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VEGETATION AND SOILS OF
CARNATION CREEK WATERSHED
(Upper Section)

by

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INTRODUCTION

Carnation Creek Watershed was selected by Fisheries Service for an intensive investigation of the effects of forest harvesting operations on salmonid fish populations. The creek is located north of Sarita River and empties into Trevor Channel of Barkley Sound, on the west coast of Vancouver Island. The Canadian Forestry Service undertook the classification and mapping of soils and vegetation of the watershed.

A survey of soils and vegetation of the watershed was initiated in 1972. During this period, the lower or western portion was completed (Oswald, 1973). The survey was extended to the upper portion of the watershed during 1973 and the results are hereby presented. The report is intended as a working document and much of the background material has been presented in the 1973 report.

METHODS

The methods were essentially the same as those used for the lower portion (Oswald, 1973). Tentative vegetation and soil units were delineated on panchromatic aerial photographs at a scale of 1:15,840. Traverses passing through most of the delineated units were conducted in the field, but the most inaccessible units were not visited. Soils, vegetation and physical site parameters of the location were examined and recorded for each unit visited. Representative soil samples for laboratory analyses were collected. Sample plot locations are indicated in Figure 1. The soil samples were analysed for texture, hydrogen ion concentration, moisture retention at 1/3 and 15 atmospheres, water holding capacity, color and per cent carbon.

RESULTS

Soil and vegetation of the upper portion of Carnation Creek Watershed were similar to those of the lower portion; consequently, this report is an extension of the previously defined units (Oswald, 1973) to the upper portion.

The soils were all developed on coarse-textured colluvium and associated alluvium derived from volcanic rocks. The physical properties (Appendix I) and profile descriptions (Appendix II) were similar among the pits sampled, except for one which had a lower organic matter concentration and, consequently, a lower moisture retention capacity at 15 atmospheres pressure. The water-holding capacity of this soil was, however, relatively high.

Two soil types, added to the prior list (Figure 1), belonged to the Ferro-Humic Podzol Great Group, as did most of the other soils in the watershed, and were delineated on the basis of topographic and drainage characteristics. They were moderately steep receiving sites adjacent to drainage channels; one with mixed alluvium and colluvium, the other on northerly aspects with alluvial cappings over colluvium. They also occurred in the lower portion of the watershed but were not of sufficient size to be delineated separately.

The tree cover of the plots selected for soil sampling consisted primarily of western hemlock (Tsuga heterophylla) with some amabilis fir (Abies amabilis) and western red cedar (Thuja plicata), rarely with Douglas-fir (Pseudotsuga menziesii) or Sitka spruce (Picea sitchensis). The understory vegetation was composed of deerfern (Blechnum spicant) with variable amounts of the following: swordfern (Polysticum munitum), salal (Gaultheria shallon), Oregon grape (Berberis nervosa), huckleberry (Vaccinium

alaskensis, V. parvifolium and V. ovatum), trillium (Trillium ovatum), foam flower (Tiarella trifoliata), twayblade (Listera cordata), devil's club (Oplopanax horridus), salmonberry (Rubus spectabilis), mosses (Eurhynchium oregonum, Hylocomium splendens, Rhytidiadelphus loreus, Sphagnum girgensohnii, Placiothecium undulatum) and liverworts (mostly Scapania bolanderi).

The vegetation types (Figure 2) were essentially the same as in the lower portion, although western red cedar was more common. Three additional vegetation units were tentatively delineated. Two of them, the Tsuga heterophylla/Polysticum munitum - Blechnum spicant unit and the Tsuga heterophylla/Polysticum munitum unit, were large occurrences of communities in nearly pure states, as opposed to the other units which consisted of composites of more than one plant community. The third unit was similar to the previously defined Pseudotsuga menziesii/Gaultheria shallon community, but western hemlock and western red cedar had essentially replaced Douglas-fir.

DISCUSSION

Inaccessibility prevented field work on some units of the upper portion of the watershed because of the time allotment; consequently, heavy reliance on photo interpretation was necessary. Further field work is advisable to check unit boundaries and the soil and vegetation types that occur within each unit.

