

## Polygon 1

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | | Dr100% | Dr100% | Dr90% Fd10% | |
| Density (stems/ha) | | 20 | 700 | 400 | |
| Tree Diameter at Breast Height (cm) | | 34 | 22 | | |
| Tree Height (m) | | 23 | 17 | | |
| Live Crown (%) | 80 | | | | |
| Crown Closure (%) | 80 | | | | |
| Total Stand Density (stems/ha) | 720 | | | | |
| Dominant Trees Average Age | 35 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /80% | | | | |
| Soil Moisture/Soil Nutrients | 4/D | | | | |
| BEC Site Series | CWHdm 05(100%) | | | | |

[1] Species codes: Dr (red alder), Fd (Douglas-fir).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Digitalis purpurea , Lactuca muralis* |
| 6-10% | *Polystichum munitum* |
| 11-25% | |
| 26-50% | |
| >50% | |
| Moss | *Kindbergia oregana* |
| Invasive Species | |

**Figure 1.** Photographs of Polygon 1.

**Polygon 2**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | Fd100% | Fd100% | Fd70% Hw15% Cw15% Mb1% | Hw60% Fd30% Cw10% Dr1% | Hw70% Fd30% |
| Density (stems/ha) | 20 | 200 | 200 | 400 | 200 |
| Tree Diameter at Breast Height (cm) | 60 | 40 | 27 | | |
| Tree Height (m) | 31 | 30 | 25 | | |
| Live Crown (%) | 35 | | | | |
| Crown Closure (%) | 45 | | | | |
| Total Stand Density (stems/ha) | 420 | | | | |
| Dominant Trees Average Age | 68 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /70% | | | | |
| Soil Moisture/Soil Nutrients | 3/C | | | | |
| BEC Site Series | CWHdm 01(100%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Cw (western redcedar), Mb (bigleaf maple), Dr (red alder).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Dryopteris expansa, Holodiscus discolor, Mahonia nervosa, Polystichum munitum, Rubus ursinus, Vaccinium parvifolium, Trientalis latifolia* |
| 6-10% | |
| 11-25% | |
| 26-50% | *Gaultheria shallon* |
| >50% | |
| Moss | *Hylocomium splendens, Kindbergia oregana, Rhytidiadelphus loreus, Plagiothecium undulatum* |
| Invasive Species | |

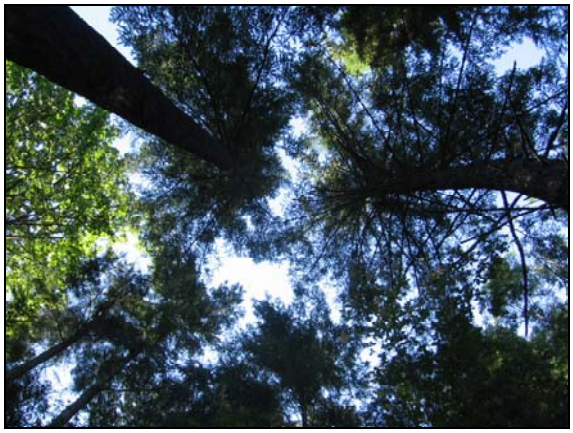

**Figure 2.** Photographs of Polygon 2.

**Polygon 3**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | Fd100% | | Dr80% Fd15% Hw5% | Fd70% Hw20% Dr10% | Fd70% Hw30% |
| Density (stems/ha) | 10 | | 600 | 300 | 200 |
| Tree Diameter at Breast Height (cm) | 35 | | 21 | | |
| Tree Height (m) | 24 | | 16 | | |
| Live Crown (%) | 35 | | | | |
| Crown Closure (%) | 75 | | | | |
| Total Stand Density (stems/ha) | 610 | | | | |
| Dominant Trees Average Age | 18 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /60% | | | | |
| Soil Moisture/Soil Nutrients | 3;4/C | | | | |
| BEC Site Series | CWHdm 01(100%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Dr (red alder).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Grass sp.* |
| 6-10% | *Holodiscus discolor, Mahonia nervosa, Polystichum munitum* |
| 11-25% | *Gaultheria shallon* |
| 26-50% | |
| >50% | |
| Moss | *Hylocomium splendens, Kindbergia oregana, Rhytidiadelphus loreus* |
| Invasive Species | |

