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Land resource inventory of the Power River watershed, British Columbia

Report No. 64 British Columbia Soil Survey 1988

Canada

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British Columbia Soil Survey

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PREFACE

The Power River land resource inventory was initiated at the request of the Vancouver Forest Region, B. C. Ministry of Forests. The inventory will be used at the sub-unit (watershed) level of planning, which is discussed in the Forest Planning Handbook, B. C. Ministry of Forests, Planning Division 1978.

The land resource inventory consists of a report and a series of maps derived from the original inventory data base. These maps include:

a) the base map with each map delineation identified by a unique number to which is attached all data collected in the area;

b) a landscape unit map and legend, which presents descriptions of map units with interpretations; and

c) a series of interpretive maps derived from the landscape units or from data attached to each delineation. These maps include: wildlife, fisheries, and forestry resource management priorities, mass movement, torrent, flood and sediment hazard ratings. As well, a map combining all hazard interpretations onto one base and another showing the degree of bedrock control are included. In addition to descriptions of soils, vegetation, and landscape units, the report includes sections on mapping, classification, and interpretive methods.

SECTION I:

SUMMARY

The Power River watershed can be characterized by four general landscapes.

A floodplain landscape is dominated by deep soils on level to low slopes. Timber values and site quality range from low to good and the landscape provides critical range for ungulates. The river channel is active and channel migration and flooding are frequent. This landscape supports good fish habitat, which is susceptible to serious degradation. This will require that development be carefully planned and controlled.

A basal slope landscape is dominated by relatively deep soils on moderate to low slopes. Timber values and site quality are moderate to good, ungulate range values are generally moderate, and the landscape, unless seriously mismanaged, presents only a low to moderate hazard to water quality.

A valley side slope landscape is dominated by potentially unstable, shallow to moderately deep soils on steep slopes. Timber values and site quality are moderate and ungulate range values are generally low to moderate. Significant areas of this landscape pose a distinct threat to water quality if not managed appropriately.

A high elevation landscape is dominated by shallow soils on both steep and hummocky terrain. Except for limited areas it supports low timber and wildlife values and is unlikely to have significant impacts on water quality for fisheries.

The probability of conflicting resource interests is highest in the floodplain landscape followed by the valley side slope landscape. The report and maps that follow give more detailed descriptions, information, and interpretations.

SECTION II:

DESCRIPTION OF STUDY AREA

Location

The Power River watershed occupies an area of 6000 ha, roughly 20 km south southwest of Port Alice on the west coast of Vancouver Island (Fig. 1). The river drains into the Ououkinish Inlet. Access to the watershed is by boat, to the mouth of the river, or by air (float plane or helicopter to Power Lake). The remote location and difficult access has resulted in limited use of the watershed. Selective logging of Sitka spruce was done during World War II and past mining exploration is evident in the upper reaches of the watershed.

Climate

A maritime climate characterizes the Power River watershed. There is abundant moisture throughout the year (greater than 3000 mm), relatively mild winter temperatures (lowest monthly daily mean 5.5°C), and cool summers (highest monthly daily mean 13.9°C). Extremes of temperature are rare. Summer drought is minimal or lacking and some precipitation occurs during all summer months (driest monthly mean 97 mm). Fog is generally restricted to the outer coast and probably contributes little to the water status of the watershed. Winter snow depth on the valley bottom is low (a 25-year average of 58 cm at Quatsino, the nearest comparable climate station) with no month having snow accumulation. At higher elevations snow depth may be considerable.

Geology

The Power River map area is underlain by three formations of the Vancouver Group ranging in age from Upper Triassic to Lower Jurassic. Most of the watershed is characterized by the Karmutsen Formation (Figure 2) which in the Power River area consists almost exclusively of a thick layering of Triassic basaltic lava. Intervolcanic lenses of limestone have been noted in the vicinity, but their presence in the watershed was not documented. The Parson Bay Formation, which has been mapped as a single unit in the upper portion of the watershed, represents an area of Upper Triassic calcareous shales and limestones. The distribution of calcareous till correlates with this distribution of limestone bedrock. A small area at the head of the watershed is mapped as the Bonanza volcanics. These Lower Jurassic basaltic andesites are often interrelated with minor Jurassic sediments but otherwise are similar to the Karmutsen Formation (Muller 1977).

Figure 1 Location of the Power River watershed

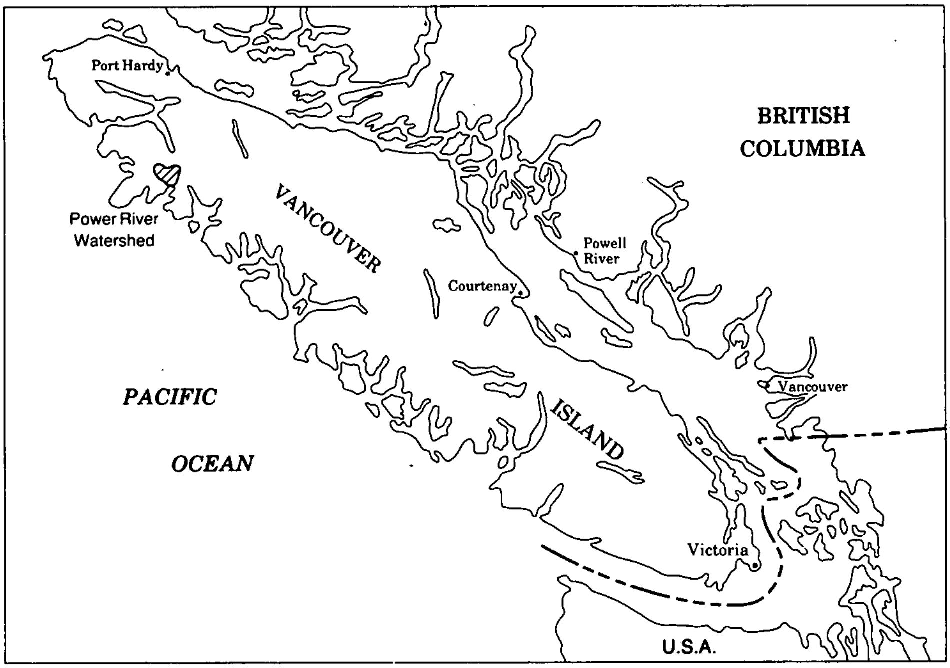
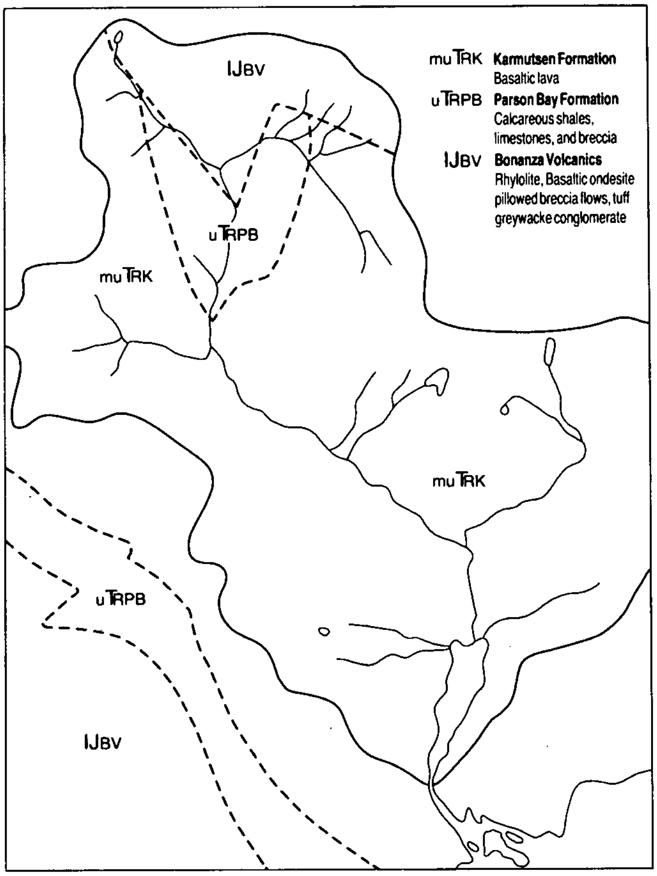


Figure 2 Geology of the Power River watershed (after Muller 1977)



SECTION III:

SURVEY PROCEDURES

Reconnaissance

Three major landscapes were identified during a 4-day aerial and ground reconnaissance of the watershed. A high elevation area was dominated by very shallow soils and scrub forest on strongly hummocky or very steep terrain. A mid-elevation area was dominated by shallow to moderately deep soils and moderate forest growth on very steep valley side slopes. A low elevation area was dominated by deep soils and good forest growth on moderate slopes and by an active floodplain which supported good forest growth on the more stable areas. The low elevation landscape was later subdivided into basal slope and floodplain landscapes.

Aerial reconnaissance was adequate to identify the high elevation landscape as a low priority area. Ground reconnaissance identified the valley side slopes as a moderate priority area because of the timber values. The overwhelming importance of slope and the ease with which it could be inferred from aerial photographs or aerial inspection indicated that sampling effort in this area could be relatively low. The valley bottom was recognized as the highest priority area because it had heavy ungulate use, good fish habitat, and high timber values on an extremely active floodplain. In addition, critical soil properties presented serious problems of boundary recognition on aerial photographs or with aerial inspection. Ground verification of properties and boundaries was expected to be relatively easy.

Sampling effort was therefore directed toward the valley bottoms with much less emphasis on the valley side slopes. Sampling of the high elevation areas was deferred until the end of each survey phase and conducted only if time permitted.

Definition of the mapping individuals

Sampling to define mapping individuals requires the establishment of the criteria used to recognize an individual. In the context of this inventory, an individual is defined as an area at least 20 m x 20 m showing uniform vegetation (as evidenced by a single species-area curve) and a soil having the same surface soil family texture class, coarse fragment content, and profile development. The choice of sampling individuals was determined by following random traverses. If an area met the vegetation criteria for an individual and the criteria for a soil individual were met, a random location within the area was sampled and the traverse continued. A change in either the soil criteria or the vegetation criteria warranted the recognition of a new individual, which was sampled. Locations of all sampling sites and traverses were recorded on 1:15 840 aerial photographs.

In addition to the data needs defined earlier, complete soil and vegetation descriptions (as in Walmsley et al. 1980) were completed and samples taken for laboratory analysis as part of a research project. In this survey only directly observable data were collected. Vegetation data were collected on a minimum 20 m x 20 m area and soils data from a minimum 1 m x 1 m x 1.6 m (or depth to bedrock) deep soil pit. Site data were based on the 20 m x 20 m vegetation plot. Collection of only those parameters relevant to the survey needs would have reduced the length of time spent on this phase of the survey from 60 person days to about 15. Vascular plant names are according to Taylor and McBride (1977). Bryophyte names are according to Crum et al. (1973). Voucher specimens have been deposited in the University of British Columbia herbarium.

The watershed was stratified into sampling areas to ensure that most of the high- and medium-priority areas were sampled. On completion of each sampling area the data were coded for computer analysis. The soil data were analyzed using a cluster analysis procedure based on Ward's algorithm (Patterson and Whitaker 1978) to group soils on the basis of overall similarity in those soil properties considered important to the survey. The results were used to form provisional soil classes for testing during the next sampling phase. A similar approach was taken with the vegetation data. A computerized version of tabular analysis (Ceska and Roemer 1971) was used to establish provisional vegetation classes for testing. The procedure was followed for four sampling trips. The data for all previous trips were pooled for each analysis. At the end of the third trip (45 samples) both the soil and vegetation groups seemed to have stabilized and this was confirmed by the fourth trip (60 samples). During the sampling period soil data, on the classification parameters only, were collected for an additional 35 sites. These data were added to the existing 60 samples and clustered to confirm that no new groups had formed. These results indicated that all of the soil and vegetation types significant to the survey had been sampled and that the data necessary to define the mapping individuals would be adequate.

Establishing the working legend

Before establishing the working legend, the data were subjected to a more rigorous evaluation than had been possible during the sampling season. Provisional soil and vegetation classes were refined and keys to their identification constructed. Tables 1 and 2 present keys for the vegetation and soil types (i.e., mapping individuals) respectively. In addition to the field keys, allocation forms were constructed so that additional data for the mapping individuals could be collected (Tables 3 and 4). Surveyors were instructed to fill out the allocation forms wherever there was any ambiguity or problem with the classification of types. Additional classes of terrain surface expression and active processes (e.g., flooding, channeling, gullying) were established. Data on the dominant, subdominant and any minor inclusions of the soil and vegetation types were recorded for each map delineation. In addition, terrain surface expression, active processes, and slopes (where needed in greater detail than that provided by soil types) were recorded along with any relevant notes about pattern or distribution of types within the delineation.

Mapping

Data from the sampling program, including notes on ground control features of the traverses and soil and vegetation classes, were used as the basis for delineating probable map unit boundaries on 1:15 840 scale panchromatic black and white aerial photographs. One criterion for boundary location was that it separate areas showing significant differences in at least one of the following:

a) the presence of at least one soil or vegetation type on more than 10% of the area;
b) the nature or degree of terrain surface expression or active processes; or
c) the pattern or distribution of component soil or vegetation types.

Table 1 Power River Species Groups and Key to Community Types

SPECIES GROUP 1 (3)*
Elymus hirsutus
Ranunculus uncinatus
Mycelis muralis
Alnus rubra (A1)**
Carex canescens
Pleuropogon refractus

SPECIES GROUP 2 (4)*
Tiarella laciniata
Tiarella trifoliata
Polystichum munitum
Rubus spectabilis

SPECIES GROUP 3 (3)*
Abies amabilis (A1)
Tsuga heterophylla (B1)
Vaccinium alaskaense
Gaultheria shallon
Rubus pedatus
Hylocomium splendens

SPECIES GROUP 4 (2)*
Thuja plicata (A1)
Tsuga heterophylla (A3)
Thuja plicata (B1)

SPECIES GROUP 5 (3)*
Chamaecyparis nootkatensis (A1)
Tsuga mertensiana (A1)
Tsuga mertensiana (B1)

SPECIES GROUP 6 (2)*
Empetrum nigrum
Phyllodoce empetriformis
Alnus sinuata

SPECIES GROUP 7 (6)*
Carex hoodii
Erigeron peregrinus
Fauria crista-galli
Drosera rotundifolia
Gentiana spp.
Tofieldia glutinosa
Eleocharis rostellata
Agrostis spp.
Eriophorum angustifolium

KEY TO COMMUNITY TYPES

SPECIES GROUPS PRESENT	COMMUNITY
1&2	Elymus
2	Tiarella
2&3	Tsuga-Tiarella
3	Tsuga
3&4 (±2)	Thuja
3&5	Chamaecyparis
5&6	Empetrum
7	Carex hoodii

* A species group is considered present if a minimum of the indicated number of species are present.

** Each strata of vegetation in which a species occurs is treated separately in the analysis. When the stratum is relevant it is given in brackets following the species.
A1 Trees of the main canopy generally above 20 m in height.
A3 Trees over 10 m high but below the main tree canopy.
B1 Woody plants between 2 m and 10 m tall.

Table 2 Power River Soil Key

1) Fluvial deposits
  2) Surface lacks gravels or boulders
    3) Surface 10 cm or more silt loam or loam .... Quineex
    3) Surface sandy loam to sand .... Klaskish
  2) Surface with gravels or boulders
    4) Texture sandy loam to sand
      5) Slope less than 4% .... Klaskish
      5) Slope greater than 4% .... Upsowis
    4) Texture loam to silty sand .... Atush Trail
1) Morainal or colluvial deposits
  6) Slope less than 50%
    7) No evidence of bedrock control (deposit deeper than 120 cm)
      8) Dense morainal material within 120 cm .... Aanimi
      8) Dense morainal material absent within 120 cm .... Atush Trail
    7) Bedrock control evident (bedrock within 120 cm)
      9) Mesic or humic organic material deeper than 30 cm .... Qwushin
      9) Mesic or humic organic material less than 30 cm
        5) Bedrock within 10 cm of surface .... Bunsby
        5) Bedrock between 10 cm and 50 cm from surface .... Cuttle
        5) Bedrock between 50 cm and 120 cm from surface .... Kayumin
  6) Slope greater than 50%
    10) No evidence of bedrock control
      11) Dense morainal material within 120 cm .... Battle
      11) Dense morainal material absent within 120 cm .... Tanakmis
    12) Bedrock control evident .... Power River

Table 3 Soil Allocation Sheet

Polygon number	*A249*
Soil name	*Cuttle*
Associated soils	*Bunsby, Keyumin*
Position in polygon	*Rondon*
Elevation	*210 m*
Slope	*30%*
Microtopography	*Hummocky*
Active processes	*None*
Forest floor classification	*F-H MOR*
Forest floor depth	*20 cm*
Surface texture	*SL*
Surface coarse fragments	*30%*
Subsurface texture	*SL*
Subsurface coarse fragments	*30%*
Depth to and kind of mottles	*40 cm prominent*
Depth to particle size discontinuity	*160 cm*
Depth to compact till	*160 cm*
Depth to bedrock	*70 cm*
Estimated drainage	*imperfect*

Table 4 Power River Species Group

SPECIES GROUP 1 (3)*
Elymus hirsutus
Ranunculus uncinatus
Mycelis muralis
Alnus rubra (A1)
Carex canescens
Pleuropogon refractus

SPECIES GROUP 2 (3)*
Tiarella laciniata
Tiarella trifoliata
Polystichum munitum
Rubus spectabilis

SPECIES GROUP 3 (3)*
Abies amabilis (A1)
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Vaccinium alaskaense
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Tsuga mertensiana (B1)

SPECIES GROUP 6 (2)*
Empetrum nigrum
Phyllodoce empetriformis
Alnus sinuata

SPECIES GROUP 7 (6)*
Carex hoodii
Erigeron peregrinus
Fauria crista-galli
Drosera rotundifolia
Gentiana spp.
Tofieldia glutinosa
Eleocharis rostellata
Agrostis spp.
Eriophorum angustifolium

COMMON SPECIES
Tsuga heterophylla
Picea sitchensis
Menziesia ferruginea
Vaccinium parvifolium
Blechnum spicant
Maianthenum dilatatum
Coptis asplenifolia
Rhytidiadelphus loreus
Stokesiella oregana

WET INDICATORS
Adiantum pedatum
Carex obnupta
Lysichiton americanum
Oplopanax horridus

DISTURBANCE SPECIES
Stachys cooleyae
Circaea alpina
Galium triflorum
Leucolepis menziesii
Luzula parviflora
Melica subulata
Mnium glabrescens
Montia sibirica
Poa marcida
Tolmiea menziesia
Trisetum cernuum
Viola glabella

ADDITIONAL SPECIES

* A species group is considered present if a minimum of the indicated number of species (bracketed) is present.

The other criterion for boundary location was that the area delineated on the photograph had to be greater than 0.25 cm^2 and, wherever possible, greater than 1 cm^2. The resulting polygons were numbered consecutively and the predicted proportions of soil and vegetation types, terrain features, and active processes were recorded in a field book. It was useful at this stage to have the soil scientist and vegetation ecologist view and evaluate the stereo image simultaneously.

Field checking verified or modified boundary locations, the proportions of soil and vegetation types, surface expression, and active processes. In addition, notes on the pattern or distribution of soil and vegetation were recorded where necessary or where they were not evident on the aerial photographs. The criteria were the same as those used in producing the provisional classes. Verification of the soil and vegetation types was done using the field keys. Windthrows and stream cuts were used instead of digging whenever possible and depth to bedrock was commonly inferred from the frequency and distribution of rock outcrops, the degree of bedrock control of surface expression, and landform. Soil pits deeper than 50 cm and allocation forms were only used where the soil classification was ambiguous.

Ground verification was conducted following ground traverses designed to cross every map delineation (polygon) in the high priority areas. Fewer ground traverses were run on the steep valley sides. Those done provided additional ground control for aerial verification and air photo interpretation. On completion of the ground verification, field keys were constructed to be used in aerial verification of map delineations (Tables 5 and 6). The keys were based on features, which were visible from a low-flying helicopter and strongly characteristic of specific soil and vegetation patterns. Broad correlations of tree species size and distribution with soil depth were used in constructing the key to soil map delineations. The keys were tested against ground traverses and then used to verify most of the delineations in the intermediate priority area. Although not properly tested, it appears that the perspective afforded by an aerial view and the ease with which the most pertinent soil and vegetation features could be recognized, produced a more reliable verification of the valley side slopes than could be accomplished with ground traverses. This is promising because in terms of delineations verified, one day of aerial verification exceeded 15 days of ground traverse verification. A total of 60 person-days were spent on field verification.

Table 5 Key to Aerial Identification of Soil Types

Key	Soil type
1) Delineation shows bedrock	
2) Slopes greater than 50%	Power River
2) Slopes less than 50%	
3) Rock outcropping and/or scrub forest	Bunsby
3) Strong bedrock control, poor growth western hemlock western red cedar forest, salal understory	Cuttle
3) Moderate growth western hemlock with minor western red cedar and/or Pacific silver fir, salal or Alaskan blueberry-red huckleberry understory	Kayumin
1) Delineation does not show bedrock control	
4) Slopes greater than 50%	
5) Fan or apron morphology	Tanakmis
5) Gullied mantle morphology	Battle
4) Slopes less than 50%	
6) Subdued or sloping surface morphology	
7) Drainage lines deranged, western hemlock forest with minor western red cedar or Pacific silver fir, salal or Alaskan blueberry understory	Kayumin
7) Drainage lines straight, Pacific silver fir-western hemlock forest, Alaskan blueberry understory	Aanimi
6) Fan or level surface morphology	
8) Fan or level surface morphology	
9) Low slope fans, significant Sitka spruce or red alder in forest canopy	Upsowis
9) Low to moderate slope fans, forest canopy lacks red alder or significant Sitka spruce	Atush Trail
8) Level surface morphology	
10) Sedge-dominated surface vegetation	Qwushin
10) Surface vegetation not sedge dominated	
11) Nonforested	Klaskish
11) Forested	Quineex or Klaskish

Table 6 Key to Aereal Identification of Vegetation Types

Key	Vegetation type
1) Floodplain units	
2) Alder dominant; generally lacking or with scattered to patchy Sitka spruce and western hemlock; grassy understory	Elymus
2) Conifers dominant; uniform open to closed canopy	
3) Open canopy lacking Pacific silver fir; high covers of western sword fern in herb stratum	Tiarella
3) Closed canopy dominated by western hemlock and Pacific silver fir with scattered Sitka spruce veterans; red huckleberry and/or Alaskan blueberry common to abundant in understory	Tsuga-Tiarella
1) Upland units	
4) Lacking yellow cedar or mountain hemlock in forest cover	
5) Forest cover dominated by western hemlock and Pacific silver fir and lacking western red cedar; understory dominated by red huckleberry, Alaskan blueberry, or salmonberry	Tsuga-Tiarella
5) Forest cover with at least occasional western red cedar present or shrubs not as above	
6) Scattered western red cedar confined to the tops of rock faces	
7) Understory dominated by salal	Tsuga
7) Understory lacking significant cover of salal but generally with high covers of western sword fern or deer fern; on steep slopes	Tiarella
6) Significant cover of western red cedar - either patchy or an even cover throughout the unit	Thuja
4) Yellow cedar and/or mountain hemlock present in forest cover	
8) Significant patches of open sedge dominated vegetation	Carex hoodii
8) Sedge dominated vegetation lacking	
9) Forested with moderate to poor productivity	Chamaecyparis
9) Patchy forest cover with significant areas of rock outcropping dominated by heath vegetation; low productivity	Empetrum

The delineations not verified by ground or air traverse were generally the low-priority, high-elevation areas. Sampling and ground traverses in this area, while limited, provided the basis for air photo interpretation of these units.

Definition of map units (landscape units)

The formulation of map units entails the loss of some area specific information and, if the number of interpretations requested is large, some loss in utility. Two basic groups of interpretations were requested from the inventory. For one group, interpretations were most easily, and perhaps most appropriately, made on a unit that represented a generalized landscape concept. For the other group, interpretations were most appropriately based on delineation specific information. The estimation of the importance of an area to ungulate range requirements, which is largely an empirical assessment, is an example of the first group. The estimation of mass movement hazard, which is based on a slope stability model (O'Loughlin 1974) is an example of the second group.

To meet the requirements of both groups of interpretations the working legend was coded onto a computer file so that a unique identifying number, the proportion of the area represented by each mapping individual, terrain features, active processes, and the level of verification (ground, aerial, or air photo inspection) used was attached to each delineation drawn. Once coded, the information was available for assessment on a delineation specific basis or for grouping into more generalized landscape units.