An appraisal should be conducted to correlate and coordinate the units by producing a biophysical map, rather than separate soil and vegetation maps. Such a map would form a better framework for monitoring the effects of forest harvesting operations and subsequent reforestation

because the units would be more homogeneous. Qualitative assessments of productivity, and predictions for such factors as erodability and trafficability, would be made for each unit.

REFERENCES CITED

Oswald, E. T. 1973. Vegetation and soils of Carnation Creek Watershed:
A progress report. Dept. of Environ. Canadian Forestry Service.
Int. Rept. BC-43. 38 pp.

LEGEND FOR SOILS MAP



Ridge tops with exposed bedrock, shallow soils over bedrock and steeply sloping southerly aspects.



Steep to very steep northerly aspects below ridge crests.



Moderate to steeply sloping southerly aspects with shallow colluvial soils.



Moderately sloping southerly aspects with moderately deep soils and convex surfaces.



Moderately to gently sloping southerly aspects, generally concave, moderately deep soils.



Gently sloping receiving areas, mostly convex southerly and westerly aspects, soils moderately deep.



Gently sloping westerly aspects, concave or convex, receives some drainage water, soils moderately deep.



Moderate to steeply sloping northerly aspects, soils shallow to moderately deep.



Gently to moderately sloping northerly aspects, convex, moderately deep soils, receiving sites mostly below steeper slopes.



High elevation northerly aspects or ridge tops, steeply to moderately sloping, shallow soils on colluvium.



Moderately steep receiving sites adjacent to drainage channels, with mixed alluvium and colluvium.



Gently sloping northerly aspects with alluvial capping over colluvium, receiving sites adjacent to drainage channels.



Creek channel recent alluvial regosols.