**Figure 3.** Photographs of Polygon 3.

**Polygon 4**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | | Fd60% Hw40% | Hw50% Fd35% Dr15% | Hw70% Fd20% Dr5% Mb5% | Hw100% |
| Density (stems/ha) | | 75 | 350 | 350 | 75 |
| Tree Diameter at Breast Height (cm) | | 33 | 24 | | |
| Tree Height (m) | | 18 | 13 | | |
| Live Crown (%) | 85 | | | | |
| Crown Closure (%) | 35 | | | | |
| Total Stand Density (stems/ha) | 425 | | | | |
| Dominant Trees Average Age | 20 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /60% | | | | |
| Soil Moisture/Soil Nutrients | 2;3;4/C | | | | |
| BEC Site Series | | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Mb (bigleaf maple), Dr (red alder).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Holodiscus discolor, Mahonia nervosa, Polystichum munitum, Rosa gymnocarpa, Rubus ursinus, Vaccinium parvifolium, Digitalis purpurea, grass sp., Pteridium aquilinum* |
| 6-10% | |
| 11-25% | *Gaultheria shallon* |
| 26-50% | |
| >50% | |
| Moss | *Hylocomium splendens, Kindbergia oregana, Rhytidiadelphus loreus, Pleurozium schreberi, Cladinia spp.* |
| Invasive Species | Himalayan blackberry |

**Figure 4.** Photographs of Polygon 4.

**Polygon 5**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | | Dr100% | Hw100% | Dr60% Hw40% | Fd60% Hm40% |
| Density (stems/ha) | | 700 | 30 | 450 | |
| Tree Diameter at Breast Height (cm) | | 16 | 25 | | |
| Tree Height (m) | | 16 | 13 | | |
| Live Crown (%) | 35 | | | | |
| Crown Closure (%) | 80 | | | | |
| Total Stand Density (stems/ha) | 730 | | | | |
| Dominant Trees Average Age | 20 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /75% | | | | |
| Soil Moisture/Soil Nutrients | 4/C;D | | | | |
| BEC Site Series | CWHdm 05(100%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Dr (red alder), Hm (mountain hemlock).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | *Ribes sanguineum* |
| 0-5% | *Gaultheria shallon, Holodiscus discolor, Mahonia nervosa, Pteridium aquilinum, Rosa gymnocarpa, Rubus ursinus, Vaccinium parvifolium, Grass sp., Lactuca muralis* |
| a6-10% | *Polystichum munitum* |
| 11-25% | |
| 26-50% | |
| >50% | |
| Moss | *Kindbergia oregana* |
| Invasive Species | English holly |

**Figure 5.** Photographs of Polygon 5.

**Polygon 6**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | | | Dr40% Fd40% Hw20% | Hw35% Dr35% Cw15% Fd15% | Hw60% Fd40% |
| Density (stems/ha) | | | 450 | 300 | 200 |
| Tree Diameter at Breast Height (cm) | | | 28 | | |
| Tree Height (m) | | | 16 | | |
| Live Crown (%) | 70 | | | | |
| Crown Closure (%) | 60 | | | | |
| Total Stand Density (stems/ha) | 450 | | | | |
| Dominant Trees Average Age | 22 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /65% | | | | |
| Soil Moisture/Soil Nutrients | 3;4/C;D | | | | |
| BEC Site Series | CWHdm 01(75%) 05(25%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Cw (western redcedar), Dr (red alder).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Dryopterus expansa, Holodiscus discolor, Mahonia nervosa, Pteridium aquilinum, Rubus ursinus, Vaccinium parvifolium, Digitalis purpurea, grass sp.* |
| 6-10% | *Gaultheria shallon, Polystichum munitum* |
| 11-25% | |
| 26-50% | |
| >50% | |
| Moss | *Hylocomium splendens, Kindbergia oregana* |
| Invasive Species | |

**Figure 6.** Photographs of Polygon 6.

**Polygon 7**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | | Fd95% Cw5% | Fd65% Dr15% Hw10% Cw10% | Hw60% Fd40% | Hw50% Fd50% |
| Density (stems/ha) | | 150 | 200 | 100 | 150 |
| Tree Diameter at Breast Height (cm) | | 33 | 22 | | |
| Tree Height (m) | | 25 | 21 | | |
| Live Crown (%) | 60 | | | | |
| Crown Closure (%) | 35 | | | | |
| Total Stand Density (stems/ha) | 350 | | | | |
| Dominant Trees Average Age | 52 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /40% | | | | |
| Soil Moisture/Soil Nutrients | 3/C | | | | |
| BEC Site Series | CWHdm 01(100%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Cw (western redcedar), Mb (bigleaf maple), Dr (red alder).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Mahonia nervosa, Polystichum munitum, Pteridium aquilinum, Rosa gymnocarpa, Rubus ursinus, Vaccinium parvifolium, Ribes sanguineum* |
| 6-10% | *Holodiscus discolor* |
| 11-25% | |
| 26-50% | |
| >50% | *Gaultheria shallon* |
| Moss | *Kindbergia oregana* |
| Invasive Species | |