Landscape units were designed to be the basic interpretive unit for the following interpretations:

a) Forestry
   - tree species able to produce reasonable volumes
   - potential regeneration problems
   - limitations to productivity of tree species

b) Wildlife
   - habitat suitability and importance as range for deer and elk

c) Fisheries
   - the probability of harvesting procedures having detrimental impacts on site or downstream

The analytical procedure adopted used a cluster analysis procedure (Patterson and Whitaker 1978) to group similar delineations together. Similarity was measured using the proportion of the delineation occupied by each mapping individual (both soil and vegetation). Delineations showing the same or similar proportions of dominant and subdominant soil and vegetation types were grouped together. Classes formed at different levels of generalization were subdivided, where necessary, on the basis of terrain features and active processes. The resulting provisional classes were evaluated using the following critera:

a) Do the classes defined limit the range of conditions enough to meet the interpretive needs? If not, more classes are needed;

b) Does any subdominant or minor mapping individual influence the interpretations of the map unit so strongly that its presence dictates the evaluation of the area for all or most interpretations? If yes, all delineations with the individual present can be grouped into the same map unit regardless of dominance;

c) Do any map units share the same interpretations for all uses, and occupy the same landscape setting? If yes, they should be grouped to form one map unit.

Refinements

During the definition of map units the detailed soil and vegetation plot data were subjected to a more sophisticated analysis. Multiple stepwise discriminant analysis (Halm 1978) was used to define a means of predicting the vegetation type found on a particular soil by using only field verifiable properties of the soil. The program was able to define equations (discriminant functions) that could be used to correctly classify (discriminate) 90% of the plots. Those soil variables used by both the discriminant functions and in the soil classification were evaluated to determine whether the vegetation type (class) growing on a soil could be used to predict the soil properties. Depth to bedrock and drainage classes, inferred from soil data, showed strong correlations with vegetation types. Because the inference of soil drainage can be problematic and correlated strongly with vegetation, it was dropped as a differentiating criteria for soil types. Vegetation associated with the soil was used to infer drainage. Depth to bedrock, because it was more reliably predicted from site properties and because it is central to many interpretations, was retained.

Soil and vegetation types with a limited distribution were grouped with the types most similar to them. Soils that presented problems in boundary location when found in the same area and that had similar interpretations were grouped to form a single redefined type.

Updating the computer files was accomplished by defining a new soil or vegetation type whose value was equal to the total portion of each delineation occupied by the grouped soils. For example, all coarse texture surfaces were grouped as one class and the name Klaskish was retained as the name for the new class. The value attached to Klaskish for each delineation is equal to the proportion of the delineation occupied by coarse-textured soils. The values for the other coarse-textured soils are retained in the computer and can be recovered whenever necessary. The landscape units were redefined with the use of the new, more generalized soil and vegetation types. Once finalized, computer summaries were prepared and used to describe each mapping individual (Sections V and VI) and landscape unit. It should be noted that, as a result of the extensive research sampling, the soil and vegetation types defined (when considered both separately and in combination) provided more information than was necessary to meet the operational or planning needs of the survey.

Maps and interpretations

Map production for both landscape units and interpretations was handled in the following steps:

1) storage of the cartographic base by digitizing to produce the line file and linkage of the line file to unique polygon numbers;

2) computation of polygon areas and output of the map linkage with polygon areas to a computer file in Ottawa;

3) transfer of the output file to the University of British Columbia (U.B.C.) computer (via Data Pac computer link) and incorporation of the linkage and areas into our data file at U.B.C.;

4) classification of polygons into landscape units and the assignment of map unit symbols to each delineation in the data file;

5) interpretation of landscape units for forestry, fisheries, and wildlife and the assessment of probable use conflicts based on the landscape unit descriptions (Section IV);

6) distribution of interpretations, along with descriptions of the landscape units, soils, and vegetation, for review to the agencies concerned and revision before incorporation into the data file;

7) hazard interpretations by computer algorithms to address polygon specific data and to assign a hazard rating;

8) defintion of symbols for each of the interpretations and assignment of the symbol to each polygon in the data file;

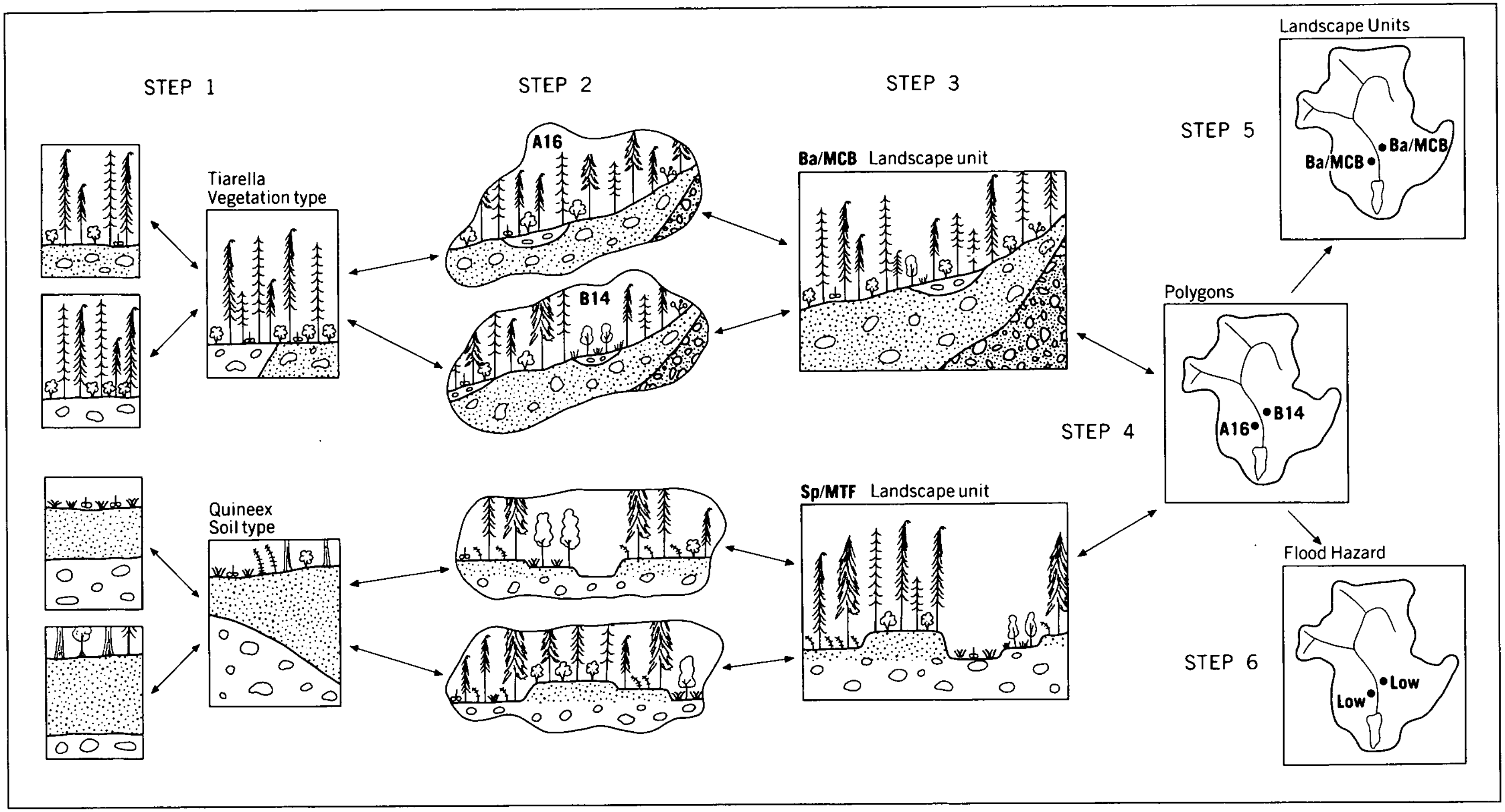
9) generation of electronic turnaround documents containing the map linkage and symbols for the landscape unit map and the map linkage, symbols, and legend for each interpretive map;

10) transfer of the turnaround document to Ottawa (via Data Pac);

11) generation, by CanSIS staff in Ottawa, using the electronic turnaround document, of a plot file for plotting of the maps.

The complete sequence from the definition of mapping individuals to the production of interpretive maps is summarized in Fig. 3.

Figure 3 Steps in classification



STEP 1 Soil and vegetation are classified to form independent types (Mapping individuals).

STEP 2 Map delineations are characterized by the proportion of types and by landscape features (mapping).

STEP 3 Map delineations are classified into a limited number of landscape units (map units).

STEP 4 The composition of types, landscape features, landscape unit labels etc. are attached to each delineation of the digitized map.

STEP 5 Landscape units or their interpretations can be plotted as maps by the computer.

STEP 6 Individual delineations can be addressed by appropriate algorithms to produce delineation specific interpretations.

SECTION IV:

LANDSCAPE UNITS

Definitions

The basic descriptive and planning unit used in this report is the landscape unit. Each landscape unit consists of a distinct combination and pattern of soil and vegetation types. Twenty units, defined by grouping areas of land with similar management concerns for forestry, wildlife, and fisheries, were recognized in the Power River watershed. These units, although generalized and representing broad patterns rather than detailed relationships, still provide much of the information necessary to make management plans for each resource. Other necessary information is dealt with on a map delineation basis.

The watershed was stratified into four broad landscapes to facilitate identification of the landscape units and to provide a framework for broad level management and planning decisions (Fig. 4). The landscapes and the distribution of landscape units within each landscape are outlined below:

A Floodplain

Level or nearly level areas of valley bottom influenced at one time by main channel waters. Slopes are usually less than 2%.

Landscape units
- AL/CTF alder on coarse-textured floodplain deposits
- AL/MTF alder on medium-textured floodplain deposits
- SP/CTF spruce on coarse-textured floodplain deposits
- SP/MTF spruce on medium-textured floodplain deposits

B Basal slopes

Valley bottom areas between the steep valley side slopes and the floodplain. Slopes range from 0 to 50%.

Landscape units
- BA/CFB balsam[1] on coarse-textured fluvial basal slopes
- BA/MCB balsam on medium-textured colluvial basal slopes
- BA/MMB balsam on medium-textured basal slopes
- HE/MMB hemlock on medium-textured morainal basal slopes
- SP/CFB spruce on coarse-textured fluvial basal slopes

[1] the term balsam instead of Pacific silver fir has been used for Abies amabilis in the landscape unit names at the request of B.C. Ministry of Forests personnel.

C Valley side slopes

Steep side slopes, with areas of moderate slope lying between the valley bottom and high elevation units. Slopes are usually greater than 50%.

Landscape units

- BA/SCS balsam on steep colluvial side slopes
- BA/SMS balsam on steep morainal side slopes
- CE/MMS cedar on moderate slope shallow side slopes
- CE/SCS cedar on steep colluvial side slopes
- HE/SCS hemlock on steep colluvial side slopes

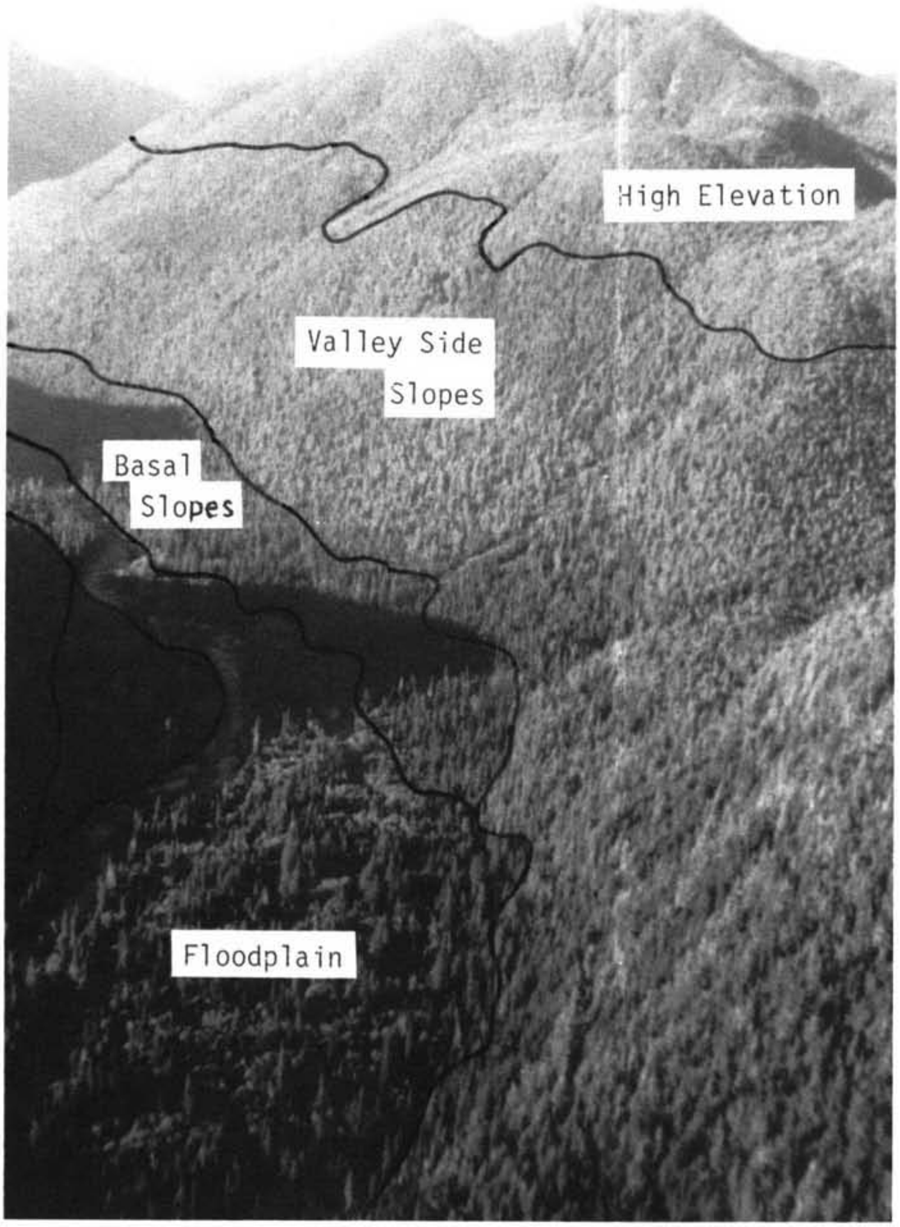
D High elevation

Areas, generally above 600 m, that have a significant component of yellow cedar and mountain hemlock, or both, in the forest canopy. There are relatively large areas of hummocky moderate slopes.

Landscape units

- BY/SCS balsam and yellow cedar on steep colluvial side slopes
- HT/MMS heather on moderately sloping morainal side slopes
- MH/MMS mountain hemlock on moderatly sloping morainal side slopes
- MH/SCS mountain hemlock on steep colluvial side slopes
- YC/SCS yellow cedar on steep colluvial side slopes
- AVAL avalanche tracks

Fig. 4 Landscapes of the Power River Watershed



Landscape unit descriptions

Landscape unit descriptions are grouped for presentation by the landscape in which they occur. Each landscape description is followed by a key to the identification of individual landscape units. A description for each landscape unit is given. It consists of a description of the vegetation and soils found in the unit and a description of landscape features characteristic of the unit. Specific vegetation and soil types found in the landscape unit are identified as one of the following categories:

Diagnostic components are those soil and vegetation types, or combinations of types, that must be present in the specified proportions for the area to be called that landscape unit.

Accessory components are those vegetation and soil types that are usually present but are not diagnostic of the landscape unit.

Accidental components are those soil and vegetation types that may be present but are not strongly associated with the landscape unit.

The proportion of each component is expressed as dominant (occupies at least 50% of the area), subdominant (occupies 30-50% of the area), and minor (occupies less than 30% of the area). More detailed descriptions of the specific vegetation and soil types can be found in Sections V and VI.

Properties of the landscape units which are important to forestry, wildlife (deer and Roosevelt elk), and fisheries are presented as management considerations. Intepretations for flood hazard, torrent hazard, mass movement hazard, avalanche hazard, possible sediment yield related to harvesting and road construction, degree of bedrock control, and productivity are presented as generalized planning interpretations.

Floodplain units

The floodplain is defined as broad, level areas of the valley bottom influenced at one time by main channel waters. This area has frequent channels and a relatively high water table. Certain landscape units are susceptible to annual flooding, whereas the more stable units reflect a longer flooding cycle. The Power River has a rapid storm flow response with water levels capable of rising from a dry stream bed to two or three feet in a matter of hours.

Fluctuations in the velocity of flow have influenced the deposition and properties of the floodplain soils. High velocity water is responsible for the deposition of coarse-textured gravelly deposits with pebble-, cobble-, and boulder-size coarse fragments. Medium-textured loam to sandy loam material lacking coarse fragments is deposited by slow moving water. These two parent materials form the major classes of the floodplain soils.

The vegetation patterns on the floodplain are a reflection of the frequency and severity of flooding and of stand age. Recent deposits are colonized by alder vegetation, which is able to withstand annual flooding and therefore maintain dominance in frequently disturbed environments. As the flooding frequency decreases, coniferous forest vegetation (dominated by Sitka spruce and western hemlock) becomes established. Where water tables are low and flooding is rare, Pacific silver fir is also part of the forest vegetation and the forest floor is well developed, reflecting a more stable environment.

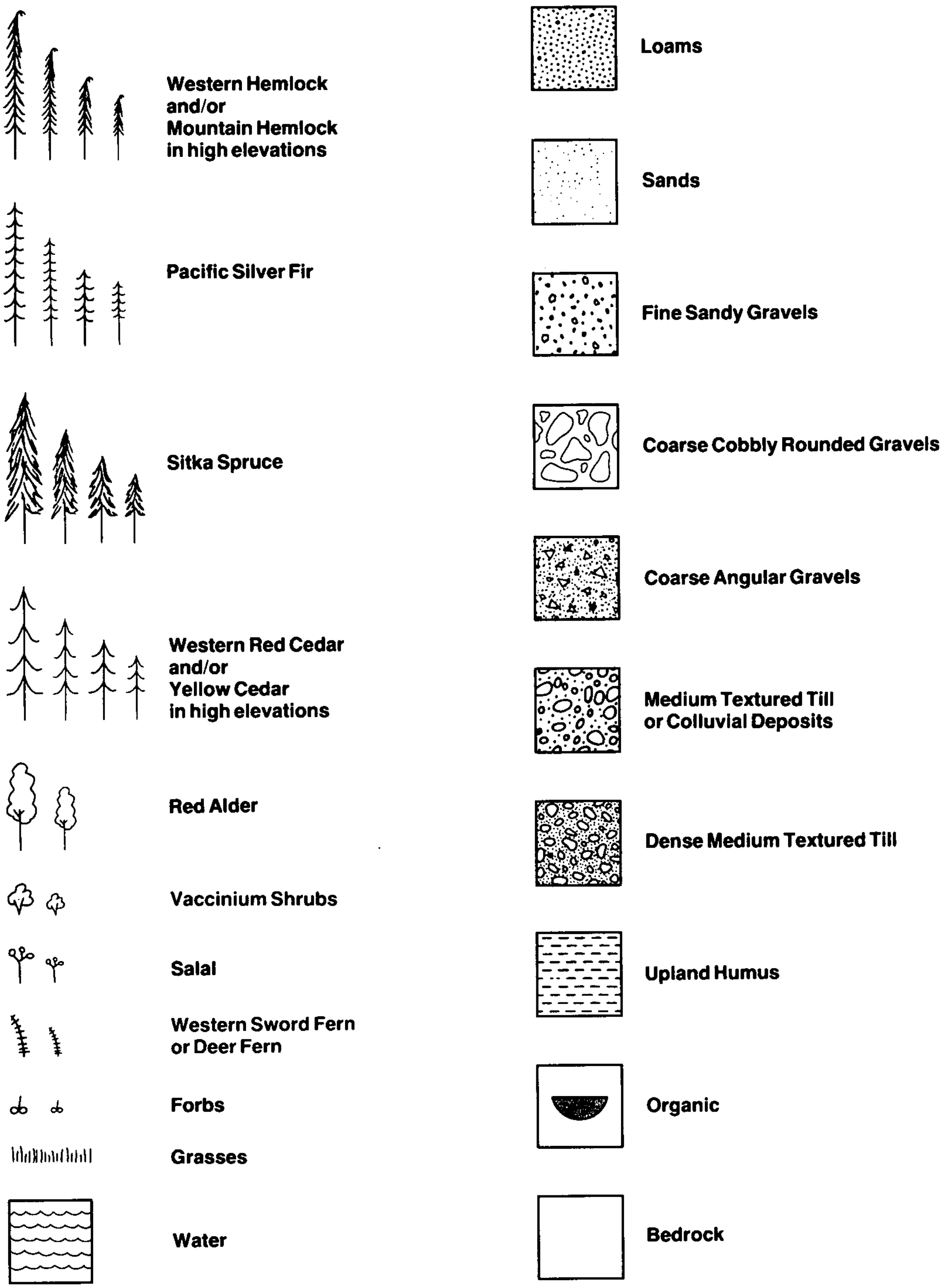
A combination of soils and vegetation is used to define four landscape units associated with the floodplain area of the watershed. The following key is provided for rapid differentiation of units. Complete descriptions follow.

Key to floodplain landscape units

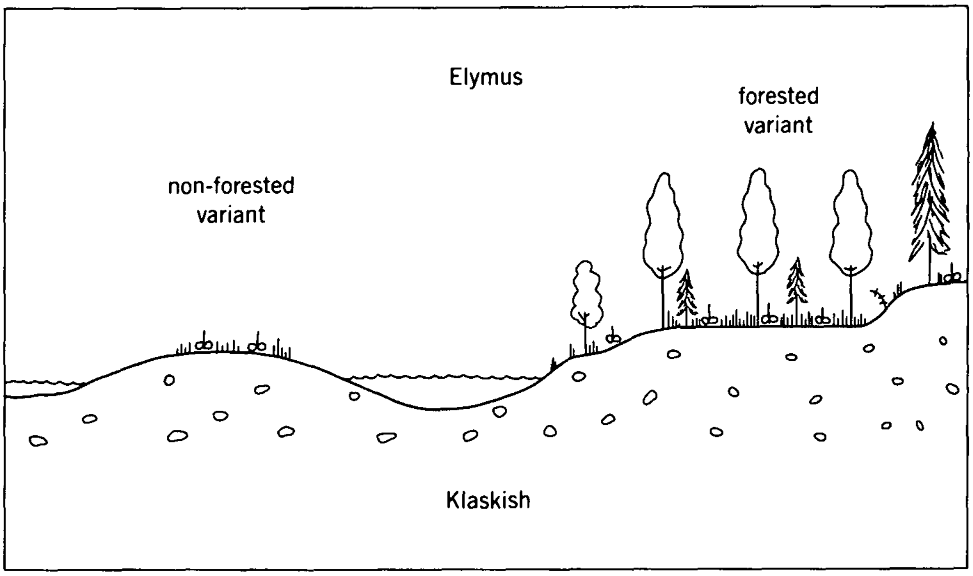
1a. Non-forested or alder dominated vegetation
- 2a. At least 30% of the area covered by non-gravelly loamy surface soils.............. AL/MTF
- 2b. Greater than 70% of the area is covered by sandy or gravelly sandy soils.............. AL/CTF

1b. Continuous cover of open to closed western hemlock and Sitka spruce or Pacific silver fir
- 3a. At least 30% of the area is covered by non-gravelly loamy surface soils.............. SP/MTF
- 3b. Greater than 70% of the area is covered by sandy or gravelly sandy soils.............. SP/CTF

Figure 5 Key to symbols used in landscape unit diagrams



AL/CTF ALDER ON COARSE TEXTURED FLOODPLAIN



GENERAL DESCRIPTION

Vegetation where present is early successional. Coniferous forest cover is lacking (non-forested openings and/or dominated by red alder). Ground cover is a sparse to dense cover of annual grasses and forbs with occasional red huckleberry and shrub-size Sitka spruce (the Elymus type).

Soils are sand to sandy, gravel and bouldery coarse textured floodplain deposits, and frequently have high water tables (Klaskish soils). Forest floors are absent, or are rhizomulls, or deciduous Humimors.

AREA

average size 2.7 ha   total area 27.3 ha

LANDSCAPE FEATURES

These units are confined to near level areas of the active floodplain. The river is frequently braided and there is a high density of both permanent and seasonal frequently migrating channels.

COMPONENTS

Diagnostic Vegetation - Dominant: Elymus and/or non forested
Subdominant: none

Diagnostic Soils - Dominant: Klaskish
Subdominant: none

- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- Frequent flooding precludes productive tree growth

Wildlife

- High covers of grasses and forbs in all but main channel areas.
- Low shrub cover; close proximity to water and hiding cover.
- Evidence of browse on young sitka spruce but little trail use.
- constitutes a portion of elk winter range.