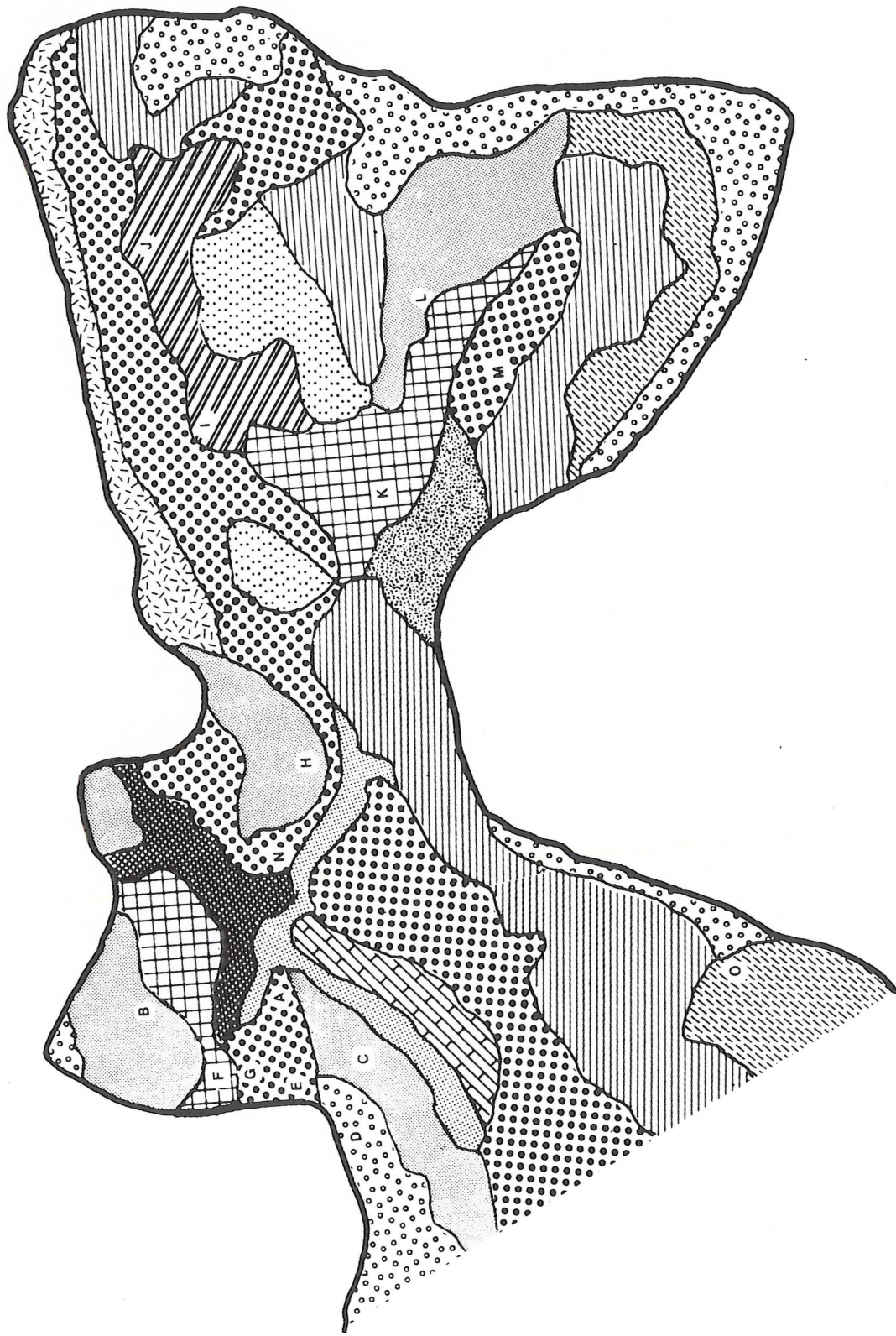


Figure 1. Soils Map of the Eastern Half of Carnation Creek Watershed.

Letters Indicate Sample Plot Locations

Scale: 1: 15,840

LEGEND FOR VEGETATION MAP



Pseudotsuga menziesii/Gaultheria shallon community in interstices of exposed bedrock, best development of Vaccinium ovatum.



Pseudotsuga menziesii/Gaultheria community predominantly but has inclusions of Tsuga heterophylla/Gaultheria-Blechnum spicant and Tsuga/Blechnum communities.



Tsuga heterophylla/Gaultheria shallon-Blechnum spicant community with inclusions of Pseudotsuga/Gaultheria and Tsuga-Abies/Blechnum communities.



Tsuga heterophylla-Abies amabilis/Blechnum spicant community with inclusions of Pseudotsuga/Gaultheria mostly on southern aspects and Tsuga/Gaultheria-Blechnum, Tsuga/Polystichum-Blechnum and Tsuga/Polystichum on northern aspects.



Creek channel communities composed of Tsuga/Blechnum, Tsuga/Polystichum-Blechnum, Tsuga/Polystichum communities plus unclassified types.



Tsuga heterophylla (Thuja plicata)/Gaultheria shallon with inclusions of Pseudotsuga/Gaultheria on ridge tops.



Nearly pure Tsuga heterophylla/Polystichum munitum-Blechnum spicant on northerly aspects.



Nearly pure Tsuga heterophylla/Polystichum munitum on alluvial soils.