**Figure 7.** Photographs of Polygon 7.

**Polygon 8**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | | Fd75% Cw15% Hw10% | Fd60% Dr40% Mb+ | Fd40% Dr35% Hw25% | Hw100% |
| Density (stems/ha) | | 125 | 150 | 300 | 20 |
| Tree Diameter at Breast Height (cm) | | 36 | 26 | | |
| Tree Height (m) | | 30 | 19 | | |
| Live Crown (%) | 75 | | | | |
| Crown Closure (%) | 35 | | | | |
| Total Stand Density (stems/ha) | 275 | | | | |
| Dominant Trees Average Age | 51 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /50% | | | | |
| Soil Moisture/Soil Nutrients | 3;4/C | | | | |
| BEC Site Series | CWHxm1 01(60%) 05(30%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Cw (western redcedar), Mb (bigleaf maple), Dr (red alder).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | *Galium triflorum* |
| 0-5% | *Rubus ursinus, Pteridium aquilinum, Holodiscus discolor* |
| 6-10% | *Vaccinium parvifolium* |
| 11-25% | *Polystichum munitum* |
| 26-50% | *Gaultheria shallon* |
| >50% | |
| Moss | |
| Invasive Species | |

**Polygon 9**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | | Fd40% Cw30% Hw20% 10% | Hw70% Fd30% | Hw80% Fd20% | |
| Density (stems/ha) | | 25 | 200 | 300 | |
| Tree Diameter at Breast Height (cm) | | 48 | 20 | | |
| Tree Height (m) | | 30 | 13 | | |
| Live Crown (%) | 40 | | | | |
| Crown Closure (%) | 75 | | | | |
| Total Stand Density (stems/ha) | 225 | | | | |
| Dominant Trees Average Age | 68 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /45% | | | | |
| Soil Moisture/Soil Nutrients | 4/D | | | | |
| BEC Site Series | CWHxm1 05(100%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Cw (western redcedar).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Blechnum spicant, Gaultheria shallon, Vaccinium parvifolium* |
| 6-10% | |
| 11-25% | |
| 26-50% | |
| >50% | *Polystichum munitum* |
| Moss | *Hylocomium splendens, Kindbergia oregana* |
| Invasive Species | |

**Figure 8.** Photographs of Polygon 9.

**Polygon 10**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | | Fd60% Dr30% Hw10% | | | Fd70% Hw20% Cw10% |
| Density (stems/ha) | | 700 | | | 25 |
| Tree Diameter at Breast Height (cm) | | 20 | | | |
| Tree Height (m) | | 14 | | | |
| Live Crown (%) | 95 | | | | |
| Crown Closure (%) | 35 | | | | |
| Total Stand Density (stems/ha) | 700 | | | | |
| Dominant Trees Average Age | 19 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /45% | | | | |
| Soil Moisture/Soil Nutrients | 3/C | | | | |
| BEC Site Series | CWHxm1 03(50%) 01(30%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Cw (western redcedar), Dr (red alder).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Rubus parviflorus* |
| 6-10% | *Holodiscus discolor, Polystichum munitum, Vaccinium parvifolium* |
| 11-25% | |
| 26-50% | |
| >50% | *Gaultheria shallon* |
| Moss | *Hylocomium splendens, Kindbergia oregana* |
| Invasive Species | Himalayan blackberry |

**Figure 9.** Photographs of Polygon 10.

**Polygon 11**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | Fd100% | Fd70% Dr20% Hw10% | | | Fd100% |
| Density (stems/ha) | 25 | 550 | | | 25 |
| Tree Diameter at Breast Height (cm) | 45 | 30 | | | |
| Tree Height (m) | 27 | 14 | | | |
| Live Crown (%) | 50 | | | | |
| Crown Closure (%) | 40 | | | | |
| Total Stand Density (stems/ha) | 575 | | | | |
| Dominant Trees Average Age | 20 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /40% | | | | |
| Soil Moisture/Soil Nutrients | 3/B | | | | |
| BEC Site Series | CWHxm1 01(60%) 03(30%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Dr (red alder).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Dryopteris expansa, Holodiscus discolor, Mahonia nervosa, Polystichum munitum, Rubus ursinus, Vaccinium parvifolium, Trientalis latifolia* |
| 6-10% | |
| 11-25% | |
| 26-50% | *Gaultheria shallon* |
| >50% | |
| Moss | *Hylocomium splendens, Kindbergia oregana* |
| Invasive Species | |