Fisheries

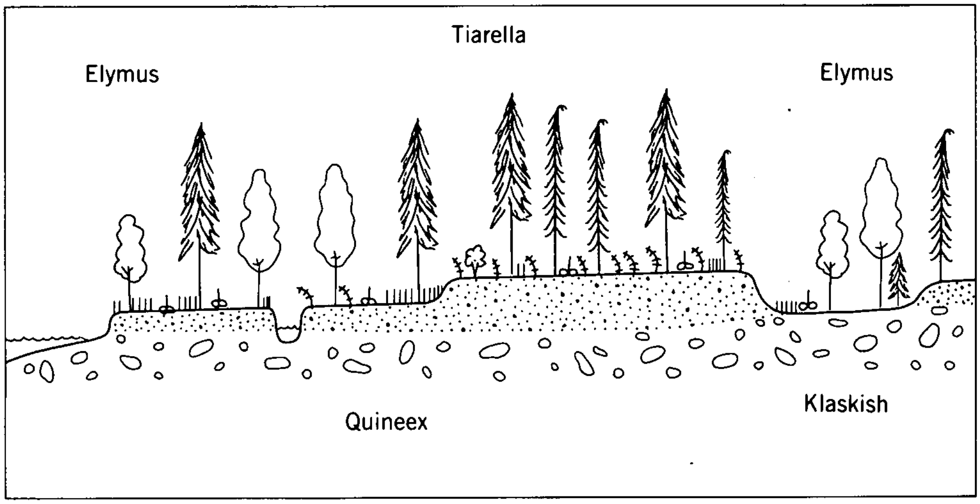
- Frequent flooding and channel migration.
- Frequent permanent gravelly substrate channels.
- areas of unstable channel banks but siltation potential is low.
- disruption of natural channels and banks may lead to redistribution of sand and gravel deposits.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
high to extreme	none	none	none	low	low	none	none*

* One or more of the individual map delineations comprising the map unit has a significantly different interpretation. Consult the interpretive maps presented in section 7.

AL/MTF ALDER ON MEDIUM TEXTURED FLOODPLAIN



GENERAL DESCRIPTION

Vegetation is dominated by early to mid successional types. An open canopy of red alder-Sitka spruce with an open understory of grasses, forbs, and western sword fern (the Elymus type) is found in close association with more closed Sitka spruce-western hemlock cover having low to moderate covers of western sword fern and forbs but generally lacking red alder (the Tiarella type).

At least 30% of the area is covered by non-gravelly, medium textured floodplain deposits (Quineex soils) overlying gravels. Coarse textured floodplain deposits (Klaskish soils) may also be present and in some cases dominant. The water table is frequently high and the surface is frequently disturbed by flood waters. Forest floors are poorly to well developed rhizomulls intergrading to mineral Ah horizons.

AREA

average size 7.0 ha   total area 63.4 ha

LANDSCAPE FEATURES

These units occupy level to near level areas of the floodplain, generally adjacent to the main channel. Where the floodplain is broad, medium textured floodplain deposits dominate. Where the floodplain is narrower, coarse textured floodplain deposits dominate. Occasionally coarse textured, fluvial, basal slope deposits (Upsowis soils) may encroach on the unit. These soil types support either of the vegetation types. Actively migrating temporary channels are frequent and low velocity permanent channels are common. Flooding is frequent.

COMPONENTS

Diagnostic Vegetation - Dominant: Elymus
Accessory Vegetation - Subdominant: Tiarella
Minor: pockets of slough sedge or skunk cabbage in depressions
Diagnostic Soils - Dominant or subdominant: Quineex
Accessory Soils - Dominant or subdominant: Klaskish or Upsowis
- descriptions of soil and vegetation types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- Low to moderate covers of western hemlock and Sitka spruce.
- Site potential is high but regeneration presents problems. Sitka spruce and western hemlock appear to require nurse logs.
- Frequent flooding and high water tables exclude Pacific silver fir.
- Frequent surface disturbance may inhibit seedling establishment and brush problems may be severe.

Wildlife

- High covers of grasses, western sword fern and salmonberry with low to moderate covers of red huckleberry.
- Hiding cover is good to moderate and proximity to water is close.
- Browse and trail use is heavy.
- Prime elk habitat, foraging area and winter range.
- Deer spring and fall range.

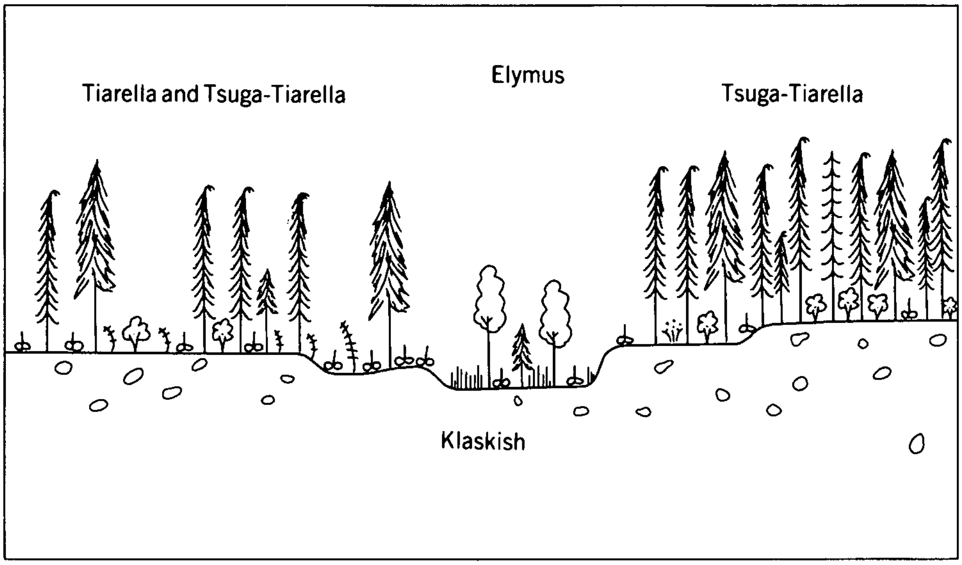
Fisheries

- Common to frequent permanent and temporary side and back water channels.
- Substrate varies from silt to gravels.
- Gradient and flow velocities are low.
- The units are highly sensitive with unstable and erodable channel banks, and flood prone erodable soils.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
high	none	none	none	variable	variable	none	good to medium

SP/CTF SPRUCE ON COARSE TEXTURED FLOODPLAIN



GENERAL DESCRIPTION

Forest cover is a somewhat open to closed canopy of western hemlock and Sitka spruce. Low to moderate ground covers of forbs and western sword fern with low covers of salmonberry and red huckleberry under relatively open crowns (the Tiarella type) give way to relatively low forb and western sword fern covers, decreasing salmonberry, and increasing Alaskan blueberry under dense crown cover (the Tsuga-Tiarella type). Alder covered or non-forested areas with high covers of grasses and forbs (the Elymus type) are common minor associates.

Soils are coarse textured sandy and/or gravelly (Klaskish soils) frequently subject to high rapidly fluctuating water tables. Forest floors are generally thin (2-6 cm) moders tending to form Humimors under denser crown closure.

AREA

average size 3.5 ha   total area 21.1 ha

LANDSCAPE FEATURES

This unit occupies relatively stable sections of the floodplain and frequently shows low terraces and temporary channels. Older Tsuga-Tiarella types with thicker forest floors and denser crown closure occur on the raised terraces. Minor areas of the Elymus type occur in temporary or recently abandoned channels.

COMPONENTS

- detailed description of the vegetation and soil types can be found in sections 3 and 4 respectively

Diagnostic Vegetation - Dominant: Tsuga-Tiarella or Tiarella
Accessory Vegetation - Subdominant or minor Elymus
Diagnostic Soils - Dominant: Klaskish or Upsowis with subdominant Klaskish
Accidental soils - Minor: Quineex

- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- moderate to high volume (relative to other landscape units) of western hemlock and low to moderate volume of Sitka spruce or Pacific silver fir.
- high water tables restrict Pacific silver fir to raised terraces.
- possible severe brush problems

Wildlife

- moderate to high covers of western swordfern, Alaskan blueberry, and red huckleberry
- prime elk habitat; winter range and foraging areas
- deer spring and fall range
- moderate to good hiding cover and heavy trail use.

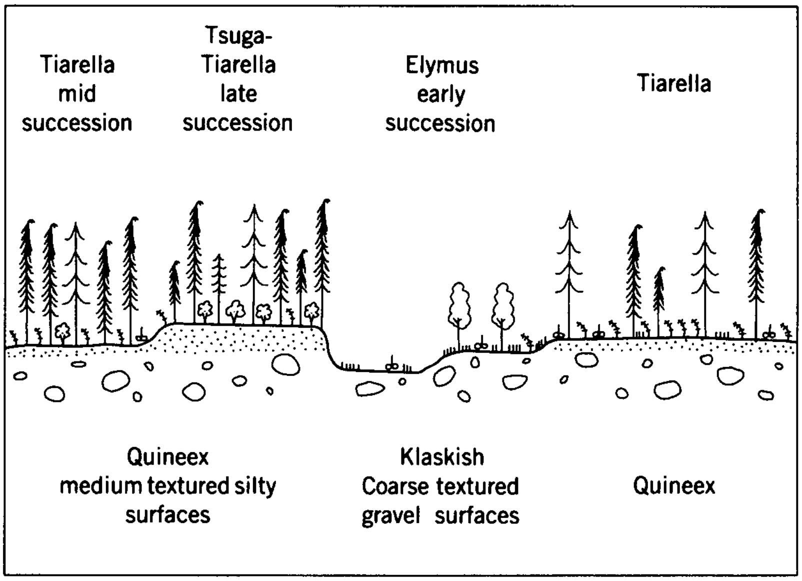
Fisheries

- gravel substrate channels have winter flow and show summer flow only in response to rainstorms.
- flood frequency is low to moderate but potential sediment yield is low.
- disruption of natural channels may lead to redistribution of sand and gravel deposits leading to potential infilling of spawning gravels.
- major fish habitat.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
variable	low	none	none	low	low	none	medium

SP/MTF SPRUCE ON MEDIUM TEXTURED FLOODPLAIN



GENERAL DESCRIPTION

Forest cover is dominated by open to closed canopies of western hemlock and sitka spruce. A moderately dense ground cover of forbs and western sword fern, with moderate covers of salmonberry and red huckleberry in openings (the Tiarella type) gives way to lower western sword fern and much lower forb and salmonberry covers under crown closure (the Tsuga-Tiarella type). A subdominant, open, red alder and/or sitka spruce forest with higher covers of grasses and forbs and low fern and shrub covers (the Elymus type) is a common associate.

Non-gravelly medium textured soils (Quineex soils) are generally dominant but coarse textured sands and gravels (Klaskish soils) can occasionally occupy as much as 60% of the area. The soils are usually subject to rapidly fluctuating high water tables and have thin moder humus forms tending to humimors under crown closure.

AREA

average size 6.3 ha   total area 69.7 ha

LANDSCAPE FEATURES

SP/MTF landscape units are generally found on broad level areas of the floodplain. They are moderately stable but subject to frequent flooding. Channel density is low to moderate but permanent channels are infrequent. Elymus types when present are adjacent to the main channel or occupy recently abandoned channels.

COMPONENTS

Diagnostic Vegetation - Dominant: Tiarella or Tsuga-Tiarella
Accessory Vegetation - Subdominant: Elymus
Accidental Vegetation - Minor: pockets of slough sedge or skunk cabbage (variants of the Elymus type)
Diagnostic Soils - Dominant or Subdominant: Quineex
Accessory Soils - Subdominant or occasionally dominant: Klaskish
- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- moderate to high volumes (relative to other landscape units) of western hemlock and low to moderate volumes of overmature Sitka spruce.
- potential regeneration problems (sitka spruce and western hemlock appear to require nurse logs).
- water tables restrict Pacific silver fir to higher ground.
- potential severe brush problem.

Wildlife

- moderate to high covers of forbs, western sword fern, salmonberry, red huckleberry, and Alaskan blueberry.
- heavy browse on salmonberry and pockets of skunk cabbage.
- moderate hiding cover.
- heavy trail use.
- prime elk habitat; lower end of watershed provides elk winter range.

Fisheries

- low to moderate frequency of temporary low velocity side and back water channels.
- unstable and highly erodable channel banks; sediment potential high.
- infrequent overland flooding.
- channel substrate silty to gravelly.
- important fish overwintering habitat.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
moderate to high	low	none	none	high	high	none	medium to good

Basal slope units

The term basal slopes is used to encompass low slope valley bottom units as well as low to moderate slope areas adjacent to the valley bottom or floodplain. Flooding is not a controlling factor in this area of the watershed and the landscape units are rarely channeled.

Three primary depositional processes can be distinguished. Coarse-textured fluvial fans have been deposited by high gradient side streams. Soils are deep and well drained. Medium-textured gravelly and rubbly soils have developed on debris fans while medium textured soils with root and water restricting layers have been deposited by glacial ice.

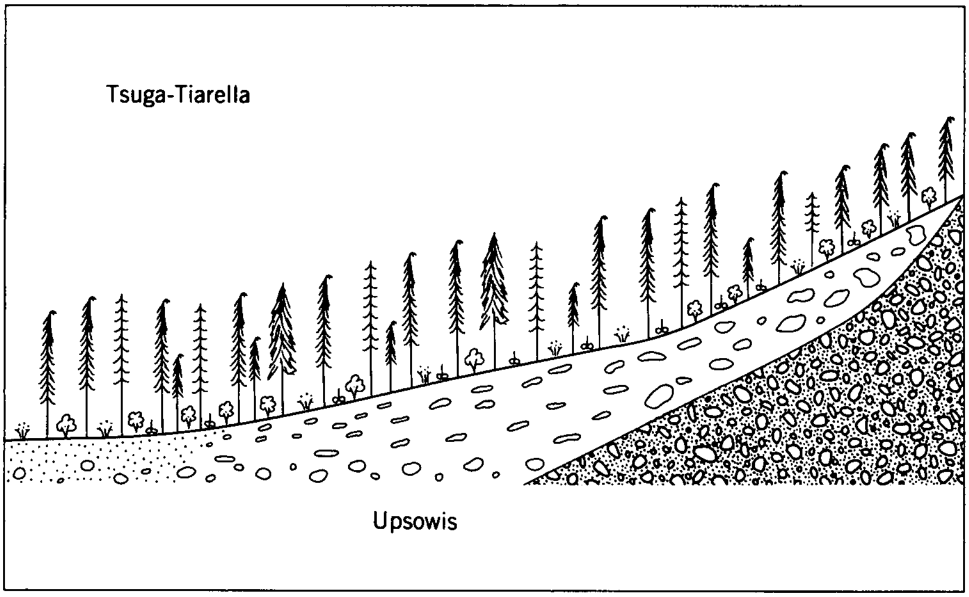
The vegetation on basal slopes is a function of disturbance or depth of soil deposit. Early successional alder dominated vegetation is restricted to units recently subjected to debris torrents. Mature western hemlock and Pacific silver fir forest vegetation dominates on deeper soils or at the base of slopes with shallow soils. Units with shallow to moderately deep soils are generally characterized by western hemlock and western red cedar vegetation. Forest productivity on all basal slopes is moderate to good.

Five landscape units have been defined for the basal slopes in the Power River watershed. The following key differentiates these units. Complete descriptions follow.

Key to basal slope landscape units

1a. Alder dominated forest cover with scattered
    Sitka spruce.. SP/CFB
1b. Coniferous forest dominant
    2a. Sloping, coarse textured fans................. BA/CFB
    2b. Medium textured gravelly and rubbly soils
        3a. Debris fans without evidence of
            bedrock control or impeded drainage...... BA/MCB
        3b. Deep to relatively deep deposits with
            evidence of drainage restricting layers.. BA/MMB
        3c. Shallow to moderately deep soils with
            evidence of strong bedrock control....... HE/MMB

BA/CFB BALSAM ON COARSE TEXTURED FLUVIAL BASAL SLOPES



GENERAL DESCRIPTION

Uniform dense cover of western hemlock and Pacific silver fir. Sitka spruce is common in early climax stands. The shrub layer is well developed with low to moderate covers of Alaskan blueberry and red huckleberry and low covers of salmonberry. The ground cover is rich in forbs and generally has low covers of ferns (the Tsuga-Tiarella type).

Soils form on deposits grading from pebbly sandy gravels on low slopes (2-7%) to bouldery sandy gravels on moderate slopes (Upsowis soils). They are generally well drained but are commonly imperfectly drained in toe slope positions. Forest floors are thin (1-7 cm) but well expressed moders to humimors.

AREA

average size 2.5 ha   total area 22.5 ha

LANDSCAPE FEATURES

These units are generally fan shaped with slopes ranging from 2-3% at the toe of the fan to 10-13% at the apex. Streams are intermittent and channels are well defined or even gullied at the apex.

COMPONENTS

Diagnostic Vegetation - Dominant: Tsuga-Tiarella
Subdominant: none

Diagnostic Soils - Dominant: Upsowis
Subdominant: none

- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- high volume (relative to other landscape units) of western hemlock and Pacific silver fir.
- no limitations to productivity.
- possible brush problems with regeneration.

Wildlife

- moderate to high covers of Alaskan blueberry and red huckleberry with low to moderate forb and western sword fern cover.
- moderate to good hiding cover.
- moderate to light browse and trail use.
- spring to fall range for deer and elk.
- lower extent of deer winter range.

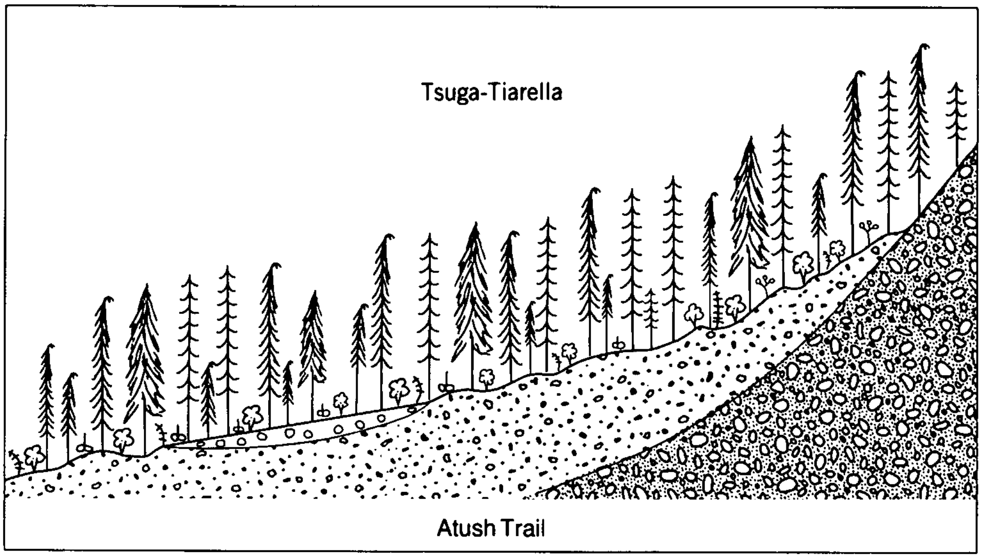
Fisheries

- intermittent streams in well defined channels.
- low sediment potential.
- blocking of natural drainages may lead to channel migration and the introduction of sands and gravels to the main channel.
- lower gradient intermittent streams may provide over-winter habitat for fish.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	low	none	none	low	low	none	medium to good

BA/MCB BALSAM ON MEDIUM TEXTURED COLLUVIAL BASAL SLOPES



GENERAL DESCRIPTION

Uniform, dense cover of Pacific silver fir and western hemlock. Sitka spruce is common in early climax stands. The shrub layer is well developed with low to moderate covers of Alaskan blueberry and red huckleberry, and low covers of salmonberry. With increasing slope, moderate covers of salal may be present as well. The ground cover is rich in forbs and has low to moderate covers of ferns (the Tsuga-Tiarella type).

Soils develop in gravelly medium textured (sandy loam) debris fans or long stable fluvial fans (Atush soils). They are well drained, have moderate to low slopes and no root or water restricting layer within 2 meters. Forest floors are thin (2-10 cm) but well expressed mor humus forms. Areas of coarse textured fluvial deposits (Upsowis soils) are common and on some map units may be dominant.

AREA

average size 6.1 ha　　total area 79.3 ha

LANDSCAPE FEATURES

These units are large fan shaped deposits and the surface is somewhat hummocky. Drainage lines are well channelized and generally gullied towards the apex. Stream flow is permanent near the apex, where the channel is incised to high density till, but seasonal towards the toe of the fan. The Upsowis soils, if present, occupy long abandoned drainage lines. Slopes are 2-30%.

COMPONENTS

Diagnostic Vegetation - Dominant: Elymus and/or non forested
Accidental Vegetation - Minor: Elymus
Diagnostic Soils - Dominant: Atush Trail
Accessory Soils - Dominant to subdominant: Animi or Upsowis
Accidental Soils - Subdominant: Klaskish
Minor: Quineex
- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- moderate to high volumes (relative to other landscape units) of Pacific silver fir and western hemlock, low volumes of Sitka spruce.
- no limitations to productivity.
- brush hazard may present a problem.

Wildlife

- moderate to dense Alaskan blueberry and red huckleberry.
- moderate hiding cover.
- lower extent of deer winter range.
- spring to fall range for deer and elk.
- light to moderate browse and moderate to heavy trail use.

Fisheries

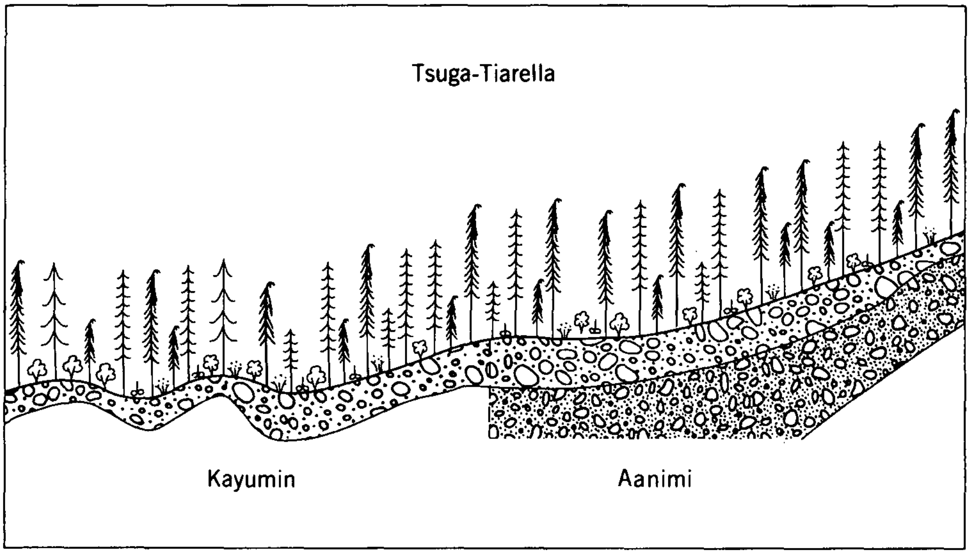
- no permanent streams and temporary channel flow is moderate to high velocity.
- potential sediment problems only if natural drainage lines are disrupted or ground cover is seriously disturbed:
- overwintering potential in lower reaches.
- gullies at the apex may be steep sided.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	low to moderate*	none*	none	low*	variable	none	medium

* One or more of the map delineations comprising the map unit has a significantly different interpretation. For this reason interpretive maps based on individual polygons are presented in section 7.

BA/MMB BALSAM ON MEDIUM TEXTURED MORAINAL BASAL SLOPES



GENERAL DESCRIPTION

Uniform dense cover of western hemlock and Pacific silver fir. Western red cedar may be a significant component on hummocky terrain. A well developed shrub layer is generally dominated by Alaskan blueberry with low to moderate covers of red huckleberry. Salal may be present on shallow soils or with increasing slope. The ground is rich in forbs and is dominated by deer fern or less commonly western sword fern (the Tsuga-Tiarella type).

Soils have a root and water restricting layer of rock (Kayumin soils) or high bulk density till (Aanimi soils) between 0.5 and 1.2 meters from the surface. The materials are medium textured gravelly loams to sandy loams and are generally well to imperfectly drained although small pockets of poorly drained soils are found in depressions on hummocky terrain or near level till deposits. Forest floors are well expressed (6-20 cm thick) fibri-humimors and humimors.

AREA

average size 6.1 ha   total area 73.0 ha

LANDSCAPE FEATURES

These units occupy two characteristics landscapes. Kayumin soils occur on low to moderate slopes (0-40%). Drainage lines are often deranged and not strongly incised. Aanimi soils occur on moderate slopes with straight, well incised, V-shaped drainage lines or on low slopes where drainage lines are broader and commonly occupied by poorly drained soils. Earlier successional vegetation (Elymus or Tiarella types) commonly occupies drainage lines.