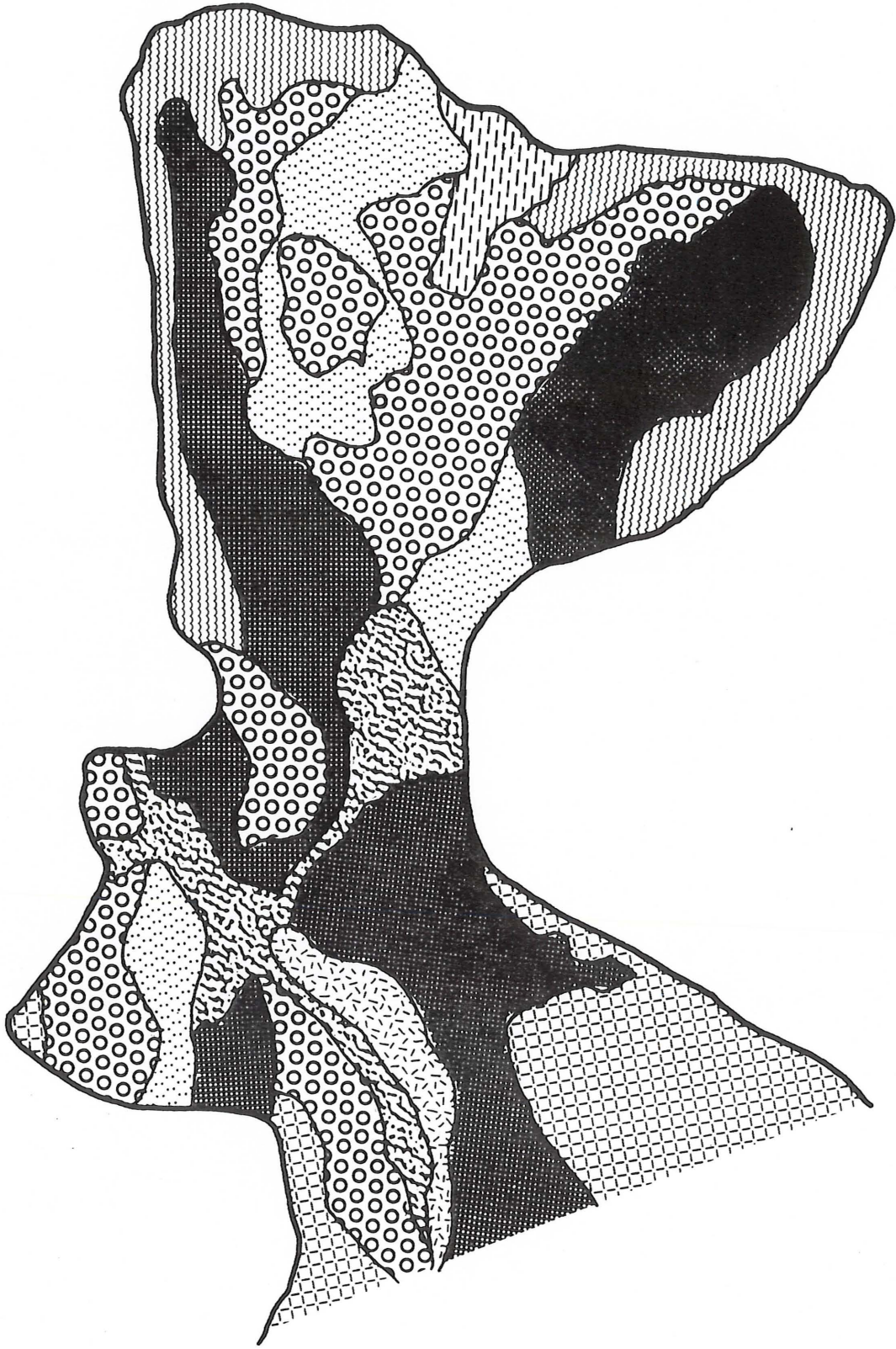


Figure 2. Vegetation Map of the Eastern Half of Carnation Creek Watershed.

Scale: 1:15,840

APPENDIX I

Physical properties, pH and percent organic carbon of soil samples collected in the upper portion of the Carnation Creek Watershed.