**Figure 10.** Photographs of Polygon 11.

**Polygon 12**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | | Fd60% Cw30% Hw10% | Fd80% Pl20% | | |
| Density (stems/ha) | | 500 | 250 | | |
| Tree Diameter at Breast Height (cm) | | 45 | 20 | | |
| Tree Height (m) | | 30 | 13 | | |
| Live Crown (%) | 50 | | | | |
| Crown Closure (%) | 60 | | | | |
| Total Stand Density (stems/ha) | 750 | | | | |
| Dominant Trees Average Age | 78 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam /40% | | | | |
| Soil Moisture/Soil Nutrients | 3/C | | | | |
| BEC Site Series | CWHxm1 01(60%) 05(20%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Cw (western redcedar), Pl (lodgepole pine).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Holodiscus discolor, Mahonia nervosa, Vaccinium parvifolium* |
| 6-10% | *Polystichum munitum* |
| 11-25% | |
| 26-50% | *Gaultheria shallon* |
| >50% | |
| Moss | *Hylocomium splendens, Kindbergia oregana, Rhytidiadelphus triquetrus* |
| Invasive Species | |

**Figure 11.** Photographs of Polygon 12.

**Polygon 13**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | Fd100% | Fd80% Pl20% | Fd100% | | |
| Density (stems/ha) | 5 | 300 | 25 | | |
| Tree Diameter at Breast Height (cm) | 70 | 30 | 17 | | |
| Tree Height (m) | 28 | 22 | 13 | | |
| Live Crown (%) | 80 | | | | |
| Crown Closure (%) | 40 | | | | |
| Total Stand Density (stems/ha) | 330 | | | | |
| Dominant Trees Average Age | 43 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam/30% | | | | |
| Soil Moisture/Soil Nutrients | 2/C | | | | |
| BEC Site Series | CWHxm1 03(50%) 02(30%) | | | | |

[1] Species codes: Fd (Douglas-fir), Pl (lodgepole pine).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | |
| 0-5% | *Holodiscus discolor, Mahonia nervosa, Vaccinium parvifolium* |
| 6-10% | |
| 11-25% | *Gaultheria shallon* |
| 26-50% | |
| >50% | |
| Moss | *Cladinia spp, Rhytidiadelphus triquetrus* |
| Invasive Species | |

**Figure 12.** Photographs of Polygon 13.

**Polygon 14**

| Stand and Ecology Characteristics | Dominant Trees | Co-Dominant Trees | Intermediate Trees | Suppressed Trees | Regeneration |
|---|---|---|---|---|---|
| Species[1] (% by volume) | | Dr50% Fd30% Hw20% Cw10% | Hw80% Fd20% | | Fd90% Cw10% |
| Density (stems/ha) | | 1000 | 100 | | 5 |
| Tree Diameter at Breast Height (cm) | | 18 | 10 | | |
| Tree Height (m) | | 11 | 6 | | |
| Live Crown (%) | 60 | | | | |
| Crown Closure (%) | 60 | | | | |
| Total Stand Density (stems/ha) | 1100 | | | | |
| Dominant Trees Average Age | 23 | | | | |
| Soil Texture/Coarse Fragment Content | Sandy Loam | | | | |
| Soil Moisture/Soil Nutrients | | | | | |
| BEC Site Series | CWHxm1 05(40%) 03(30%) | | | | |

[1] Species codes: Fd (Douglas-fir), Hw (western hemlock), Cw (western redcedar), Dr (red alder).

| Coverage (%) | Understory Vegetation |
|---|---|
| Trace (+) | *Blechnum spicant* |
| 0-5% | *Rosa gymnocarpa, Rubus ursinus, Vaccinium parvifolium* |
| 6-10% | *Mahonia nervosa* |
| 11-25% | *Polystichum munitum, Gaultheria shallon* |
| 26-50% | |
| >50% | |
| Moss | *Hylocomium splendens* |
| Invasive Species | 0 |

**Figure 13.** Photographs of Polygon 14.