COMPONENTS

Diagnostic Vegetation - Dominant: Tsuga-Tiarella
Accidental Vegetation - Minor: Elymus or Tiarella
Diagnostic Soils - Dominant: Aanimi or Kayumin
Accidental Soils - Sub-dominant: Upsowis
- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- medium to high volumes (relative to other landscape units) of western hemlock and Pacific silver fir.
- no limitations to productivity.
- brush hazard may be a problem.

Wildlife

- low to moderate Alaskan blueberry and red huckleberry.
- light to moderate browse, moderate to heavy trail use.
- constitute the lower portions of deer winter range.

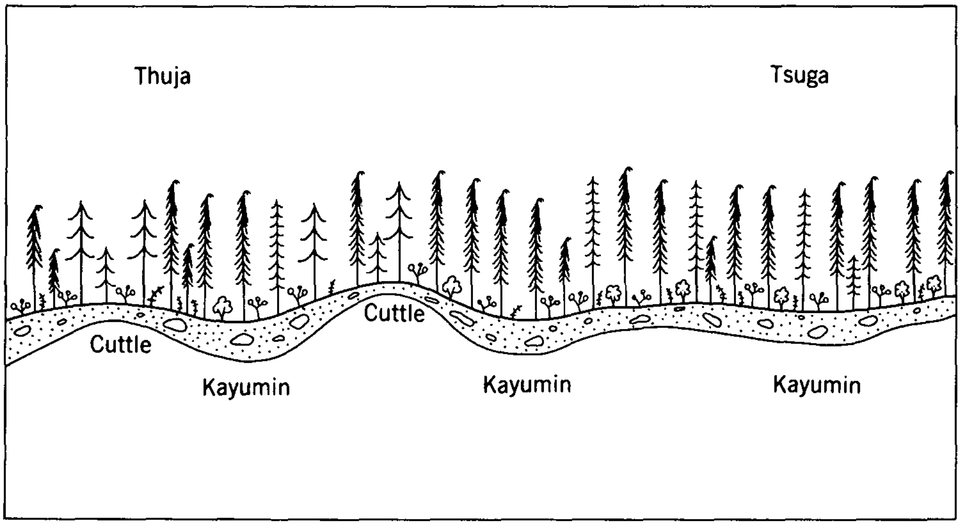
Fisheries

- common but frequently inaccessible permanent streams.
- soils are erodable (potential source of sediment and gravels) and streams can provide a delivery system if erosion occurs.
- v-shaped streams on moderate slope tills are sensitive to disturbance.
- lower reaches may be useful over wintering sites if accessible.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield: Harvesting	Potential Sediment Yield: Roads	Bedrock Control	Productivity
none	low	low	none	low to moderate	low to moderate	none	medium

HE/MMB HEMLOCK ON MEDIUM TEXTURED BASAL SLOPES



GENERAL DESCRIPTION

A dense cover of dominantly western hemlock and lesser amounts of Pacific silver fir with a shrub layer dominated by salal and lesser amounts of red huckleberry and Alaskan blueberry. The ground cover is dominated by deer fern with only scattered forbs (the Tsuga type). A moderately dense cover of western hemlock with lesser amounts of western red cedar is a frequent subdominant to codominant associate. This type has high covers of salal and lesser amounts of red huckleberry,Alaskan blueberry, and false azalia in the shrub layer. Ground cover is dominated by deer fern and forb covers are moderate to high along drainages (the Thuja type).

Soils are relatively shallow and bedrock is generally found within 1.2 meters. A root and water restricting layer of high bulk density till or bedrock (Cuttle soils) is a common associate with the areas of deeper soil (Kayumin soils). Soil materials are medium textured gravelly loams to sandy loams. The soils are dominantly well drained with significant but minor areas of imperfectly to poorly drained soils found along drainage lines or in minor depressions. Forest floors are well developed (7-32 cm thick) humi-fibrimor and fibri-humimor humus forms.

LANDSCAPE FEATURES

These map units are found on moderate to low slope, basal slope areas. They show evidence of strong bedrock control and, although frequently hummocky, have only infrequent rock outcroppings. Drainage lines are generally deranged and along with minor depressions have imperfectly to poorly drained soils with herb rich vegetation. The Tsuga vegetation type is normally associated with the moderately deep Kayumin soils while the Thuja type is found on hummocks and the shallower Cuttle soils.

COMPONENTS

Diagnostic Vegetation - Dominant: Tsuga
Subdominant or codominant: Thuja
Accidental Vegetation - Minor: Tsuga-Tiarella or Elymus
Diagnostic Soils - Dominant to subdominant: Kayumin
Accessory Soils - Dominant to subdominant: Cuttle
- descriptions of vegetation and soil types can be found in sections 5 and 6.

AREA

average size 6.1 ha   total area 92 ha

MANAGEMENT CONSIDERATIONS

Forestry

- moderate to high volumes (relative to other landscape units) of western hemlock and low to moderate volumes of Pacific silver fir and western red cedar.
- residual brush may be a problem.

Wildlife

- low covers of western sword fern with low to moderate deer fern, red huckleberry and Alaskan blueberry, and moderate to high covers of salal.
- proximity to water is fair with good hiding and escape cover.
- moderate trail use (travel corridors) and light browse.
- deer and elk summer-fall range.
- in some cases lower extent of deer winter range.

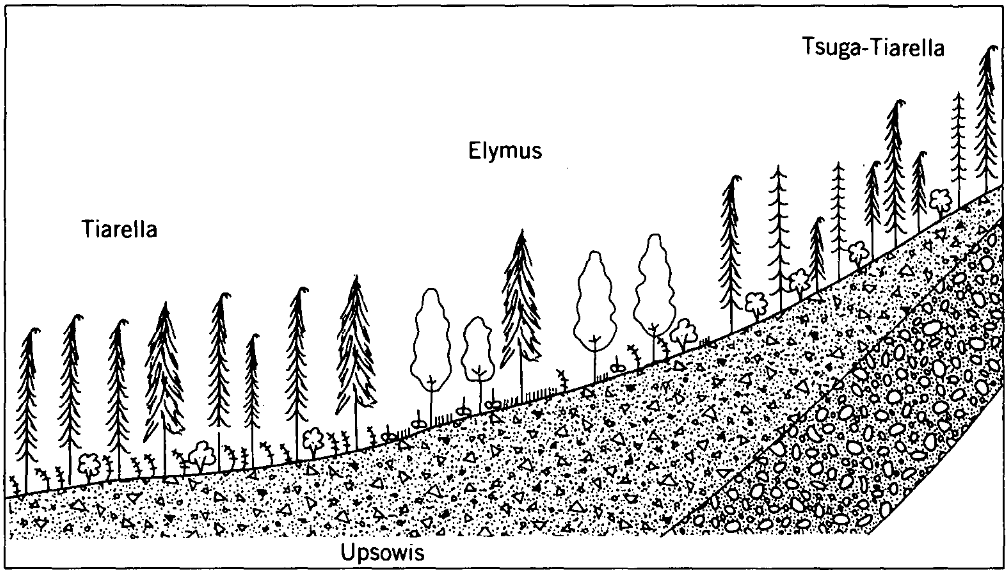
Fisheries

- no accessible channels.
- low potential sediment hazard.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	low	low	none	low	low	variable	medium

SP/CFB SPRUCE ON COARSE TEXTURED FLUVIAL BASAL SLOPES



GENERAL DESCRIPTION

Red alder with scattered mature Sitka spruce forest cover and an understory of dense grass and forb cover with sparse shrub cover (the Elymus type) is dominant to subdominant. A dense canopy of mid to late successional western hemlock and Sitka spruce or Pacific silver fir with variable covers of western sword fern, numerous scattered forbs and sparse to moderate covers of Alaskan blueberry and/or red huckleberry (the Tiarella or Tsuga-Tiarella types) will form the remaining dominant to subdominant component.

Soils form on deposits grading from low slope (2%) coarse sands and pebbly sands to moderate slope (15%) bouldery and gravelly loamy sands (Upsowis soils). They are generally well to imperfectly drained although minor areas of toe slope positions can be poorly drained. Forest floors are weakly expressed under the Elymus type but grade to well expressed thin (less than 10 cm) humimors under the Tiarella and Tsuga-Tiarella types.

LANDSCAPE FEATURES

These units are generally fan shaped with slopes ranging from 2-7% at the toe to 15% at the apex. Stream flow is intermittent and generally well channelized near the apex but less so towards the toe. The Elymus type occurs in response to disturbance by overland flow of the poorly channelized and migrating drainage lines or less frequently by debris or water torrents from upslope.

COMPONENTS

Diagnostic Vegetation - Dominant or subdominant: Elymus
Accessory Vegetation - Dominant or subdominant: Tiarella or Tsuga-Tiarella
Diagnostic Soils - Dominant: Upsowis
Accidental Soils - Minor: Quineex or Klaskish
- descriptions of vegetation and soil types can be found in sections 5 and 6.

AREA

average size 1.5 ha   total area 7.5 ha

MANAGEMENT CONSIDERATIONS

Forestry

- low to moderate volumes (relative to other landscape units) of western hemlock and low volumes of Sitka spruce or Pacific silver fir.
- shifting drainage lines and water torrents or debris flows inhibit the establishment of western hemlock and Pacific silver fir.

Wildlife

- moderate to high covers of grasses, forbs and ferns, and sparse shrub cover.
- low hiding cover.
- lower portions of the floodplain constitute a portion of elk winter range.
- moderate browse and little trail use.
- deer and elk forage areas.

Fisheries

- shifting seasonal streams with 2-15% gradients.
- low sediment potential.
- low gradient streams provide over wintering habitat for fish.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	low to moderate	none	none	low	low	none	medium to good

Valley side slope units

The valley sides are defined as moderate to steep sloping units above the valley floor which lack yellow cedar. They are usually below 600 m. Flooding is not a potential hazard in this area of the watershed, but on low slope units drainage may become concentrated creating localized wet conditions. Gullies are common and slope stability is of major concern on the steep sloping landscape units.

The major factors influencing soils in this area are slope and depth of deposit. Shallow to moderately deep bedrock controlled soils are common in most of the landscape units, although high density, compact till replaces bedrock as the controlling factor in one landscape unit. Units having a slope of less than 40% are on moderately to strongly hummocky terrain. Steeply sloping units may have relatively stable soil surfaces or soils showing active surface movement.

Soil depth and surface stability are the factors most closely related to vegetation distribution. Very shallow to shallow soils tend to support a poor to low productivity western red cedar and western hemlock forest. The moderately deep, stable surfaces support a poor to medium productivity western hemlock dominated forest. The moderately deep to deep soils, often showing active surface movement, tend to support a Pacific silver fir and western hemlock forest with medium to good productivity.

The valley sides encompass five landscape units. The following key differentiates these units. Complete descriptions follow the key.

Key to valley side slope landscape units

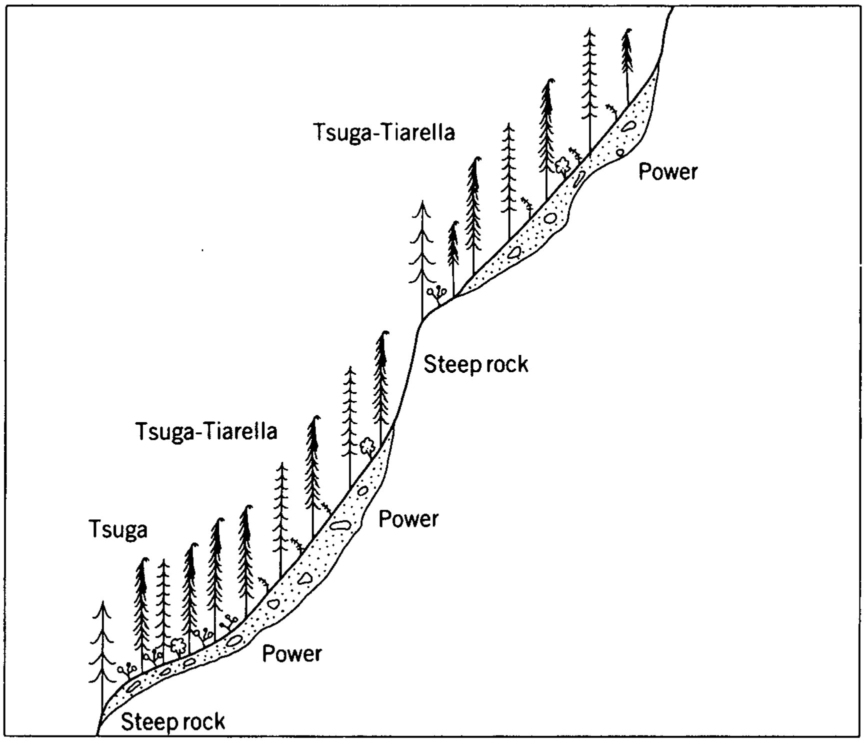
1a. Overall slope greater than 50%
- 2a. Forest cover dominated by uniform, moderately dense, low volume western red cedar; strong bedrock control .... CE/SCS
- 2b. Scattered to subdominant western red cedar
  - 3a. Steep, strongly gullied and often failing slopes with little or no evidence of bedrock control .... BA/SMS
  - 3b. Steep, bedrock controlled slopes with common to frequent rock outcropping or steep rock faces; forest cover of western hemlock, Pacific silver fir and western red cedar

4a. Scattered western red cedar; open understory with ground cover dominated by western sword fern or deer fern; shrubs and western red cedar are restricted to rock outcroppings; active soil surface movement............................. BA/SCS

4b. Subdominant Western red cedar; understory of moderate to high cover and vigor of salal............. HE/SCS

1b. Overall slope less than 50%; forest cover dominated by low stature western red cedar; moderately to strongly hummocky terrain with shallow to very shallow soils (if this description does not fit, see the basal slope units)........... CE/MMS

BA/SCS BALSAM ON STEEP COLLUVIAL SIDE SLOPES



GENERAL DESCRIPTION

Forest cover is dominated by a somewhat open stand of western hemlock and Pacific silver fir. There is an open understory of low to moderate covers of western sword fern and lesser covers of deer fern with scattered to low forb covers (the Tsuga-Tiarella fern variant or Tiarella types). It is commonly found in association with subdominant covers of dense western hemlock and scattered veteran western red cedar cover having an understory dominated by moderate to high covers of salal and lesser amounts of red huckleberry and Alaskan blueberry. The ground cover is dominated by deer fern with lesser amounts of western sword fern and scattered forbs (the Tsuga type).

Soils develop in moderate to deep (0.5-2.0 m), medium textured, rubbly loams and sandy loams (Power soils). They are well drained and under the Tsuga-Tiarella type show active surface creep, while under the Tsuga type soils are somewhat shallower and show stable surfaces. Forest floors range from moder-like humus where surface creep is active to well developed (9-24 cm) mor humus forms on stable surfaces.

AREA

average size 24.3 ha   total area 830 ha

LANDSCAPE FEATURES

These units are steep (50-80% slope), relatively unbroken, valley side slopes. Gullies are common and steep rock faces frequent. The Tsuga-Tiarella type on active soil surfaces is found at the base of steep rock faces and the Tsuga type when present is found adjacent to, or above the steep rock faces. Mass movements were noted but are not common.

COMPONENTS

Diagnostic Vegetation - Dominant: Tsuga-Tiarella or Tiarella
Accessory Vegetation - Subdominant: Tsuga
Minor: Thuja
Diagnostic Soils - Dominant: Power River or Tanakmis
Accessory Soils - Limiting: steep rock
Minor: Cuttle
- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- medium to high volumes (relative to other landscape units) of western hemlock and Pacific silver fir.
- active surface creep may inhibit seedling establishment and disruption of the ground cover may promote surface creep on previously stable areas.
- road construction will increase the area of active surface and cause significant side cast exposure.

Wildlife

- low to moderate covers of western sword fern and deer fern with low covers of shrubs and forbs.
- shrub cover is generally poor although does exist; proximity to water is poor.
- observed browse was light to moderate and trail use moderate to heavy.
- may constitute a portion of deer and occasionally elk winter range when on south to west aspects.

Fisheries

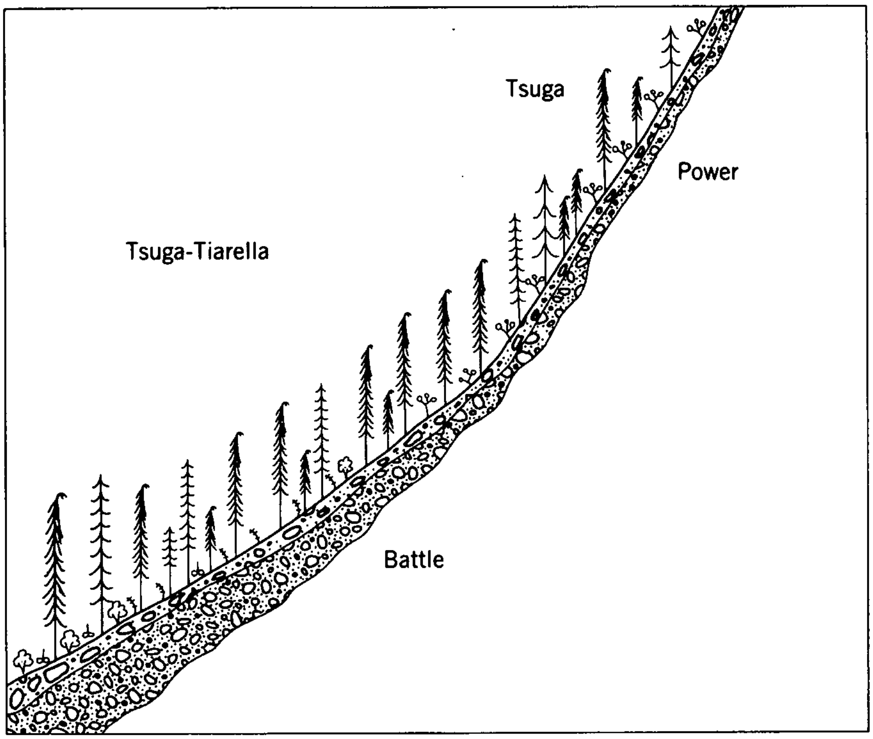
- no accessible channels.
- debris dams in gullies may lead to debris flows or channel scour.
- surface disturbance and road construction present a moderate to high erosion potential (localized sediment source).

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	variable	variable	none*	moderate*	high	variable	medium

* One or more of the individual map delineations comprising the map unit has a significantly different interpretation. Consult the interpretive maps based on individual map delineations presented in section 7.

BA/SMS BALSAM ON STEEP MORAINAL SIDE SLOPES



GENERAL DESCRIPTION

Vegetation is dominated by relatively dense western hemlock and Pacific silver fir forest cover; an Alaskan blueberry and red huckleberry dominated shrub layer with a forb rich; deer fern dominated ground cover (the Tsuga-Tiarella type shrub variant), or a sword fern dominated understory with a sparse shrub and forb cover (the Tsuga-Tiarella type fern variant). A dense cover of western hemlock and lesser amounts of Pacific silver fir with moderate to high covers of salal and lesser amounts of red huckleberry and Alaskan blueberry (the Tsuga type) is generally minor or subdominant while covers of western hemlock and western red cedar with high salal cover (the Thuja type) in the understory is a common component.

Soils develop in moderately deep to deep (greater than 1 m), medium textured, gravelly loam glacial till materials (Battle soils). A root and water restricting layer of high bulk density till is found within 1.5 meters and soils range from rapidly to imperfectly drained but are dominantly well drained. Forest floors range from lacking on recent failures to well developed mor humus forms.

AREA

average size 12.9 ha   total area 90 ha

LANDSCAPE FEATURES

These map units have steep (45-80%), relatively long, continuous slopes. They are strongly gullied and show frequent evidence of mass movements. The Tsuga-Tiarella type occupies deep soils on the lower portions of larger slopes and gully side positions with the fern variant on the steeper slopes. The Tsuga type occurs on the lower portions of shorter slopes and above the Tsuga-Tiarella type on longer slopes. The Thuja type when present occupies shallow soils on upper slope or intergully positions. Soils tend to be shallower and rapidly drained on upper slope and intergully positions, and deeper and imperfectly drained in lower slope and gully positions.

COMPONENTS

Diagnostic Vegetation - Dominant: Tsuga-Tiarella
Accessory Végetation - Subdominant or minor: Tsuga or Thuja
Diagnostic Soils - Dominant: Battle
Accessory Soils - Subdominant: Power River
- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- moderate to high volumes (relative to other landscape units) of western hemlock and Pacific silver fir, low volumes of western red cedar.
- susceptible to localized windthrow.
- unstable surfaces may present regeneration problems, road construction will increase the area of unstable surfaces.

Wildlife

- low to moderate covers of western sword fern, Alaskan blueberry, red huckleberry, salmonberry and salal.
- poor to moderate hiding cover.
- few but heavily used trails represent major travel corridors for deer and elk.
- south aspects may provide deer with some winter range.
- summer to fall feeding area for deer and elk.

Fisheries

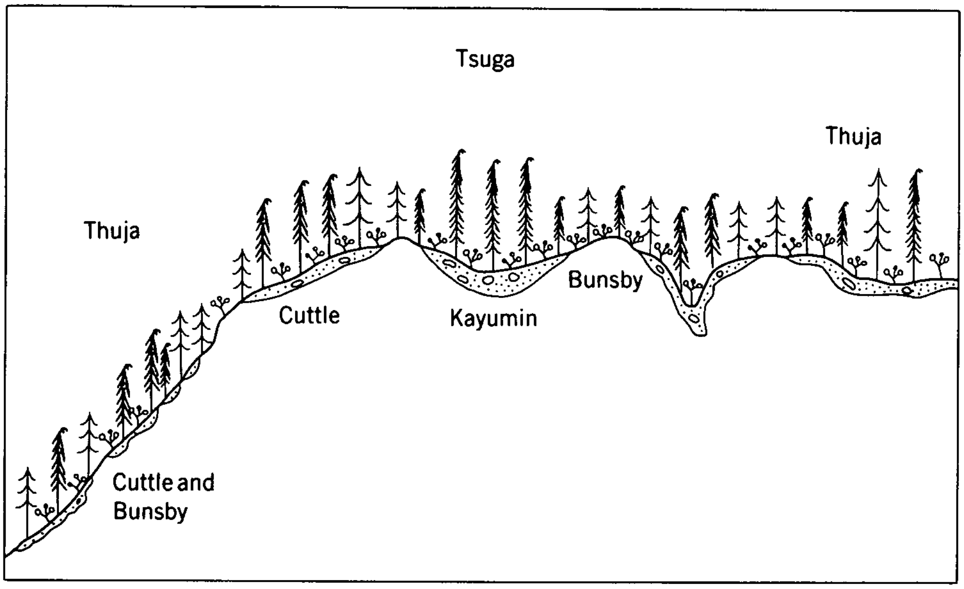
- no accessible streams.
- potential sediment source from debris flows, channel scours or mass movements all of which may be aggravated by harvesting or roads.
- main channel blockage may lead to channel migration.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	high to extreme*	extreme	none	high*	extreme	low	medium*

* One or more of the individual map delineations comprising the map unit has a significantly different interpretation. Consult the interpretive maps based on individual map delineations presented in section 7.

CE/MMS CEDAR ON MODERATE SLOPE MORAINAL SIDE SLOPES



GENERAL DESCRIPTION

An open, uneven cover of low stature western hemlock and western red cedar with high covers of salal, low covers of deer fern and sparse to low covers of forbs (the Thuja type) is generally found in association with a subdominant cover of higher stature western hemlock and moderate to high covers of salal (the Tsuga type).

Soils are formed in shallow (less than 0.5 m to bedrock), medium textured, gravelly loams and sandy loams (Cuttle soils) with a subdominant component of rock outcrops (Bunsby soils) or less frequently deeper (0.5-1.2 m) deposits of the same material (Kayumin soils). All soils are rapidly to well drained except in depressions and impounded drainages where they may be poorly to very poorly drained. Forest floors are well developed (13-19 cm thick) mor humus forms.

AREA

average size 9.0 ha   total area 225 ha

LANDSCAPE FEATURES

These map units have dominantly moderate slopes (0-40%) but generally have a subdominant component of very steep slopes and show strong bedrock control. The units are either strongly hummocky or broken (discontinuous) and rock outcrops are frequent. The Thuja vegetation type occurs on the shallow (Cuttle and Bunsby) soils often associated with hummocks while the Tsuga type occurs on the deeper (Kayumin) soils associated with open depressions and low slopes.

COMPONENTS

Diagnostic Vegetation - Dominant: Thuja
Accessory Vegetation - Subdominant: Tsuga
Diagnostic Soils - Dominant: Cuttle
Accidental Soils - Subdominant: Bunsby and/or Kayumin
- descriptions of vegeration and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- low timber values.
- probable site degradation if burned or seriously disturbed.

Wildlife

- dense salal and shrub size western red cedar.
- good hiding cover.
- light trail use; minimal browse.
- portions may be used for summer and fall range by deer.
- south aspects may provide some deer winter range.