Plot No.	Horizon	Depth cm.	Sample Separates % wt.				Texture			pH			% Moisture Retention			WHC %	% C
			OM >2mm	8+ mm	2-8 mm	<2 mm	% Sand	% Silt	% Clay	Texture Class	H ₂ O	CaCl ₂	1/3 Atm.	15 Atm.			
B	Ah	8-18	0	5	10	85	47.7	42.9	9.4	1	4.6	3.8	79.6	57.8	21.8	15.0	
	Bf1	18-38	0	21	23	56	56.8	34.9	8.3	S1	5.1	4.3	60.4	38.8	21.6	8.8	
	Bf2	38-56	0	24	23	53	52.4	40.6	7.0	1	5.1	4.3	53.1	36.4	16.7	7.4	
	BC	56-71	0	6	16	78	51.4	40.9	7.7	1	4.9	4.3	49.0	36.3	12.7	7.9	
	C	71+	0	61	21	18	57.5	37.1	5.4	S1	5.0	4.3	40.9	25.6	15.3	6.9	
H	Bf1	3-30	0	21	29	50	51.6	40.6	7.8	1	4.9	4.4	44.8	22.3	22.5	3.9	
	Bf2	30-48	0	16	34	50	65.2	29.7	5.1	S1	5.0	4.4	31.1	20.2	10.9	5.0	
	BC	48-81	0	13	19	68	52.1	36.5	11.4	1	4.9	3.9	30.7	20.5	10.2	4.8	
	C	81+	0	23	26	51	66.7	27.1	6.2	S1	5.0	4.2	28.5	20.4	8.1	4.8	
	Ah	0-10	0	29	19	52	60.3	30.4	9.3	S1	5.5	4.6	35.1	26.3	8.8	6.1	
L	Bf1	10-36	0	22	13	65	63.4	30.3	6.3	S1	5.6	4.5	35.7	23.5	12.2	5.6	
	Bf2	36-61	0	25	22	53	59.7	35.8	4.5	S1	5.6	4.5	34.6	20.3	14.3	4.6	
	IIBf	61-89	0	27	20	53	58.9	32.8	8.3	S1	5.6	4.8	37.1	23.9	13.2	5.0	
	IIBC	89-107	0	42	22	36	64.8	28.0	7.2	S1	5.6	4.7	27.7	18.9	8.8	4.5	
	IIC	107+	0	35	26	39	65.2	27.7	7.1	S1	5.8	4.5	27.9	17.9	10.0	3.7	
M	Ah	0-8	0	45	23	32	64.4	27.2	8.4	S1	4.9	4.1	51.5	39.7	11.8	10.0	
	Bf1	8-20	0	44	26	30	54.0	37.3	8.7	S1	4.9	4.1	45.4	30.3	15.1	6.8	
	Bf2	20-51	0	45	26	29	61.8	32.0	6.2	S1	5.1	4.6	39.5	31.9	7.6	5.4	
	BC	51-69	0	60	18	22	53.2	39.6	7.2	S1	5.2	4.4	46.8	26.9	19.9	5.8	
	C	69-97+	0	63	13	24	55.3	35.4	8.8	S1	5.1	4.5	42.4	24.7	17.7	5.7	
N	Ah	0-25	0	18	25	57	51.2	39.7	9.1	1	5.2	4.3	47.2	25.8	21.4	5.1	
	Bf1	25-51	0	28	22	50	55.8	36.5	7.7	S1	5.1	4.7	31.9	13.7	18.2	1.5	
	Bf2	51-81	0	28	26	46	54.2	37.7	8.1	S1	5.0	4.5	31.6	12.8	18.8	1.2	
	C	81+	0	35	23	42	58.7	34.1	7.2	S1	5.0	4.8	31.4	15.7	15.7	2.0	

APPENDIX II

Profile descriptions of sample plots in upper portion of Carnation Creek watershed. Dominant or most prevalent plant species are listed first and other species occurring on the site are in parentheses. Horizon depths are in centimeters and colors according to Munsell color notations.

Plot A

Physiography: Slope--80%, Aspect--SE, Mid-slope position.

Vegetation: Trees--western hemlock (amabilis fir, red cedar)

Understory--deerfern (swordfern, tall blue huckleberry, trillium,
foam flower, devils club, salmonberry)

Soils:

- 10-5 Reddish black to dark red, partially decomposed organic material.
- 5-0 Well decomposed black organic material.
- 0-13 Brown (10YR 5/3) moist, gravelly sandy loam, few roots, wavy lower boundary.
- 13-35 Red (2.5YR 4/8) moist, gravelly loam, few angular rocks, roots common.
- 35-66 Color variable, mostly yellowish red (5YR 5/6) moist, with veins of red (2.5YR 4/8) and yellowish brown (10YR 5/4), gravelly loam, angular rocks common, mostly about 3 mm in diameter; roots common.
- 66+ Red (2.5YR 4/8) moist, gravelly loam, coarse angular volcanic rocks common, few roots.

Plot B

Physiography: Slope--15%, Aspect--SE, Mid-slope position.

Vegetation: Trees--western hemlock (amabilis fir, red cedar)

Understory--deerfern (tall blue huckleberry, swordfern, trillium,
salmonberry, foam flower, moss)

Soils:

- 8-0 Well to partially decomposed reddish black organic matter, roots numerous.