Fisheries

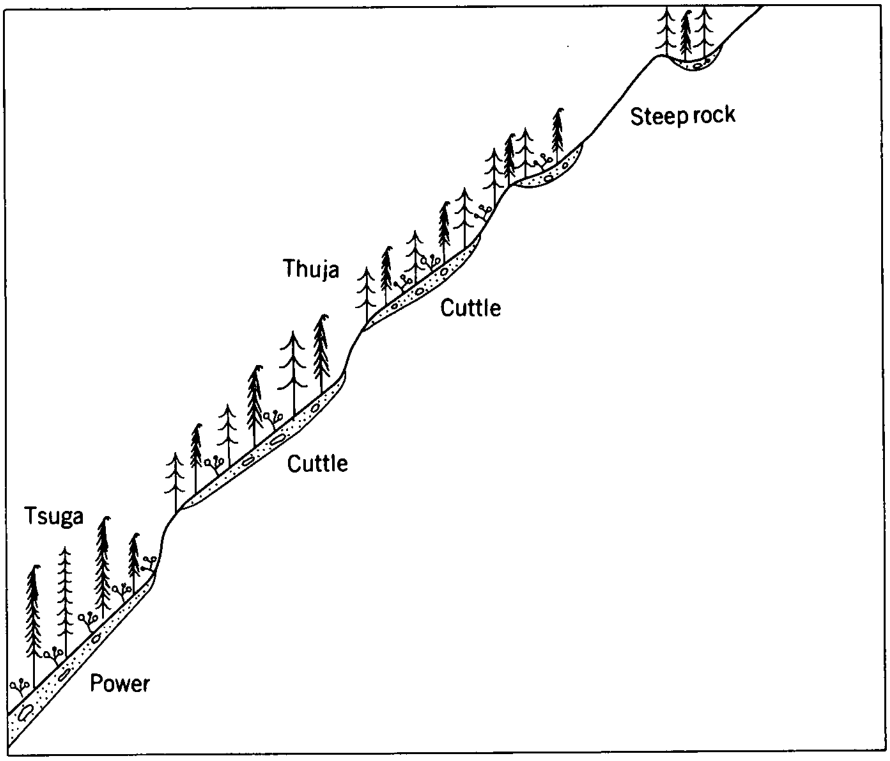
- no probable impact on fisheries.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	low	moderate*	none	low	low	high to extreme	poor

* One or more of the map delineations comprising the map unit has a significantly different interpretation. Consult the interpretive maps based on individual assessments presented in section 7.

CE/SCS CEDAR ON STEEP COLLUVIAL SIDE SLOPES



GENERAL DESCRIPTION

An open to closed cover of uneven low stature western hemlock and western red cedar with high covers of salal, low covers of deer fern, and sparse covers of forbs (the Thuja type) is found in association with a subdominant cover of higher stature western hemlock with moderate to high covers of salal (the Tsuga type).

Soils are dominantly shallow (less than 0.5 m to bedrock), medium textured, gravelly loams and sandy loams formed in colluvial or morainal material (Cuttle soils), with a subdominant component of deeper (0.5-1.2 m) soils formed in colluvial materials (Power River soils). Steep rock faces and rock outcroppings (Bunsby soils) are common and may occasionally be dominant. Soils are rapidly drained.

AREA

average size 7.2 ha   total area 144 ha

LANDSCAPE FEATURES

These units are steep, continuous, valley side slopes. Steep rock faces and rock outcroppings are common. The Thuja vegetation type is associated with the shallower Cuttle soils and the rock outcrops or Bunsby soils. The Tsuga vegetation type is associated with the deeper Power River soils.

COMPONENTS

Diagnostic Vegetation - Dominant: Thuja or non-forested
Accessory - Subdominant: Tsuga
Accidental - Subdominant: Tsuga-Tiarella (fern variant)
Diagnostic Soils - Dominant: Cuttle, Bunsby, Power River, or steep rock
Subdominant: Power River or steep rock if not dominant

- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- low volumes (relative to other landscape units) of western hemlock.
- soils are highly sensitive to surface disturbance.

Wildlife

- moderate to dense low stature salal cover.
- poor proximity to water.
- minimal trail use or browse.
- may provide deer winter range when on south facing slopes.

Fisheries

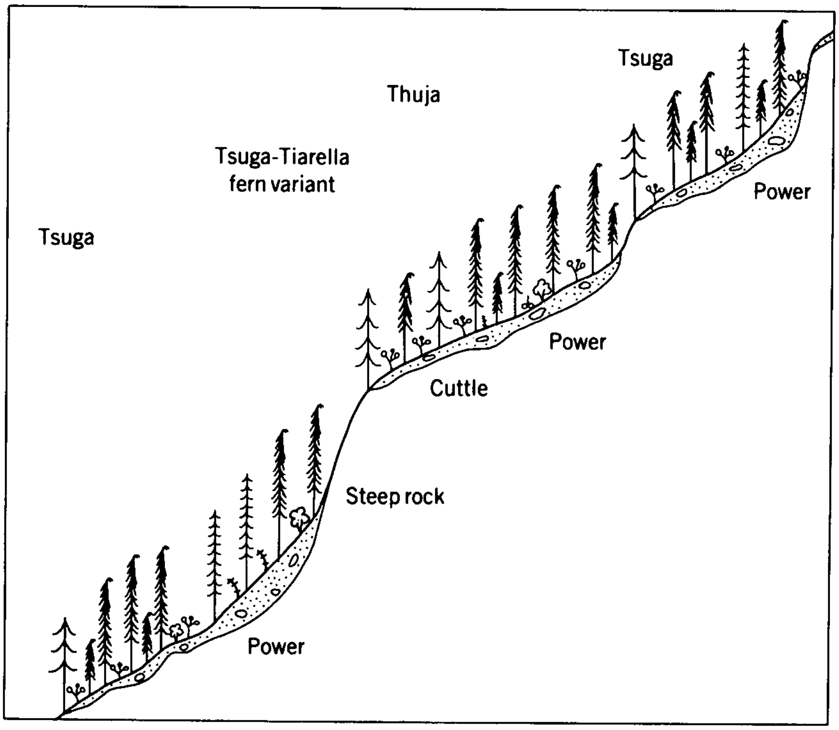
- soils are highly erodable and susceptible to mass movement if disturbed.
- potential sediment source if delivery to the main channel is provided.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	low*	variable	none	low to moderate	variable	moderate to extreme	low to poor

* One or more map delineations comprising the map unit have a significantly different interpretation. Consult the interpretive maps based on an assessment of individual delinations presented in section 7.

HE/SCS HEMLOCK ON STEEP COLLUVIAL SIDE SLOPES



GENERAL DESCRIPTION

Forest cover is dominated by closed stands of western hemlock and scattered Pacific silver fir with a salal dominated understory. Red huckleberry and Alaskan blueberry have sparse to low covers and the ground cover is dominated by deer fern and mosses (the Tsuga type). A minor to codominant component of more open western hemlock and western red cedar with a moderate to dense understory of salal and low fern and forb covers (the Thuja type) is a constant associate. A somewhat open stand of western hemlock and Pacific silver fir with sparse shrub and forb cover and low to moderate fern cover (the Tsuga-Tiarella type fern variant) is a common minor to subdominant component.

Soils develop in steep (45-70% slope) moderately deep (0.5-1.2 m), medium textured, rubbly loams and sandy loams (Power River soils) with minor to codominant shallow, medium textured, rubbly loam or sandy loams (Cuttle soils). Soils are rapidly to well drained and forest floors are generally well developed (5-25 cm thick) mor humus forms. Steep rock faces are a common minor component.

LANDSCAPE FEATURES

These units are steep (45-90% slope) valley side units with gullies and steep rock faces commonly present. The continuity of slopes is occasionally broken by low slope rock outcrops. The dominant Tsuga vegetation type is found on the Power River soils but may be replaced by the Tsuga-Tiarella fern variant at the base of steep rock faces where soils are somewhat deeper. The Thuja type is found on the shallower Cuttle soils and/or steeper Power River soils.

COMPONENTS

Diagnostic Vegetation - Dominant: Tsuga
Subdominant or minor: Thuja or Tiarella
Diagnostic Soils - Dominant: Power
Accessory Soils - Subdominant: Cuttle
Minor: steep rock
- descriptions of vegetation and soil types can be found in sections 5 and 6.

AREA

average size 13.0 ha   total area 517 ha

MANAGEMENT CONSIDERATIONS

Forestry

- moderate volumes (relative to other landscape units) of western hemlock, and low volumes of Pacific silver fir and western red cedar.
- surface disturbance may initiate surface creep and retard regeneration.

Wildlife

- moderate to high salal cover with low to moderate fern cover.
- poor proximity to water with moderate hiding cover and good escape terrain.
- light trail use, low browse may constitute deer winter range on south aspect.

Fisheries

- debris dams in gullies may lead to debris flows or channel scours.
- surface disturbance and road construction present a moderate to high erosion potential.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	variable	moderate to high*	none	low to moderate	high*	variable	poor to medium

* One or more of the individual map delineations comprising the map unit has a significantly different interpretation. Consult the interpretive maps based on an assessment of individual delineations presented in section 7.

High elevation units

The high elevation area in the Power River watershed is defined as the area in which yellow cedar, mountain hemlock, or both, may be present in the forest cover. Although in general this is the area above 600 m, some lower elevation units might be included when the microenvironment provides a suitable habitat for vegetation that would otherwise be found at higher elevations. These are functionally high elevation units. Climate is of overriding importance in this area of the watershed. High snowpack and a shorter growing season influence the vegetation patterns, productivity, and soil development. Low slope units are often hummocky and may have impounded drainage, whereas steep slope units are frequently gullied and often failing.

Slope and depth to bedrock are the most important physical properties, although a few exceptions occur. Soils are generally very shallow to moderately deep. The deeper soils, which may or may not have active surface movement, are associated with steep slopes, whereas the shallow soils are generally found on hummocky and strongly bedrock controlled lower angle slopes. Organic soil has developed in wet environments and low slope fluvial or debris fans are occasionally present.

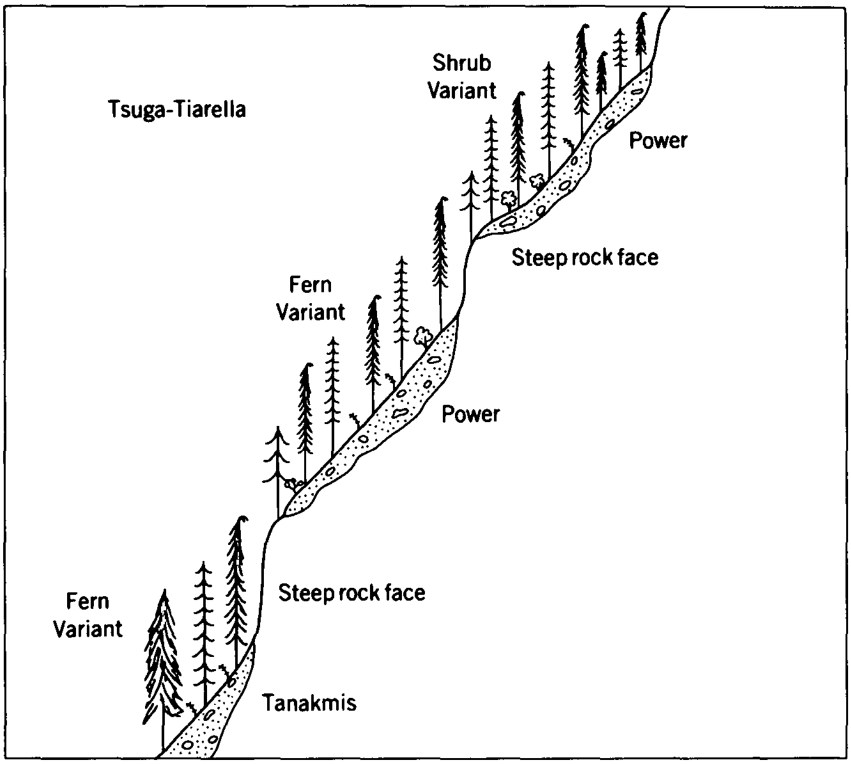
The vegetation pattern is closely related to soil depth and slope. A medium productivity forest consisting of Pacific silver fir and western hemlock is found on deeper soils, usually associated with steep slopes. A forest consisting of yellow cedar, Pacific silver fir, and western hemlock of poor to medium productivity is also found on steep slopes but with shallow soils. Also on shallow soils, but where the snowpack is heavier, a dense yellow cedar and mountain hemlock forest of poor to low productivity has developed. This vegetation is found on both steep and low slope units. A heavy snowpack, in conjunction with hummocky terrain and frequent rock outcroppings, has resulted in a complex of subalpine parkland and wetland vegetation types having a forest productivity of low to none. Scrub vegetation also develops on avalanche tracks.

Six landscape units are included in the high elevation landscape of the Power River watershed. A key for rapid identification is followed by complete descriptions.

Key to high elevation units

1a. Overall slope less than 50% or dominated by nonvegetated bedrock
    2a. Parkland vegetation on shallow soils with frequent rock outcroppings...................... HT/MMS
    2b. Scrub and continuous forest cover of yellow cedar and mountain hemlock without significant rock outcroppings.................. MH/MMS
1b. Overall slope greater than 50% and well vegetated
    3a. Avalanche tracks (not sampled or described).... AVAL
    3b. Forested units
        4a. Dense covers of Pacific silver fir and medium to high covers of western hemlock with scattered yellow cedar or western red cedar................................. BY/SCS
        4b. Dominant yellow cedar and/or mountain hemlock
            5a. Forest consisting of yellow cedar, western hemlock, and Pacific silver fir of poor to medium productivity on steep slopes...................... YC/SCS
            5b. Yellow cedar and mountain hemlock forest with poor to low productivity on steep slopes...................... MH/SCS

BY/SCS BALSAM AND YELLOW CEDAR ON STEEP COLLUVIAL SIDE SLOPES



GENERAL DESCRIPTION

Forest cover is a continuous closed canopy of Pacific silver fir and western hemlock. The understory consists of sparse to low covers of Alaskan blueberry, red huckleberry and deer fern (the Tsuga-Tiarella type). Scattered yellow cedar at the top of rock faces is common but not necessarily present.

Soils develop in moderately deep (0.5-2 m), medium textured, gravelly and rubbly loams and sandy loams (Power River or Tanakmis soils). They are well drained and frequently show active surface creep. Forest floors are highly variable, ranging from poorly developed on active surfaces to thick (35 cm) fibri-humimors on stable lower slope surfaces.

AREA

average size 15.6 ha   total area 562 ha

LANDSCAPE FEATURES

These are steep (46-80% slope) frequently gullied units. The relatively shallow (Power River) soil dominated systems and the deeper (Tanakmis) soil dominated systems have been grouped to form this high elevation unit. Power River soil dominated units are found on relatively continuous slopes or the sides of major gullies. Tanakmis dominated map units are talus aprons at the base of extensive steep rock faces.

COMPONENTS

Diagnostic Vegetation - Dominant: Tsuga-Tiarella with only scattered yellow cedar trees

Accidental Vegetation - Subdominant: Tsuga
Minor: Thuja or Chamaecyparis

Diagnostic Soils - Dominant: Power River or Tanakmis

Accidental Soils - Subdominant to minor: Upsowis, Atush Trail or Cuttle

- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- moderate volumes (relative to other landscape units) of western hemlock and Pacific silver fir.
- artificial regeneration will require special provenance.

Wildlife

- sparse to moderate Alaskan blueberry, red huckleberry, and deer fern.
- used by deer and elk for summer and fall range.
- moderate browse, light to moderate trail use.
- may constitute the upper extent of deer winter range.

Fisheries

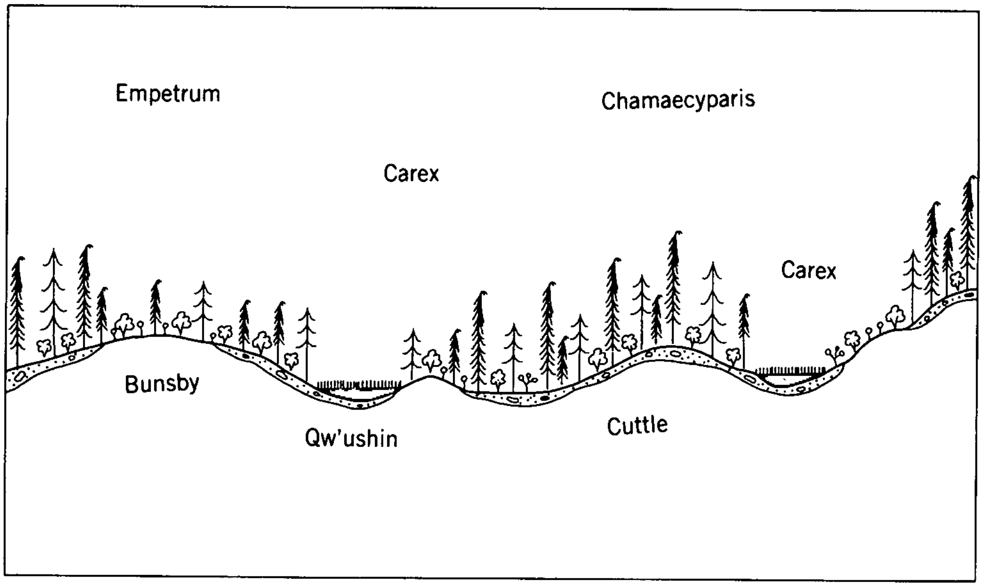
- gullied units present a potential sediment source from debris dams and road construction.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	variable	variable	none*	moderate to high	high	variable	poor to medium

* One or more map delineation comprising the map unit has a significantly different interpretation. Consult the interpretive maps presented in section 7.

HT/MMS HEATHER ON MODERATE SLOPE MORAINAL SIDE SLOPES



GENERAL DESCRIPTION

High elevation parkland vegetation of discontinuous forest cover with dense shrub (the Chamaecyparis type), shrub size tree and shrub dominated non-forested systems (the Empetrum type), and sedge dominated wetlands (the Carex type) occur in varying proportions.

Soils range from rock outcrops (Bunsby soils), to shallow (less than 50 cm) gravelly loams and sandy loams (Cuttle soils), and shallow (30-80 cm) wetland organic deposits (Qwushin soils).

AREA

average size 18.0 ha   total area 610 ha

LANDSCAPE FEATURES

This unit is characterized by hummocky terrain with very strong bedrock control. The Chamaecyparis type attains it highest stature on hummocky or steep slope Cuttle soils where snow pack is relatively low. The Empetrum type occurs on hummocks or rock outcrop's. Depressions, where snow pack is deep, support a low stature Chamaecyparis type or, where poorly drained, the Carex type on Qwushin soils.

COMPONENTS

Diagnostic Vegetation - Dominant or subdominant: Epetrum and/or Carex
Accessory Vegetation - Dominant or subdominant: Chamaecyparis
Diagnostic Soils - Dominant or subdominant: Bunsby and/or Qwushin
Accessory Soils - Dominant or subdominant: Cuttle
- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- noncommercial

Wildlife

- moderate to high covers of Alaskan blueberry, salal and copper bush with sparse to moderate covers of deer fern and heavily browsed deer cabbage.
- moderate to good hiding cover; heavy trail use observed.
- frequent rock outcropping and heavy snow pack.
- may be summer range for deer and occasional use by elk.

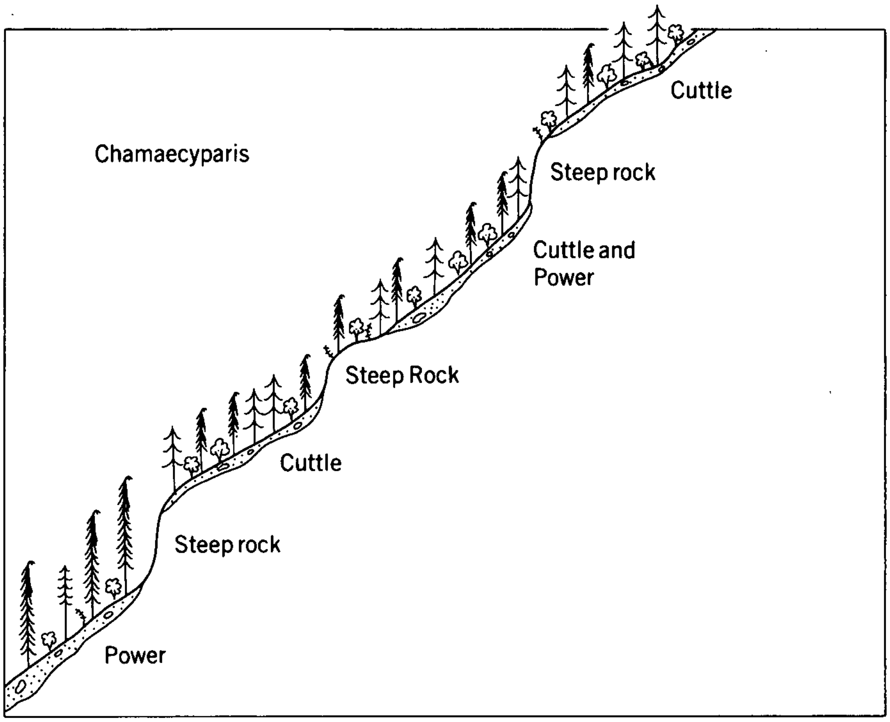
Fisheries

- no probable impact.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	low	low	none	low	low	high to extreme	none to poor

MH/SCS MOUNTAIN HEMLOCK ON STEEP COLLUVIAL SIDE SLOPES



GENERAL DESCRIPTION

Forest cover is an open to closed cover of low stature mountain hemlock, western hemlock, yellow cedar and western red cedar with moderate to dense shrub covers, low to moderate deer fern, and sparse to low forb covers (the Chamaecyparis type).

Soils are dominantly shallow (0.1-1.2 m) medium textured, rubbly or gravelly loams and sandy loams (Cuttle and Power River soils) which are rapidly to well drained with well developed mor humus forms.

LANDSCAPE FEATURES

These units are steep (50-80% slope) often continuous valley side slopes at high elevation. Steep rock faces are frequent and gullies are common.

COMPONENTS

Diagnostic Vegetation - Dominant: Chamaeyparis
Accessory Vegetation - Subdominant to Minor: Empetrum
Accidental Vegetation - Subdominant or Minor: Tsuga-Tiarella
Minor: Carex hoodii
Diagnostic Soils - Dominant: Power
Accessory soils - Subdominant: Cuttle
Minor: steep rock faces
Accidental Soils - Subdominant: Tanakmis or Kayumin
Minor: Bunsby or Qwushin

- descriptions of vegetation and soil types can be found in sections 5 and 6.

AREA

average size 17.6 ha   total area 670 ha

MANAGEMENT CONSIDERATIONS

Forestry

- low volumes (relative to other landscape units) of yellow cedar, mountain hemlock and western hemlock.
- regeneration will be problematic if logged.
- special provenance will be required for planting.

Wildlife

- moderate to high covers of Alaskan blueberry, copperbush, and shrub sized trees.
- good hiding cover and escape terrain.
- may be summer and fall range for deer.
- trail use and browse minimal.

Fisheries

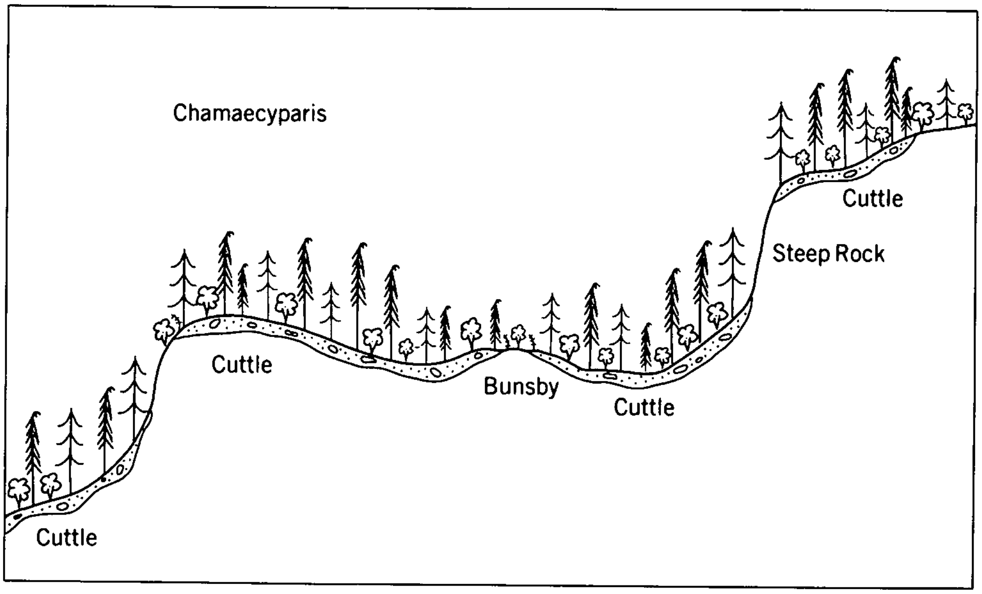
- potential sediment source if surface is disturbed.
- road construction presents a serious potential erosion and sediment hazard.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	variable	variable	none*	low*	variable	variable	poor to low

* One or more individual map delineations comprising the map unit has significantly different interpretations. Refer to the interpretive maps presented in section 7 for specific interpretations.

MH/MMS MOUNTAIN HEMLOCK ON MODERATE SLOPE MORAINAL SIDE SLOPES



GENERAL DESCRIPTION

High elevation continuous low stature and scrub forest cover with moderate to dense shrub cover and low to moderate deer fern and forb covers (the Chamaecyparis type).

Soils are dominantly shallow (0.1-0.5 m), medium textured, gravelly loams and sandy loams (Cuttle soils) with a subdominant component of very shallow (less than 0.1 m) soils or rock outcrops (Bunsby soils). Soils are rapidly to well drained and forest floors are well developed (14-20 cm) thick mor humus forms on both Cuttle and Bunsby soils.

AREA

average size 14.6 ha   total area 380 ha

LANDSCAPE FEATURES

This unit is generally low slope, broken or hummocky terrain with frequent steep rock faces. Forest cover attains its highest stature on steeper slopes or hummocks with Cuttle soils where snow pack is lower. Depressions, where snow pack is deeper, and Bunsby soils support scrub forest communities.

COMPONENTS

Diagnostic Vegetation - Dominant: Chamaecyparis
Accessory Vegetation - Minor: Empetrum and/or Carex
Accidental Vegetation - Subdominant: Tsuga-Tiarella
Diagnostic Soils - Dominant: Cuttle or Kayumin
Accessory Soils - Subdominant: Bunsby
- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- noncommercial and low volume (relative to other landscape units) western hemlock, western red cedar and yellow cedar.

Wildlife

- moderate to high covers of Alaskan blueberry and copperbush, and low to moderate covers of deer fern.
- moderate to heavy browse on small areas of American skunk-cabbage and deer cabbage.
- good hiding cover, moderate to light trail use.
- heavy winter snow pack; may be deer and elk summer/fall range.

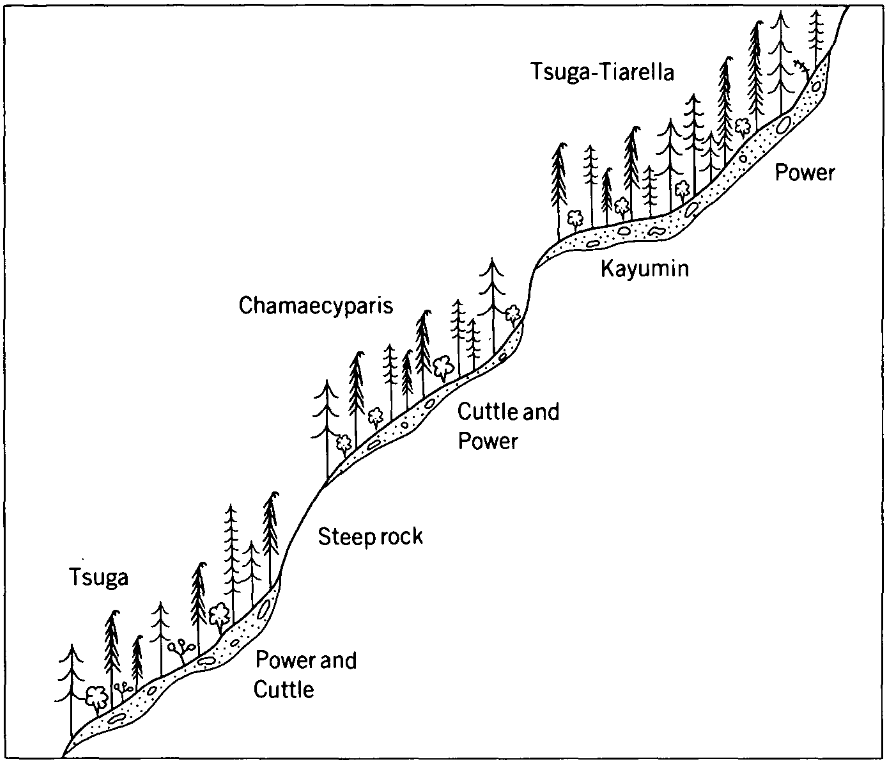
Fisheries

- no probable impact on fisheries.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	low	low	none	low	low	high to extreme	low to poor

YC/SCS YELLOW CEDAR ON STEEP COLLUVIAL SIDE SLOPES



GENERAL DESCRIPTION

Forest cover consists of medium to high density Pacific silver fir and/or western hemlock with lower covers of yellow cedar, mountain hemlock, or western red cedar. Low to high covers of Alaskan blueberry dominate the shrub layer with low covers of deer fern and a variety of forbs (a combination of the Chamaecyparis type with high elevation variants of Thuja, Tsuga, or Tsuga-Tiarella types).

Soils develop in steep (45-70% slope), moderately deep (0.5-1.2 m), medium textured, rubbly and gravelly loams and sandy loams (Power River soils) and/or relatively shallow (0.1-.5 m), medium textured, gravelly and rubbly loams and sandy loams (Cuttle soils). Soils are rapidly to well drained.

AREA

average size 15.0 ha   total area 631 ha

LANDSCAPE

These units are steep (45-90% slope), high elevation, valley side units. Steep rock faces are frequent and gullies are common. The continuity of slopes is only occasionally broken by lower slope segments.

COMPONENTS

Diagnostic Vegetation - Subdominant: combination of Chamaecyparis, Tsuga and Thuja
Minor: Chamaecyparis
Diagnostic Soils - Dominant: Power River
Accessory Soils - Subdominant: Cuttle
Accidental Soils - Subdominant to minor: Atush Trail, Tanakmis, Battle, Kayumin
- descriptions of vegetation and soil types can be found in sections 5 and 6.

MANAGEMENT CONSIDERATIONS

Forestry

- moderate volume (relative to other landscape units) of western hemlock, yellow cedar and Pacific silver fir.
- artificial regeneration will require special provenance.

Wildlife

- low covers of deer fern and forbs with moderate to high covers of Alaskan blueberry.
- good hiding cover and escape terrain.
- may be used by deer and elk for summer-fall range.

Fisheries

- potential sediment source on gullied terrain.

GENERALIZED PLANNING INTERPRETATIONS

Flood Hazard	Torrent Hazard	Mass Movement	Avalanche Hazard	Potential Sediment Yield Harvesting	Potential Sediment Yield Roads	Bedrock Control	Productivity
none	variable	variable	none*	variable	high to extreme*	variable	low to medium

* One or more map delineation comprising the map unit has a significantly different interpretation. Consult the appropriate interpretive map in section 7.

SECTION V:

VEGETATION TYPES

Introduction

The vegetation in the Power River watershed was classified into eight vegetation types. A computer simulation of the Braun-Blanquet synthesis table technique (Mueller-Dombois and Ellenberg 1974) was used in the classification procedure. The computer program developed by Ceska and Roemer (1971) performs a two-way analysis on the data set. Sample sites (plots) and species are compared to determine plots that are floristically similar and to identify groups of species that have similar distribution ranges. The combined effect is to produce a table with combinations of species having limited distribution ranges (species groups), which are used to identify groups of associated plots (vegetation types). Rule sets determine threshold values for species selections and establish a minimum level of similarity in species distributions. The formation of species groups is controlled by Rule I, which stipulates that a species is part of a group if it occurs in at least X% of the sites or plots of the group and is not present in more than Y% of the sites outside the group. Rule II stipulates that a site contains the species group if it contains at least X% of the species associated with that group. The percentage values used for X and Y can be changed as an option in the program but the value of X is the same for both rule sets. Values of X/Y used in this study are 50/10, 66/20, and 50/20.

Seven species groups species are used to characterize eight vegetation types in the Power River (Table 1). The distribution pattern of each species group can be related to the ecological tolerances of the associated species. The *Elymus* species group is associated with relatively young soils, which may be subjected to frequent flooding. With less frequent flooding, species from the *Tiarella* group become established. The rhizomatous nature of the species in this group allows them to become well established and to stabilize the soil against occasional flooding or surface creep (on slopes). High water tables do not appear to impede the growth of species in either of these groups.

In stable fluvial or upland landscapes in the watershed, the *Tsuga* species group is usually present. These species do best where drainage is well to moderate (water tables are low). Areas with a relatively shallow rooting zone support the *Thuja* species group. Periods of drought do not restrict the growth of this group of species.

Three species groups are characteristic of the high elevation environment. The *Carex hoodii* species group is restricted to wet depressions or stream margins. The *Empetrum* group is associated with shallow soils, especially where there is significant rock outcropping. Areas of high snowpack also support this group of species. Moderately deep to shallow soils with a light to moderate snowpack allow the growth of species from the *Chamaecyparis* group. This group is also favored on moderate to steep slopes.

Combinations of species groups indicate overlapping tolerance ranges and/or increased habitat diversity. These ecotones or complex microenvironments are described as separate types when they are recurrent and of sufficient size to map. Minor differences in dominance were not used to separate new types. Rather, these were grouped and described as variants of a single type. The following eight vegetation types (Plates 1-10) were defined: *Carex hoodii*, *Chamaecyparis*, *Elymus*, *Empetrum*, *Thuja*, *Tiarella*, *Tsuga*, and *Tsuga-Tiarella*. Type definitions include the diagnostic species, a general description, and distribution in the watershed. Scientific names of plants are used in the diagnostic species groups and in the Tables in Appendixes B1 and B2, but common names (except for some mosses) are used throughout the rest of the report. Both scientific and common name equivalents are given in Appendixes A1 and A2. Plant names are according to Taylor and MacBryde (1977).


1


2


3


4


5


6

Plates 1-3 The Elymus vegetation type
Plate 4 The Tiarella vegetation type
Plates 5-6 The Tsuga-Tiarella vegetation type

7

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9

10

Plate 7 The Tsuga vegetation type
Plate 8 The Thuja vegetation type
Plate 9 The Empetrum and Chamaecyparis vegetation types
Plate 10 The Carex and Chamecyparis vegetation types

Carex hoodii

Diagnostic species

The *Carex hoodii* species group is the only species group present in this community type. Six of the nine species in the group must be present.

Carex species group (6/9)

Carex hoodii (Hood's sedge)
Erigeron peregrinus (subalpine fleabane)
Fauria crista-galli (deer-cabbage)
Drosera rotundifolia (round-leaved sundew)
Gentiana spp. (gentian)
Tolfieldia glutinosa (sticky false asphodel)
Eleocharis rostellata (beaked spike-rush)
Agrostis spp. (bent grass)
Eriophorum angustifolium (narrow-leaved cotton-grass)

General description

The *Carex hoodii* type is a distinctive high elevation community. It is easily recognized by the lack of trees or shrubs and by the dominant moss and herb strata that give the community a meadow-like appearance. Numerous species characterize the herb layer. The most abundant are Hood's sedge, narrow-leaved cotton-grass, beaked spike-rush, two-flowered white marsh-marigold, and deer-cabbage. *Sphagnum* dominates the moss layer.

Distribution

This type is generally found in wet areas at high elevations. It often borders small ponds and occurs along the margins of ephemeral streams. It has a patchy distribution and tends to occur in small pockets in the heather (HT/HMS) landscape unit where it may occasionally be subdominant. Although rare, it is found in the mountain hemlock (MH/MMS) landscape unit as well. Use by wildlife was noted.

Organic soils support the *Carex hoodii* type.

Chamaecyparis

Diagnostic species

Two species groups are characteristic of the Chamaecyparis type. Two of the three species in the Chamaecyparis species group must be present and three of the six species in the Tsuga species group must be present. Occasionally the Thuja species group is present, but it is not considered diagnostic when the Chamaecyparis group is represented. No other species groups are present.

Chamaecyparis species group (2/3)

Chamaecyparis nootkatensis (A1) (yellow cedar)
Tsuga mertensiana (A1) (mountain hemlock)
Tsuga mertensiana (B1) (mountain hemlock)

Tsuga species group (3/6)

Tsuga heterophylla (B1) (western hemlock)
Abies amabilis (A1) (Pacific silver fir)
Vaccinium alaskaense (Alaskan blueberry)
Gaultheria shallon (salal)
Rubus pedatus (five-leaved creeping raspberry)
Hylocomium splendens (stairstep moss)

General description

This high-elevation type has a forest canopy dominated by yellow cedar and mountain hemlock with Pacific silver fir often associated and western hemlock occasionally present. The same species are common in the tall shrub stratum providing a moderate cover of young trees. The low shrub layer is also well developed. It is dominated by a dense cover of Alaskan blueberry or mountain hemlock with western hemlock, red huckleberry, Pacific silver fir, copperbush, yellow cedar, and rusty Pacific menziesia as common associates. Numerous species are present in the herb layer. Low covers of spleenwort-leaved goldthread, deer fern, heart-leaved twayblade, five leaved creeping raspberry, Canadian bunchberry, northern twinflower, and cucumberroot twistedstalk are the most frequently present herbs. A dense moss carpet of Rhytidiadelphus loreus and stairstep moss, that may be augmented by Mnium glabrescens or Rhytidiopsis robusta, is present.

Distribution

The *Chamaecyparis* type is restricted to high elevations or depressional areas with a high snowpack. When dominant, it is diagnostic for the mountain hemlock (MH/MMS and MH/SCS) landscape units except when associated with a 30% component of either the *Empetrum* or *Carex* types, in which case, it represents the heather (HT/MMS) landscape unit. A subdominant or minor component is usually present in the heather (HT/MMS) or theyellow cedar (YC/SCS) landscape units. In the latter, *Chamaecyparis* is associated with the *Tsuga-Tiarella*, *Tsuga*, or *Thuja* types. A minor component of the *Chamaecyparis* type is always present in the balsam-yellow cedar (BY/SCS) landscape unit.

The soils are shallow to moderately deep and lack significant rock outcropping.

Elymus

Diagnostic species

The Elymus species group is diagnostic for this type. At least three out of the six species in the Elymus species group must be present. In addition, three out of four species from the Tiarella group are usually present.

Elymus species group (3/6)

Elymus hirsutus (hairy wild rye grass)
Mycelis muralis (wall-lettuce)
Ranunculus uncinatus (little-flowered buttercup)
Alnus rubra (red alder)
Carex canescens (hoary sedge)
Pleuropogon refractus (nodding semaphore grass)

Tiarella species group (3/4)

Tiarella trifoliata (trifoliate-leaved foamflower)
Polystichum munitum (western sword fern)
Rubus spectabilis (salmonberry)
Tiarella laciniata (cut-leaved foamflower)

General description

The forest canopy is lacking or is dominated by red alder with occasional large Sitka spruce, which may become dominant. Western hemlock is an associated species in some stands. The shrub strata are not well developed but low covers of salmonberry and scattered red huckleberry are often present. The understory is characterized by a dense sward of forbs, grasses,and sedges. Numerous species are associated, the most frequent being Cooley's hedge-nettle, western sword fern, sweet-scented bedstraw, little-flowered buttercup, yellow wood violet, piggy-back plant, trifoliate-leaved foamflower, Siberian spring beauty, hairy wild rye grass, nodding trisetum, and wall-lettuce. This community type has an open park-like appearance, which is probably maintained by frequent flooding and heavy browsing by Roosevelt elk and deer.

Two distinct microtypes are commonly associated with the Elymus type. Pockets of American skunk-cabbage are often found in wet depressions. This is a very distinct vegetation type but it has a limited and patchy distribution. Its occurrence is noted because skunk cabbage was heavily browsed by Roosevelt elk. Dense stands of slough sedge are also found in wet areas, commonly in old stream channels, and along the margin of Power Lake. Overall it has a limited distribution.

Distribution

The Elymus type represents an early stage of plant succession. When dominant, it is diagnostic for the alder (AL/MTF and AL/CTF) landscape units and it is frequently a subdominant in the spruce (SP/MTF and SP/CTF) landscape units. Soil surface disturbance (either erosional or depositional) caused by flooding, channel migration, or debris or water torrents is associated with this vegetation type. The Elymus type is a product of less frequent, recent, or severe disturbance than non- or sparsely-vegetated areas of the floodplain. Red alder and Sitka spruce, which dominate the forest cover, can, once established, tolerate relatively serious disturbance and flooding. Disturbance tolerant and apparently light-demanding species such as salmonberry might be expected to form a dense shrub layer in this community type. However, heavy browse by Roosevelt elk on salmonberry and red huckleberry appears to be the reason for the poorly developed shrub layer.

Litter fall is neither heavy enough nor resistant enough to decompositon to build up a forest floor. Rhizo-mull and moder humus forms are dominant. Both medium-textured loamy and coarse textured sandy to sandy-gravel soils support the Elymus type.

Empetrum

Diagnostic species

The *Empetrum* species group is diagnostic for this vegetation type, but two other species groups are also represented. All of the species in the *Empetrum* group must be present, two of the three species from the *Chamecyparis* group are present, and three of the six species in the *Tsuga* group are usually present.

Empetrum species group (3/3)

Empetrum nigrum (black crowberry)
Phyllodoce empetriformis (red mountain-heather)
Alnus viridis (Sitka mountain alder)

Chamaecyparis species group (2/3)

Chamaecyparis nootkatensis (A1) (yellow cedar)
Tsuga mertensiana (A1) (mountain hemlock)
Tsuga mertensiana (B1) (mountain hemlock)

Tsuga species group (3/6)

Tsuga heterophylla (B1) (western hemlock)
Abies amabilis (A1)(Pacific silver fir)
Vaccinium alaskaense (Alaskan blueberry)
Gaultheria shallon (salal)
Rubus pedatus (five-leaved creeping raspberry)
Hylocomium splendens (stairstep moss)

General description

The *Empetrum* type has a low growth physiognomy and a parkland appearance. The forest cover is dominated by low stature yellow cedar and mountain hemlock trees. These are also common in the tall shrub layer along with sitka mountain alder, which tends to occur along drainage lines. Scattered shore pine may also be present. A dense low shrub layer is comprised of moderate covers of yellow cedar and copperbush with usually low covers of black crowberry, red mountain-heather, salal, Alaskan blueberry, and oval-leaved blueberry. Low covers of Canadian bunchberry are combined with sparse covers of deer fern, two-flowered white marsh-marigold, northern starflower, slender rein orchid, running club-moss, and false hellebore to form a diverse, but poorly developed, herb layer. Stairstep moss and pipecleaner moss are constant mosses with low covers. Moderate covers of *Rhytidiadelphus loreus* may be present.

Distribution

This vegetation type is common on hummocky terrain at high elevations where there is frequent rock outcropping and high snowpack. The *Empetrum* type covers at least 30% of map delineations in the heather (HT/MMS) landscape unit. It may be present as a minor component in mountain hemlock (MH/MMS and MH/SCS) landscape units.

Soils are very shallow and show significant rock outcropping.

Thuja

Diagnostic species

Only one species group is required for classification of this type, although two other groups may be represented. Two out of three species from the Thuja species group must be present for a plot to classify as the Thuja type. Usually western red cedar is present in both the forest canopy and the shrub layer. In addition, three out of six species in the Tsuga species group are usually present and in the herb-rich variant, three of the four species in the Tiarella group are also present.

Thuja species group (2/3)

Thuja plicata (A1) (western red cedar)
Tsuga heterophylla (A3) (western hemlock)
Thuja plicata (B1) (western red cedar)

Tiarella species group (3/4)

Tiarella trifoliata (trifoliate-leaved foamflower)
Polystichum munitum (western sword fern)
Rubus spectabilis (salmonberry)
Tiarella laciniata (cut-leaved foamflower)

Tsuga species group (3/6)

Tsuga heterophylla (B1) (western hemlock)
Abies amabilis (A1) (Pacific silver fir)
Vaccinium alaskaense (Alaskan blueberry)
Gaultheria shallon (salal)
Rubus pedatus (five-leaved creeping raspberry)
Hylocomium splendens (stairstep moss)

General description

The Thuja type is characterized by a moderately dense forest cover of western hemlock and western red cedar with a tall shrub layer of the same species. The dense low shrub layer is dominated by vigorous salal (50-75% cover) with scattered red huckleberry and rusty Pacific menziesia. In the herb-rich variant, low covers of Alaskan blueberry are also present. The herb layer is usually represented by low covers of deer fern and scattered Canadian bunchberry. Scattered western sword fern, heart-leaved twayblade, trifoliate-leaved foamflower, five-leaved creeping raspberry, and cut-leaved foamflower are common only in the herb rich variant. Rhytidiadelphus loreus and stairstep moss are abundant and frequently occurring mosses that often provide a dense ground cover. Low covers of _Stokesiella oreganum_ are commonly present. On rock outcrop areas, a dense lichen cover may be associated with scattered western red cedar. This was not sampled and therefore has not been described as a separate type. It is included here as a dry variant of the _Thuja_ type.

Distribution

On basal slopes in the hemlock (HE/MMB) landscape unit the _Thuja_ type may be subdominant or codominant with the _Tsuga_ type. When dominant on valley side slopes, the _Thuja_ type is indicative of the cedar (CE/SCS and CE/MMS) landscape units. It is usually present as a subdominant or codominant with the _Tsuga_ type in the Hemlock (HE/SCS) landscape unit and as a minor or subdominant with _Tsuga-Tiarella_ in the balsam (BA/SMS and BA/SCS) landscape units. At high elevations, it may be associated as a subdominant or codominant in the yellow cedar (YC/SCS) landscape unit, which requires at least a minor component of the _Chamaecyparis_ type.

The _Thuja_ type is found in areas with rock outcropping and shallow soils. It is frequently confined to the tops of steep rock faces.

Tiarella

Diagnostic species

This type is characterized by the presence of only one species group. Three out of four species in the *Tiarella* group should be present. However, when a plot is lacking sufficient species to meet the rule requirements of any other species group but contains two species from the *Tiarella* group, it should also be classified as the *Tiarella* type.

Tiarella species group (3/4)

Tiarella trifoliata (trifoliate-leaved foamflower)
Polystichum munitum (western sword fern)
Rubus spectabilis (salmonberry)
Tiarella laciniata (cut-leaved foamflower)

General description

The *Tiarella* type has a forest cover of western hemlock, which may have Sitka spruce or Pacific silver fir in association. On steep slopes, scattered western red cedar may also be present and Pacific silver fir is more abundant. There is a sparse shrub cover with minor amounts of salmonberry and red huckleberry. Western sword fern and deer fern are constant species in the herb stratum. Numerous scattered herbs are common, including trifoliate-leaved foamflower, cut-leaved foamflower, common lady fern, Siberian spring beauty, and small-flowered wood-rush. Mosses are abundant with *Rhytidiadelphus loreus* and *Stokesiella oregana* most frequently present. The understory has an open appearance.

Distribution

The *Tiarella* type is a mid- to late-successional type. When dominant on floodplain or basal slope units, it is diagnostic for the spruce (SP/CTF and SP/MTF, SP/CFB) landscape units. In the alder (AL/CTF and AL/MTF) landscape units it is frequently a subdominant where disturbance is less frequent. Crown closure of western hemlock increases and, with Sitka spruce, can form relatively closed stands. Covers of salmonberry and herbs decrease from the *Elymus* type in response to increased crown closure. Moderate browse on red huckleberry, Alaskan blueberry, salmonberry, western sword fern, and deer fern was noted.

The *Tiarella* type may also be found on valley sides where it is analagous to the fern variant of the *Tsuga*-*Tiarella* type. When dominant, it is diagnostic for the balsam (BA/CFB, BA/MCB, BA/MMB, BA/SMS and BA/SCS) landscape units. It is commonly a subdominant or minor component in the hemlock (HE/MMB and HE/SCS) landscape units.

Litter fall is heavy enough and resistant enough to decomposition to build up a forest floor which can form a thin (1-6 cm) but well expressed Mor. The *Tiarella* type can develop on a wide range of deeper soils, but is more frequently associated with floodplain soils, coarse textured fluvial basal slope (CFB) soils, or steep colluvial side slope (SCS) soils.

Tsuga

Diagnostic species

The Tsuga type contains at least three of the six species in the Tsuga species group, and no other species groups are represented.