- 0-10 Dark reddish brown (5YR 3/4) moist, brown (7.5YR 4/4) dry, loam, roots numerous.
- 10-28 Dark reddish brown (5YR 3/3) moist, strong brown (7.5YR 5/6) dry, loam, roots common, angular volcanic rocks common.
- 28-45 Dark reddish brown (5YR 3/4) moist, yellowish brown (10YR 5/6) dry, loam, roots common, angular volcanic rocks common.
- 45-61 Reddish brown (5YR 4/4) moist, yellowish brown (10YR 5/6) dry, loam, roots sparse, nearly stone free.
- 61+ Dark reddish brown (5YR 3/3) moist, dark yellowish brown (10YR 4/4) dry, gravelly sandy loam, angular volcanic rocks common, roots rare.

Plot C

Physiography: Slope--80%, Aspect--SE, Mid-slope position.

Vegetation: Trees--western hemlock (amabilis fir, red cedar)

Understory--deerfern (swordfern, salal, salmonberry, evergreen and tall blue huckleberry, moss)

Soils: Dark colored organic rich silt loam in interstices of angular colluvial volcanic rocks.

Plot D

Physiography: Top of rocky ridge

Vegetation: Trees--western hemlock (amabilis fir, red cedar)

Understory--salal (tall red and blue huckleberry, twayblade, moss)

Soils: Shallow material on fractured volcanic bedrock.

Plot E

Physiography: Slope--35%, Aspect--NE, Upper 1/3 position.

Vegetation: Trees--western hemlock (red cedar, amabilis fir)

Understory--deerfern (tall red and blue huckleberry, moss)

Soils:

- 13-10 Raw litter.
- 10-0 Well decomposed black organic matter, roots numerous.
- 0-8 Reddish brown (5YR 4/3) moist, sandy loam, roots common.
- 8-28 Dark red (2.5YR 3/6) moist, gravelly sandy loam, rocks common, roots common.

28+ Red (2.5YR 4/8) moist, loam in interstices of angular, colluvial volcanic rocks, few roots.

Plot F

Physiography: Slope--15%, Aspect--SSW, Near top of low sloping hill

Vegetation: Trees--western hemlock (red cedar, amabilis fir)

Understory--salal (deerfern, tall red and blue huckleberry, copper bush, moss)

Soils: Shallow material on fractured bedrock and colluvium.

Plot G

Physiography: Slope--60%, Aspect--N, mid-slope position.

Vegetation: Trees--western hemlock (amabilis fir)

Understory--deerfern (swordfern, moss, liverworts)

Soils:

10-0 Black well decomposed organic matter, roots numerous.

0-10 Dark reddish brown (5YR 3/3) moist, gravelly loam, angular volcanic rocks abundant, few roots.

10-23 Dark reddish brown (2.5YR 3/4) moist, organic-rich silty loam, angular rocks present, few roots.

23-47 Dark reddish brown (5YR 3/4) moist, gravelly loam, angular volcanic rocks common, few roots.

47-61 Dark red (10YR 3/6) moist, loam, small cherty and volcanic rocks numerous, few roots.

61+ Dark reddish brown (5YR 3/4) moist, gravelly sandy loam, angular volcanic rocks abundant, no roots observed.

Plot H

Physiography: Slope--30%, Aspect--N, Lower 1/3 of slope

Vegetation: Trees--western hemlock (amabilis fir, red cedar)

Understory--deerfern (moss)

Soils:

13-0 Well and partially decomposed black organic matter, roots abundant.

- 0-3 Dark reddish brown (5YR 3/4) moist, loam, thin and discontinuous.
- 3-30 Dark brown (7.5YR 4/4) moist, brownish yellow (10YR 6/6) dry, gravelly loam, very loose, few rocks, few roots.
- 30-47 Dark reddish brown (5YR 3/2) moist, dark yellowish brown (10YR 4/4) dry, gravelly loam, rocks common, few roots.
- 47-81 Dark reddish brown (5YR 3/2) moist, yellowish brown (10YR 5.4) dry, gravelly sandy loam, small angular rocks common, few roots.
- 81+ Dark reddish brown (5YR 3/2) moist, dark yellowish brown (10YR 4/4) dry, gravelly sandy loam, many small angular rocks, few large ones, roots sparse.