Tsuga species group (3/6)

Tsuga heterophylla (Bl) (western hemlock)
Abies amabilis (Al) (Pacific silver fir)
Vaccinium alaskaense (Alaskan blueberry)
Gaultheria shallon (salal)
Rubus pedatus (five-leaved creeping raspberry)
Hylocomium splendens (stairstep moss)

General description

This vegetation type has a low species diversity. The forest is dominated by western hemlock with some Pacific silver fir. Natural regeneration is variable but the combined cover of western hemlock and Pacific silver fir in the tall shrub layer may be as high as 40%. The low shrub layer is well developed and usually dominated by high covers of salal with low to moderate covers of red huckleberry. Alaskan blueberry usually has sparse or low covers but may have a moderate cover when in association with a moderate salal cover. The poorly developed herb stratum is dominated by low to moderate covers of deer fern with lesser amounts of western sword fern.

Rhytidiadelphus loreus, Stokesiella oreganum and stairstep moss are usually present on the forest floor with low to moderate covers. Occasional light browse was noted on Alaskan blueberry, red huckleberry, and deer fern.

Distribution

The Tsuga vegetation type is a late successional or climax stage and represents a stable system. It is usually found on relatively shallow or steep, well-drained soils, or on both. It is commonly a minor or subdominant component in the balsam (BA/CFB, BA/MCB, BA/MMB and BA/SMS) or cedar (CE/SCS and CE/MMS) landscape units, where it may occasionally be a codominant. It is usually dominant in the Hemlock landscape units, but may be a codominant with the Tsuga-Tiarella fern variant when a significant component of the *Thuja* type is present. At high elevations it may be a codominant or subdominant component of the balsam-yellow cedar (BY/SCS) or yellow cedar (YC/SCS) landscape units.

Forest floors are well developed (7-20 cm thick) Humi-fibrimors, and Fibri-humimors. Associated soils are usually shallow or steep, or both, and well drained.

Tsuga-Tiarella

Diagnostic Species

Both the Tiarella and Tsuga species groups must be present in this type. The Tiarella species group must be represented by at least three out of four species and three of the six species in the Tsuga group must also be present.

Tiarella species group (3/4)

- Tiarella trifoliata (trifoliate-leaved foamflower)
- Polystichum munitum (western sword fern)
- Rubus spectabilis (salmonberry)
- Tiarella laciniata (cut-leaved foamflower)

Tsuga species group (3/6)

- Tsuga heterophylla (B1) (western hemlock)
- Abies amabilis (A1) (Pacific silver fir)
- Vaccinium alaskaense (Alaskan blueberry)
- Gaultheria shallon (salal)
- Rubus pedatus (five-leaved creeping raspberry)
- Hylocomium splendens (stairstep moss)

General description

Western hemlock and Pacific silver fir dominate the forest cover in the Tsuga-Tiarella type. Sitka spruce may be associated on fluvial soils or debris fans, whereas western red cedar is an occasional minor component on shallow soils. Regeneration of western hemlock and Pacific silver fir is common. Two variants of this type can be recognized.

1) The fern variant has a weakly developed low shrub layer with scattered red huckleberry and salmonberry in the low shrub stratum. Western sword fern, deer fern, trifoliate-leaved foamflower, cut-leaved foamflower and common lady fern form the dominant ground cover in this variant along with the moss Rhytidiadelphus loreus. Exposed mineral soil is common.

2) The shrub variant is characterized by a well developed low shrub layer dominated by Alaskan blueberry, red huckleberry, and salmonberry with high covers of salal restricted to areas with shallow soils. Low to moderate covers of deer fern, trifoliate-leaved foamflower, cutleaved foamflower, western sword fern, two-leaved false Solomon's seal, and five-leaved creeping raspberry are characteristic of the herb layer. Rhytidiadelphus loreus and stairstep moss are abundant mosses providing a dense ground cover.

At high elevations yellow cedar is included in the forest canopy and the understory tends to be very open. Rhytidiopsis robusta is a common ground cover.

Distribution

The Tsuga-Tiarella type represents the latest stage of succession or climax vegetation. On the floodplain it is associated with the spruce (SP/MTF and SP/CTF) landscape units, where it is usually dominant, but may also be subdominant with the Tiarella type. When dominant in other areas of the watershed, it is diagnostic for the balsam (BA/CFB, BA/MCB, BA/MMB and BA/SMS) landscape units except when in association with at least a minor component of yellow cedar, in which case it is diagnostic for the balsam-yellow cedar (BY/SCS) landscape unit. The Tsuga-Tiarella type is occasionally subdominant in the Hemlock (HE/MMB and HE/SCS) landscape units, where it is associated with drainage lines or occurs at the base of the slope.

The shrub variant is a productive, stable vegetation type, which tends to occupy relatively deep, well to imperfectly drained soils. The fern variant usually occurs on the steep valley side slopes, which have active surface soil creep. The forest floor under the shrub variant is a well-developed fibri-humimor humus form (6-21 cm thick). Soils with active surface creep have discontinuous forest floors. A wide variety of soils support the Tsuga-Tiarella type including soils developed on both medium- and coarse-textured fluvial deposits, debris fans, steep active colluvial slopes, till, and on low slope bedrock controlled sites.

SECTION VI:

SOIL TYPES

Introduction

The soils of the Power River watershed are grouped into 12 classes. The classification is based solely on soil physical properties. No inferences of mode of deposition or pedogenic development were allowed to influence the classification. Inferences as to depositional processes are obvious and appropriate in the resulting classes, and inferences of genesis are obvious and appropriate when the classes are combined with the vegetation classes growing on them. This approach differs significantly from normal pedological or ecological practice in that the classes defined are not traditional soil classes.

Rationale

The fact, that site, soil, and vegetation properties are not perfectly correlated, has a fundamental implication for ecological classification. As the number of properties used increases, one of two things must happen: either the range of properties within a given class must increase or the number of classes must be increased to maintain the same limited range of properties. One of the major aims of classification is to maximize the information content of the classes. This is accomplished by choosing diagnostic criteria that carry as much accessory (correlated) information as possible. To choose criteria that carry redundant information tends to defeat the aims of classification by forcing it to deal with a large number of properties in exchange for only a limited increase in information content. The Power River project was designed to optimize the amount of information recoverable from the classification with the use of a minimum number of diagnostic parameters.

Analytical Approach

To minimize redundant information in the classification, soil and vegetation were classified separately. Each site was characterized by a site-soil class and a vegetation class, not by an ecosystem class. Vegetation plot data were analyzed with the use of a computer-assisted version of tabular analysis (Ceska and Roemer 1971) to identify rigorously defined species groups and community types. A multiple stepwise discriminant analysis program (Halm 1978) was used to identify the soil properties most useful in predicting the vegetation classes defined in the tabular analysis. The field verifiable soil properties of depth to bedrock, depth to high bulk density till, drainage, humus form, the color of the B horizon, and slope discriminated more than 90% of the vegetation plots. This suggested that the soil properties used in the discrimination functions would covary (be correlated) with the vegetation classes and might not have to be incorporated in the soil classification.

At the same time, independent analysis of the soil data was conducted to identify covarying soil properties. Field-verifiable soil properties were used in a factor analysis (Nie et al. 1975). The procedure defines mathematical functions that account for as much of the variation in the data set as possible. Each successive function defined accounts for less of the total variation. Soil properties that are closely associated with the same function will covary. The choice of more than one property associated with the same function will theoretically provide redundant information if used as diagnostic properties in classification. Those soil variables most strongly correlated with the resulting factors were presumed to carry the most accessory information and were logical candidates as classification parameters.

The amount of redundant information in the classification parameters was further reduced by eliminating, from the soil classification, those soil variables that were reliably predicted with the use of the vegetative classification. The assumption, that the vegetation classes would define a limited range of those soil properties used in discriminating the vegetative classes, was checked against the statistical summaries of each variable by vegetation class.

For example, the depth to bedrock and the soil drainage were both strongly correlated with factors defined in the factor analysis and were also used as discriminating variables in the discriminant analysis. This indicated areas of potential information redundancy if used in the soil classification. Because depth to bedrock was more reliably predicted from site features than from vegetation and because of its interpretive importance, it was retained in the soil classification. Because soil drainage was difficult to interpret for many soils and because it showed such a strong relationship with vegetation, it was dropped as a criterion in the soil classification.

The final classification was based on the following properties: slope, surface texture, subsurface texture, surface coarse fragment content, depth to the first texture discontinuity, depth to high bulk density morainal material, and depth to bedrock.

Following the choice of classification properties, the soil data were subjected to a cluster analysis (Patterson and Whitaker 1978). The procedure defined classes based on a measure of overall similarity of the properties chosen as the basis for the classification. The resulting classes were then defined in terms of class limits for the diagnostic properties. Dichotomous keys were produced to allow ready identification of site-soil classes in the field.

The resulting classes fit four general categories of deposit:

1) Fluvial

Quineex- floodplain soils with loamy surface layers overlying coarse gravels and having nearly level slopes.

Klaskish- floodplain soils with coarse textured, usually gravelly surfaces with nearly level slopes.

Upsowis- basal slope or floodplain soils with coarse-textured surfaces commonly overlying other deposits.

Atush Trail- long stable, basal slope, fan soils with finer textured surfaces than Upsowis soils as a result of longer weathering times.

2) Morainal

Aanimi- basal slope and high elevation glacier deposited soils. They are deep enough to mask evidence of underlying bedrock control and have medium textured surfaces with a marked increase in bulk density within 130 cm of the surface.

Battle- valley side slope glacier deposited soils. They are similar to Aanimi soils, but show steeper slopes, are commonly failing, and usually have shallower depths to the marked increase in bulk density.

Cuttle- basal slope and high elevation glacier deposited soils. They are similar to Aanimi soils, but they are not deep enough to mask the underlying bedrock control. They are usually less than 50 cm to bedrock and may not show the marked increase in bulk density before bedrock is reached.

Kayumin- basal slope and high-elevation glacier deposited soils. They are similar to Aanimi and Cuttle soils. They are not deep enough to mask the underlying bedrock control and are generally greater than 50 cm to bedrock. They may not show the marked increase in bulk density before bedrock is reached.

3) Colluvial

Power- valley side slope soils, usually not deep enough to mask the shape of the underlying bedrock, and occupying steep (greater than 45%) slopes. A high bulk density till layer is usually not encountered before bedrock.

Tanakmis- valley side slope soils deep enough to mask the shape of the underlying bedrock. They generally show a fan or apron form and have slopes of about 70%.

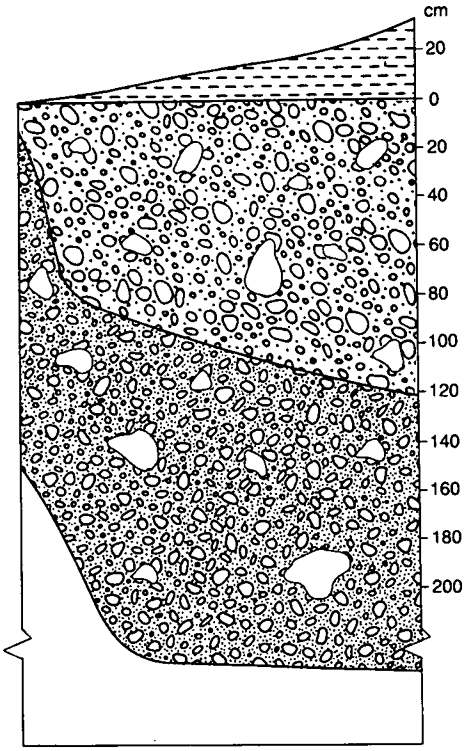
4) Organic

Bunsby- valley side slope and high elevation soils where little or no mineral soil material covers the bedrock. Vegetation is rooted in a thin layer of upland humus. Mineral material is usually less than 10 cm.

Qwushin- high-elevation soils with wetland organic deposits overlying morainal material.

The identification of the vegetative class growing on each of the soil classes defines limited ranges of additional soil properties such as humus depth and form, horizonation, organic matter and nitrogen content, and pH and base status. These relationships are discussed under the description of each soil class and representative profile descriptions are presented in Appendix C. Descriptions of all soil classes are presented alphabetically in the following pages.

AANIMI



Management summary

Aanimi soils support medium productivity of western hemlock and Pacific silver fir. Sitka spruce grows well as a late successional species on soils similar to Aanimi and may perform well if established on Aanimi soils.

The high silt content, low clay content, and generally sloping terrain produce highly erodable soils if the ground cover is disturbed. The presence of a water restricting layer and frequent streams ensures delivery of sediments produced by erosion to the main channel. These same conditions make Aanimi soils highly sensitive if natural drainage lines are disrupted.

Landform and distribution

Aanimi soils are formed in glacier ice deposited materials (till) deep enough to mask the evidence of underlying bedrock control (usually deeper than 2 m). Aanimi soils are usually confined to basal slope positions of the main valley, but small unmappable occurrences were found in high-elevation areas.

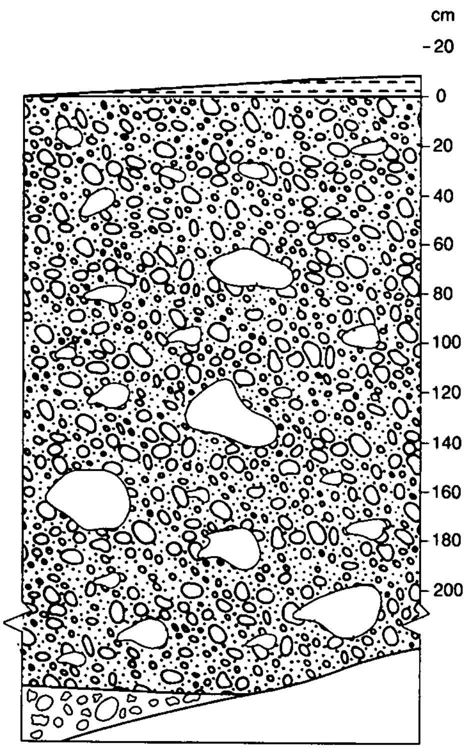
General description of soil properties

Slopes range from 0% to 45% and the surface is smooth to moderately mounded. A layer of dense till material occurs between 80 and 120 cm from the surface, although infrequent occurrences, with dense till within 50 cm, were described. The soils are dominantly well to imperfectly drained with significant areas of poorly drained soils at lower slope angles. Textures are gravelly to very gravelly fine sandy loams and loams.

Vegetation and related soil properties

Aanimi soils support the Tsuga-Tiarella community type with Fibri-humimor humus forms ranging from 3 to 34 cm thick. They are Orthic Humo-Ferric and Ferro-Humic Podzols. A horizons, are usually absent except at high elevation. The soils are extremely acid and exchangeable base nutrients are usually low. Soil organic matter levels are moderate a nitrogen levels high, giving favorable carbon to nitrogen ratios and moderate fertility.

ATUSH TRAIL



Forest Floor
Thin but well expressed Mor humus forms.

Mineral Soil
Erodable sandy loam soil textures may become coarser with depth.
Extremely acid, low base nutrient status but high nitrogen levels.
Well drained.

Bedrock or fragmental coarse gravels
May be encountered below 2 m.

Management summary

Atush Trail soils support medium productivity of Sitka spruce, western hemlock, and Pacific silver fir. Soils provide no limitation to wind firmness. A high permeability and absence of water restricting layers reduce both erosion and sediment delivery potential unless surface disturbance is severe or immediately adjacent to streams. Materials are suitable for road construction and present few off-road trafficability problems.

Landform and distribution

Atush Trail soils are formed in deep (usually greater than 2 m) long stabilized, debris or fluvial fans adjacent to the main floodplain. They are usually dissected by a major stream, which shows temporary summer flow.

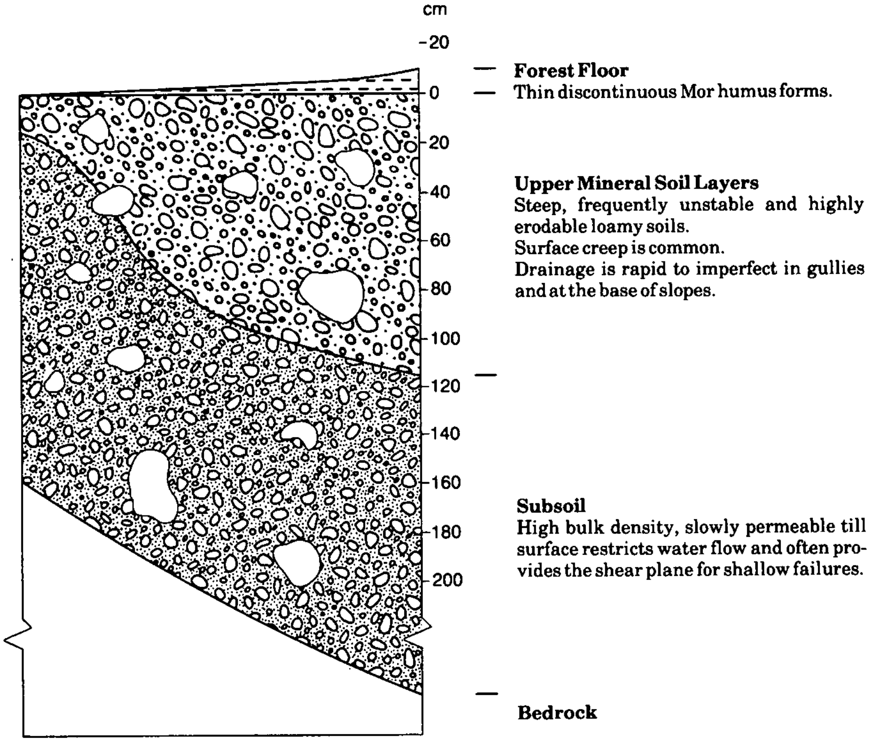
General description of soil properties

Slopes range from 7% at the base of the fan to as high as 30% at the apex. The landscape may range from smooth to moderately mounded. No root or water restricting layers were encountered within 1.5 m of the surface except near the apex of the fan, where compacted till is sometimes encountered. The soils are well drained, gravelly to very gravelly, sandy loams and may become coarser with depth.

Vegetation and related soil properties

Atush Trail soils were found to support only the Tsuga-Tiarella community type. Humus forms were highly variable, although all Mor types, and thin (2-7 cm). Ae horizons are poorly expressed (less than 2 cm thick). The soils are classified as Orthic Humo Ferric Podzols having strong Podzol colors, low organic matter content, and relatively high values of extractable iron and aluminum. The soils are extremely acid and have a low base nutrient status. Nitrogen values are relatively low with favorable C:N ratios. Despite the low nutrient status of these soils the unrestricted rooting depth makes them moderately fertile for deep-rooted species.

BATTLE



Management summary

Battle soils are the most sensitive in the watershed. Active gullying and shallow landslides are common. In addition the soils are highly erodable if the ground cover is disturbed. Road construction will be problematic and is likely to increase slope instability and sediment production. Frequent gullies are susceptable to debris damming and subsequent debris torrents.

Battle soils support medium productivity of western hemlock and Pacific silver fir. Western red cedar showed medium productivity on shallow to compact till, intergully positions, but was rare on deeper soils.

Timber harvesting may reduce the stability of Battle soils when the soil cohesive strength due to the fine roots is lost to decay.

Landform and distribution

Battle soils are formed in deep, glacier ice-deposited materials (till) on steep valley side slopes. Deposits are usually deep enough to mask the influence of bedrock on the surface expression (usually deeper than 2 m).

The distribution of Battle soils is limited to less than 90 ha in the watershed.

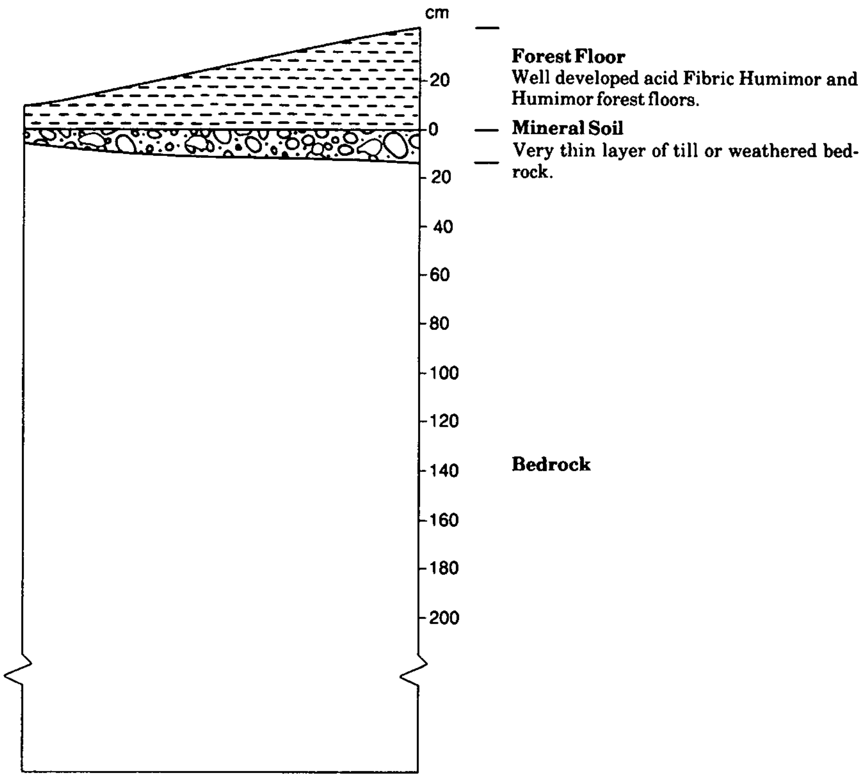
General description of soil properties

Slopes range from 45% to 80% and surfaces are usually gullied. Areas of active surface creep are common and dense till material generally occurs between 20 and 100 cm from the surface. The soils are dominantly rapidly to well drained with areas of imperfect drainage in gullies and toward the base of the slope. Textures are gravelly to very gravelly loams with higher clay contents where soils are derived partially from limestone.

Vegetation and related soil properties

Battle soils support both variants of the <u>Tsuga-Tiarella</u> community type as well as the <u>Tsuga</u> type. The forest floor is a discontinuous <u>Mor humus</u>, usually less than 20 cm thick, and <u>Ae</u> horizons are thin or absent. Soils are Orthic Ferro-Humic Podzols and less commonly Orthic Humo-Ferric Podzols. Soils have moderate levels of organic matter and nitrogen and are extremely acid. Base nutrient levels are moderate. Despite an apparently moderate fertility, productivity seems somewhat restricted by high bulk density till, which frequently restricts rooting depth.

BUNSBY



Management summary

Bunsby soils support very low productivity for western red cedar and western hemlock. Lodgepole pine and Douglas fir showing poor growth were occasionally found within 1.6 km of the coast. Bunsby soils do not usually support merchantable timber and are not manageable under sustained yield.

What little soil is present is highly susceptible to degradation following any form of surface disturbance. If it is adjacent to streams it could provide a significant sediment source. Off-road trafficability will be poor due to hummocky terrain and many steep slopes. Road construction requires significant rock work in unrippable bedrock.

General description of soil properties

Slopes range from 0% to 30% on hummocky terrain. The soils are shallow, well drained, organic deposits (10-40 cm deep) over very shallow (usually less than 10 cm), rapidly drained, mineral materials. Organic materials are Fibri-humimor and Humimor humus forms. Mineral materials are usually high in silts as a result of strong physical weathering and show evidence of strong eluviation (Ae horizon morphology) as a result of strong chemical weathering.

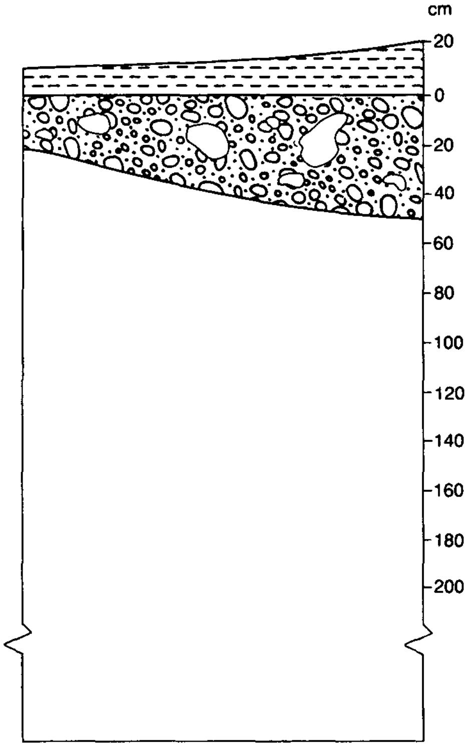
Landform and distribution

Bunsby soils are found on strongly bedrock-controlled, hummocky terrain at mid- to high-elevations in the watershed. They rarely dominate a map unit and are usually found in association with Cuttle soils.

Vegetation and related soil properties

Bunsby soils support a range of vegetation types from the Thuja type on valley side landscapes to the Chamaecyparis and Empetrum types on high elevation landscapes. Nonforested areas are infrequent on moderate slopes at low elevations but do occur in association with exposed bedrock. Forest floors are usually well developed Humimor or Fibri-humimor ranging from a few centimeters to greater than 30 cm thick. Ae horizons are well expressed and commonly the only horizon present. Deep (more than 1 m) forest floor deposits were found near the mouth of the watershed (just outside the survey area), but they were not typical of Bunsby soils found away from the immediate coastal influence.