Plot I

Physiography: Slope--55%, Aspect--SW, Mid-slope position

Vegetation: Trees--western hemlock (amabilis fir, red cedar)

Understory--deerfern - salal (Oregon grape, moss)

Soils: Shallow material over coarse angular colluvium.

Plot J

Physiography: Slope--20%, Aspect--S, Upper 1/3 of slope

Vegetation: Trees--western hemlock (amabilis fir, red cedar, Douglas fir)

Understory--salal - deerfern (tall red, blue and evergreen huckleberry, copper bush, moss)

Soils: Shallow material on colluvium, some rock outcroppings adjacent.

Plot K

Physiography: Slope--50%, Aspect--NW, Upper 1/3 of small hill below larger one.

Vegetation: Trees--western hemlock (amabilis fir, red cedar)

Understory--deerfern (swordfern, trillium, skunk cabbage, Indian hellebore, moss)

Soils: Shallow material over colluvium.

Plot L

Physiography: Slope--60%, Aspect--E, Mid-slope position.

Vegetation: Trees--western hemlock (amabilis fir, red cedar)

Understory--deerfern (swordfern, red and blue huckleberry, trillium, moss)

Soils:

- 8-0 Partially decomposed organic matter, variable depth, roots numerous.
- 0-10 Dark reddish brown (5YR 3/4) moist, yellowish brown (10YR 5/4) dry, loose sandy loam, few rocks, roots common.
- 10-36 Dark reddish brown (5YR 3/3) moist, yellowish brown (10YR 5/6) dry, sandy loam, few angular rocks, roots common.
- 36-61 Dark reddish brown (5YR 3/4) moist, strong brown (7.5YR 5/6) dry, gravelly sandy loam, angular rocks common, few roots.
- 61-89 Dark reddish brown (5YR 3/2) moist, dark yellowish brown (10YR 4/4) dry, gravelly sandy loam, angular rocks abundant, roots sparse.
- 107+ Dark reddish brown (5YR 3/3) moist, yellowish brown (10YR 5/6) dry, gravelly sandy loam in interstices of coarse angular volcanic rocks, no roots.

Plot M

Physiography: Slope--50%, Aspect--SE, Upper 1/3 of slope.

Vegetation: Trees--western hemlock (amabilis fir, red cedar)

Understory--Deerfern (swordfern, salmonberry, salal, huckleberry, moss)

Soils:

- 5-0 Mostly raw organic matter, some well decomposed material.
- 0-8 Dark reddish brown (5YR 3/3) moist, dark brown (7.5YR 4/4) dry, gravelly sandy loam, small angular rocks common, roots numerous.
- 8-20 Dark reddish brown (5YR 3/4) moist, strong brown (7.5YR 5/6) dry, gravelly sandy loam, angular rocks abundant, few roots and none in lower portion.

Plot N

Physiography: Slope--30%, Aspect--SW, Lower 1/3 of slope

Vegetation: Trees--western hemlock - amabilis fir (red cedar, sitka spruce)

Understory--deerfern (moss)

Soils:

- 5-0 Well and partially decomposed dark brown organic matter
- 0-25 Red (2.5YR 4/6) moist, strong brown (7.5YR 5/8) dry, loam, angular rocks common, roots numerous.

- 25-50 Yellowish red (5YR 4/6) moist, reddish yellow (7.5YR 6/6) dry, gravelly sandy loam, angular rocks numerous, roots common.
- 50-84 Yellowish red (5YR 5/8) moist, reddish yellow (7.5 YR 6/8) dry, gravelly sandy loam, angular rocks numerous, few roots.
- 84++ Strong brown (7.5YR 5/8) moist, reddish yellow (7.5YR 6/8) dry, gravelly sandy loam, angular rocks abundant, roots rare.

Plot 0

Physiography: Slope--20%, Aspect-N, Mid-slope position.

Vegetation: Trees--western hemlock (Douglas fir, red cedar)

Soils: Very thin material over volcanic bedrock.