CUTTLE



Management summary

Cuttle soils have low to moderate productivity of western hemlock and western red cedar. Pacific silver fir was found only rarely and Sitka spruce was not found on Cuttle soils.

Cuttle soils are highly sensitive to erosion if mineral soil is exposed and are usually associated with either steep slopes or hummocky terrain, which seriously limits off-road trafficability. Strong bedrock control, shallow soils and terrain features indicate that significant rock work will be associated with road construction.

Landform and distribution

Cuttle soils are formed in shallow, glacial ice-deposited materials, where bedrock control is strongly expressed. Cuttle soils are found in basal slope, valley side slope, and high-elevation landscapes.

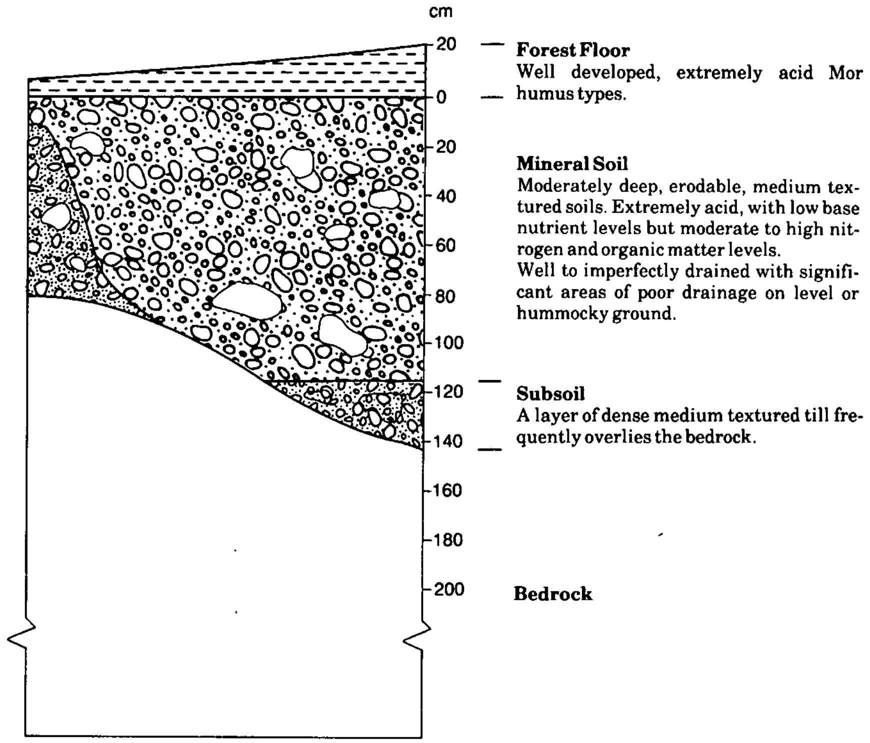
General description of soil properties

Slopes are highly variable but are consistent with the slopes of the associated soils. Bedrock is usually found between 10 and 50 cm deep and the soils are rapidly to well drained, although significant areas of poorly drained soil can be found on hummocky and moderately sloping terrain. Textures are gravelly to very gravelly, silt loams to sandy loams.

Vegetation and related properties

The Cuttle soil supports the <u>Thuja</u> or <u>Tsuga</u> community types at lower elevations and the <u>Chamaecyparis</u> type at higher elevations. Forest floors are 10-20 cm deep and are usually <u>Fibri-humimor</u> to Humimor humus forms. Ae horizons grade from thin and discontinuous at lower elevations to thin but continuous at higher elevations. The mineral soils are Orthic Humo-Ferric to Ferro-Humic Podzols, strongly to extremely acid. Organic matter, nitrogen, and base nutrient levels are high but this is offset by the low rooting volume that results in low productivity.

KAYUMIN



Management summary

Kayumin soils support medium productivity of western hemlock, Pacific silver fir, and western red cedar at lower elevations and moderate to poor productivity of yellow cedar, mountain hemlock, and Pacific silver fir at higher elevations.

High silt content and generally low clay contents combined with sloping terrain make these soils highly erodible if the ground cover is removed. The presence of a water-restricting layer and frequent streams ensures delivery of material eroded from basal slope positions to the main channel.

The parent materials of Kayumin soils are suitable for road construction and present few off-road trafficability problems. Characteristics of the landscape unit in which Kayumin soils are found will strongly influence ease of road construction.

Landform and distribution

Kayumin soils are formed in glacier ice-deposited materials (till), but the deposits are not deep enough to hide the influence of underlying bedrock control on the surface expression of the soils. Kayumin soils are widely distributed, occurring on moderate slopes in basal slope, valley side slope, and high-elevation landscapes.

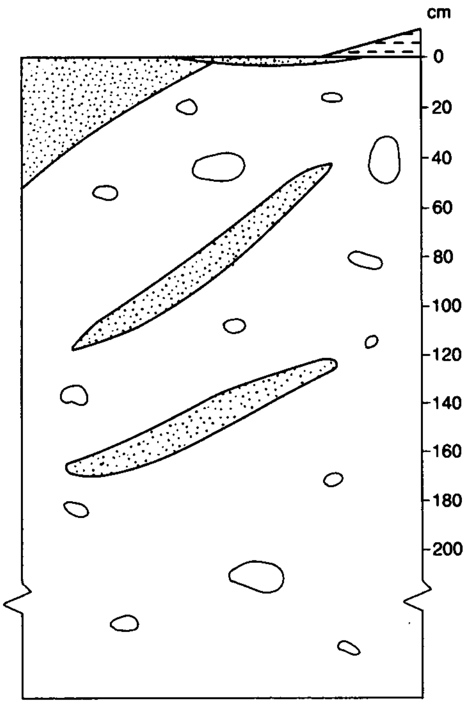
General description of soil properties

Slopes range from 0% to 45% and the surface is usually subdued to somewhat hummocky. A layer of dense till material commonly occurs between the soil surface and bedrock. Bedrock occurs between 50 and 160 cm from the surface. The soils are well to imperfectly drained, but significant areas of poorly drained Kayumin soils may occur in depressions on subdued or hummocky terrain. Textures are gravelly to very gravelly silt loams and loams with high silt contents (35-50%).

Vegetation and related soil properties

Kayumin soils support a range of vegetation community types. The Tsuga-Tiarella type is common in basal slope positions, but, it may be replaced by Tsuga or Thuja types on slopes approaching 50%. At higher elevations the Chamaecyparis type will replace the Tsuga-Tiarella type. Soils are Orthic or less commonly Gleyed Ferro-Humic Podzols. Ae horizons are poorly expressed under Tsuga but they are strongly expressed under Chamaecyparis vegetation types. Organic matter and nitrogen are moderately high and the C:N ratio is high. Soils are strongly to extremely acid and base nutrient status is moderate.

KLASKISH



Forest Floor
Lacking or poorly developed forest floors ranging from Mull to Humimor types.

Upper Mineral Soil Layers
Coarse textured sands and gravels of generally low erodability.
Extremely acid with wide ranges of base nutrient and nitrogen levels.
Imperfectly to poorly drained and frequently flood prone.

Subsoil
Coarse fragmental bouldery gravels are frequently present at depth.

Management summary

Klaskish soils can support medium to good productivity of western hemlock and Sitka spruce if flooding is not severe. Pacific silver fir is excluded from areas with a high water table. Klaskish soils show very low erodibility and are a good source of gravels if located above the active floodplain. Off-road trafficability may present some problems due to low,unconfined bearing strength.

Landform and distribution

Klaskish soils are formed in deep (more than 2 m) level or terraced floodplain deposits. They occur in areas of braided streams where erosion and deposition are proceeding concurrently and in broad areas of the floodplain where channel migration has eroded the medium textured surfaces.

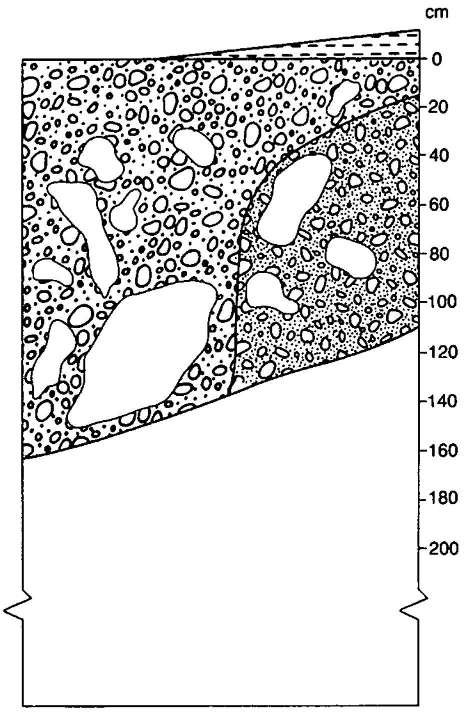
General description of soil properties

Slopes are level or nearly level and surfaces are generally smooth to moderately mounded. No water restricting layers are present, although rooting is restricted by the growing season water table. The soils are rapidly pervious and show rapid water table fluctuations in response to storm patterns. Drainage is usually imperfect to poor and textures are sandy to sandy gravels frequently overlying coarse, bouldery, fragmental gravels.

Vegetation and related soil properties

Vegetation types on Klaskish soils range from non-vegetated, on recent exposures or deposits, to the Tsuga-Tiarella late successional type, on somewhat raised terraces. Soils show progressive development with each successional stage. Base saturation decreases from 40% to 4% and organic matter in the B horizon increases from nearly zero to 5.4%. Soil classification ranges from Orthic Regosols to Gleyed Ferro-Humic Podzols. Ae horizons develop under the Tsuga-Tiarella vegetation type. Fertility of the Klaskish soils is highly variable but relatively high C:N ratios are common.

POWER RIVER



Forest Floor
Discontinous to well developed Fibri Humimor and Humimor humus forms.

Mineral Soil
Fine sandy loam to loam textures are highly erodable and susceptible to active surface creep.
Extremely acid, low base nutrient status but high organic matter and nitrogen levels.
Well drained.

Bedrock

Management summary

Power River soils support medium productivity of western hemlock and Pacific silver fir. Wind firmness does not appear to be a problem. Steep slopes make Power River soils sensitive to surface creep and erosion following disturbance. Seedling establishment on active surfaces may be difficult. Strong bedrock control and steep slopes make road construction difficult, side cast could be a major problem but full bench roads should be stable.

Landform and distribution

Power River soils are formed in colluvial materials on steep (50-80%) valley side slopes. Materials are a mixture of parent rock fragments and a thin layer of valley ice-deposited material that has moved down slope. Bedrock control is strongly evident and steep rock faces are a common associate.

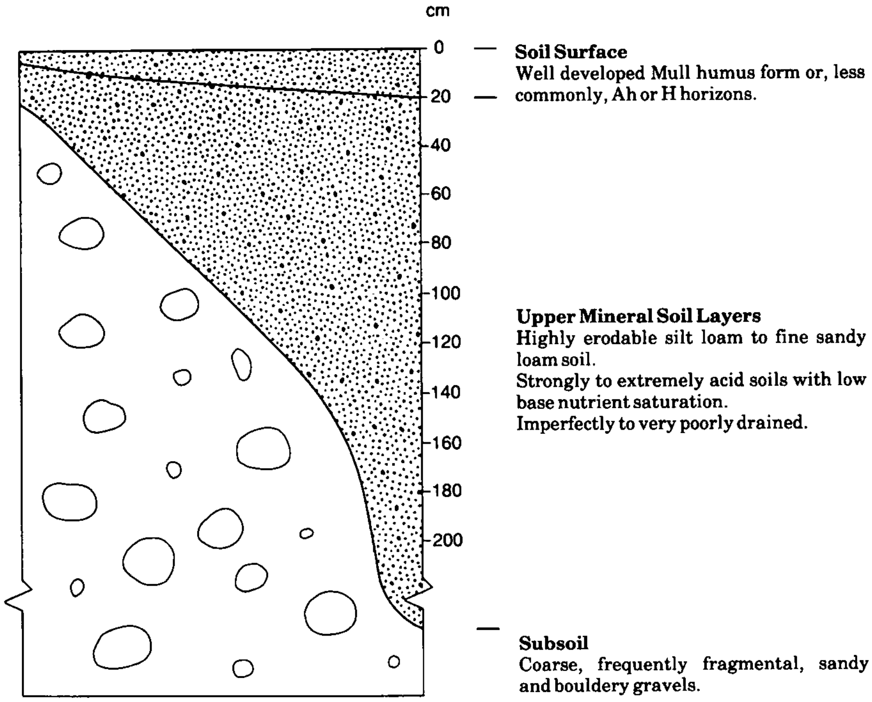
General description of soil properties

Slopes range from 50% to 80% and relatively smooth surfaces are frequently broken by steep rock faces. Bedrock is usually found within 160 cm of the surface and soil surfaces frequently show evidence of down slope movement. Power River soils are well to rapidly drained and textures are very rubbly to fragmental loams and fine sandy loams.

Vegetation and related soil properties

Power River soils support the Tsuga and the Tsuga-Tiarella community types. The Tsuga type generally shows stable surfaces and continuous Mor humus forest floors. Ae horizons are poorly expressed or absent. Organic matter and nitrogen levels are moderate and C:N ratios relatively high. Soil pH is extremely acid and base nutrient status is low. Soils under the Tsuga community type are Orthic Ferro-Humic Podzols. Power River soils supporting the Tsuga-Tiarella community type usually show evidence of surface creep and mixing. Forest floors are discontinuous and Ae horizons discontinuous or absent. Because of surface mixing, soil chemical properties are highly variable. With the exception of C:N ratio, pH and base nutrient saturation, mean values are comparable and variability greater than the same soil under the Tsuga community type. C:N ratios tend to be lower and pH and base nutrient saturation higher under the Tsuga-Tiarella than the Tsuga community types. Soils are Orthic Ferro-Humic Podzols, although the Podzolic B horizon is more strongly expressed under the Tsuga type than under the Tsuga-Tiarella type.

QUINEEX



Management summary

Quineex soils are among the most productive and sensitive soils in the watershed. Productivity of Sitka spruce and western hemlock appears high, but regeneration of those species on mineral soil is problematic. Pacific silver fir does not seem to survive on flood-prone soils, but it does well on better drained soils. Heavy elk browsing reduces an otherwise severe brush problem.

The high silt content of these soils makes them a high potential sediment source if channels are blocked or shifted or if channel banks are disturbed. Quineex soils are frequently flood prone. Off-road trafficability will be good to fair during periods of low water table but will be seriously limited when water tables are high.

Landform and distribution

Quineex soils are usually confined to broad level areas of the floodplain where the flow velocity of flood waters is very slow. They are level or nearly level but frequently have steep-sided active or abandoned channels.

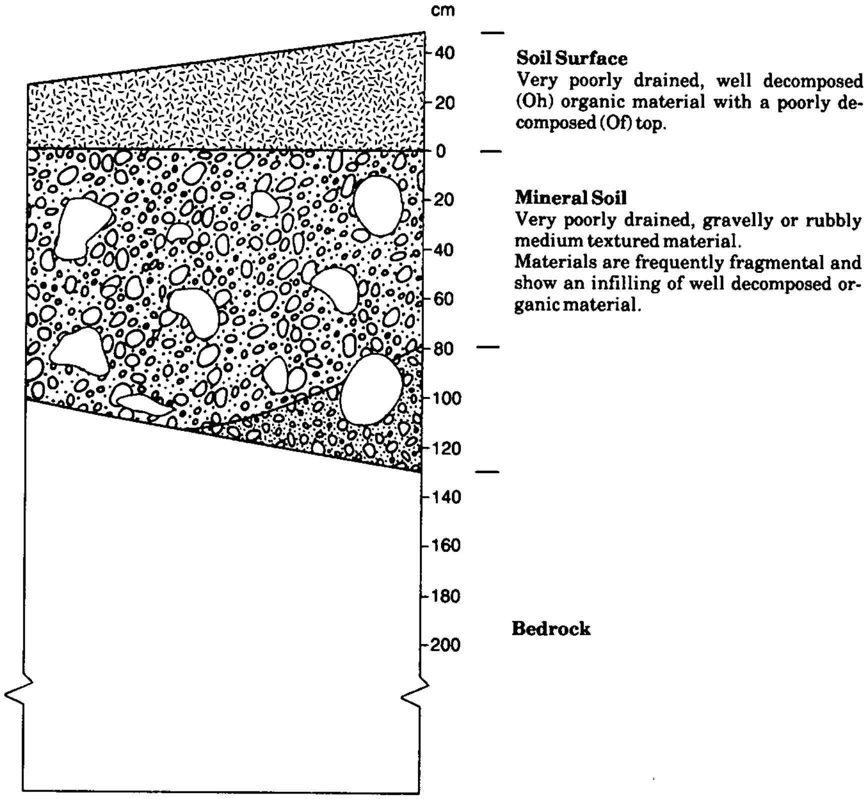
General description of soil properties

Quineex soils are level or nearly level and the surface is smooth to moderately mounded. A layer of fine sandy loam to silt loam overlies coarse, often fragmental, gravels and bouldery gravels from 20 cm to greater than 180 cm deep. Drainage is imperfect to very poor and permeability in the surface material is moderate. Soil structure is minimal, although moderate fine granular structure is often present in the Mull or Ah surfaces.

Vegetation and related soil properties

Quineex soils support a range of vegetation types from the early successional Elymus to early climax Tsuga-Tiarella. A number of soil properties vary with successional stage. The Mull humus form or Ah horizon increases in thickness and then decreases as thin Moder and Mor forest floors develop. Ae horizons are lacking on the younger soils and minimally expressed on older soils. All soils are strongly to extremely acid but have relatively high base nutrient status. Organic matter, nitrogen, cation exchange capacity, and extractable Fe and Al are all high and increase as succession progresses. The C:N ratio remains relatively constant between 10 and 18. All of the Quineex soils sampled meet the chemical criteria for Podzolic soils but they usually lack the morphological requirements when under the Elymus vegetation type. Quineex soils range from Gleyed Dystric Brunisols under the Elymus type to Gleyed Ferro-Humic Podzols under the Tsuga-Tiarella type.

QW'USHIN



Management summary

Qwushin soils have a limited distribution. They do not support productive forest, but the associated vegetation shows evidence of heavy summer ungulate use. Trafficability is low but since they occupy small areas and are shallow, Qwushin soils should present no serious engineering problems if encountered.

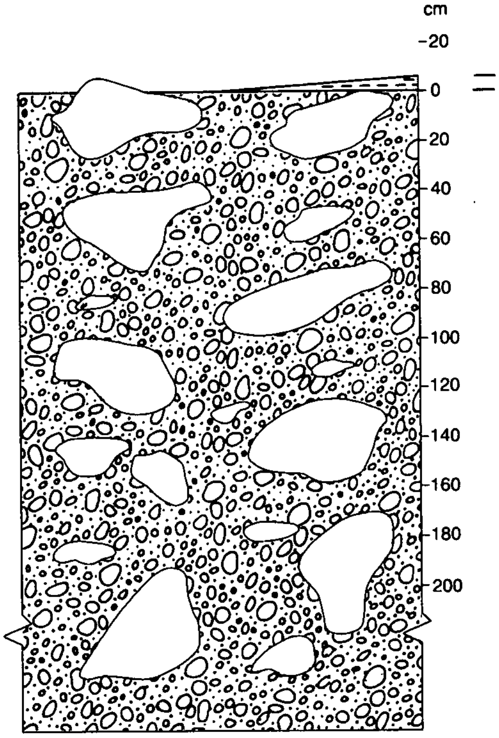
Landform and distribution

Qwushin soils are found at higher elevations in depressional areas or in areas of drainage concentration. They are generally associated with strongly hummocky terrain and low to moderate overall slopes.

Soil properties

Qwushin soils are Organic or more commonly peaty phase Gleysolic soils. They support the distinctive sedge-sphagnum dominated Carex community. The organic soil is dominated by a well-decomposed humic horizon (Oh) topped by a poorly decomposed (Of) horizon. They are extremely acid and show C:N ratios greater than 50:1.

TANAKMIS



Forest Floor
Discontinuous, thin Fibri-humimor to Humimor forest floor.

Mineral Soil
Fine sandy loam to loam, rubbly to very rubbly deposits susceptible to active surface creep.
Extremely acid, low base nutrient status but high organic matter and nitrogen levels.
Well drained.

Management summary

Tanakmis soils support medium productivity for western hemlock and Pacific silver fir. Wind firmness does not appear to be a problem. Steep slopes make Tanakmis soils sensitive to surface creep which makes seedling establishment difficult. Deep deposits produce stable roadbeds with a minimum of rock work but cutbank stability and sidecast migration are serious problems.

Landform and distribution

Tanakmis soils are formed in deep colluvial materials on steep (about 70% slope) valley side slopes. They are found at the base of steep rock faces and consist primarily of parent rock fragments.

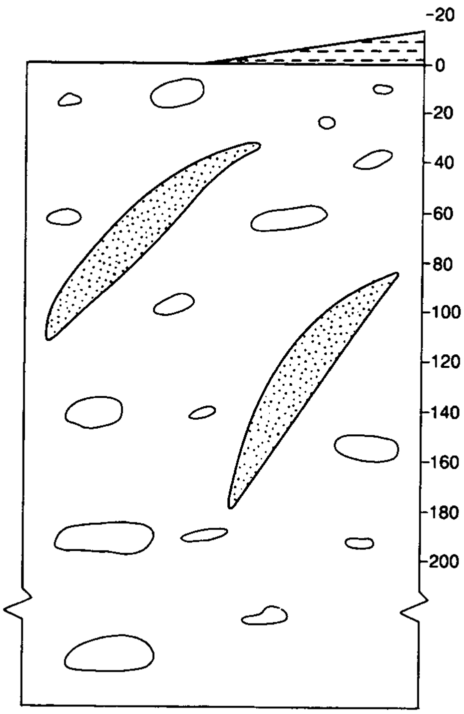
General description of soil properties

Slopes are approximately 70% and surfaces are smooth. Bedrock is usually below 200 cm and surfaces show evidence of downslope movement. Tanakmis soils are well drained and textures are very rubbly to fragmental loams and fine sandy loams.

Vegetation and related soil properties

Tanakmis soils support the fern variant of the Tsuga-Tiarella vegetation type or occasionally the Tiarella community, both of which are maintained by active surface creep. Forest floors are discontinuous and Ae horizons are discontinuous or absent. Differences in surface mixing produce highly variable soil properties. Mean values of organic matter and nitrogen are high whereas C:N ratios are relatively low. The pH is extremely acid and base status is moderate. Soils are Orthic Humo-Ferric Podzols.

UPSOWIS



Management summary

Upsowis soils frequently support early successional, alder-dominated forest but also support medium productivity of western hemlock, Pacific silver fir, and Sitka spruce on later successional sites. The coarse textures present a minimal sediment problem, support good off-road trafficability, and provide a good source of sands and gravels. Upsowis soils are commonly susceptible to overland flow and shifting stream channels.

Landform and distribution

Upsowis soils are formed in deep, water-worked debris fans and fluvial fans emerging from the base of steep valley side slopes. Migrating seasonal surface streams are common.

General description of soil properties

Slopes range from 2% at the base to 15% at the apex of the fan, and surfaces are usually smooth to slightly mounded. No root or water restricting layers were found and, except for the toe of the fan, Upsowis soils are usually well drained. Textures are very gravelly sands and sandy gravels and sand lenses are common.

Vegetation and related soil properties

Upsowis soils support the range of vegetation types from unvegetated recent deposits and early successional Elymus through the late successional Tsuga-Tiarella type. The percentage of organic matter and nitrogen increases with successional stages, whereas base saturation decreases. Ae horizons are lacking on all Upsowis soils and B horizons show increasing Podzol morphology with age. Soil classification ranges from Orthic Dystric Brunisols and Orthic Humo-Ferric Podzols under the Elymus type to Orthic and Gleyed Ferro-Humic Podzols under the Tsuga-Tiarella type. Upsowis soils show low levels of nitrogen and low levels of base nutrients, although the C:N ratio is favorable.

SECTION VII:

INTERPRETATIONS

Introduction

The interpretation of soils for forestry presents a number of problems. Wherever possible, we attempt to apply our understanding of the processes and mechanisms that govern soil or plant behavior to the conditions that will be encountered in the area. This deterministic approach may be done with the use of very sophisticated computer models or, in many cases just as effectively with equations and tables. However, often we do not have an adequate understanding of the processes involved or we cannot collect the data necessary to use the computer models or equations. When this happens, we resort to one of the approaches presented below.

We may choose to collect data on specific soil or landscape properties that, based on our limited understanding of the process, we believe control soil or plant behavior. We then attempt to define statistical relationships that can be used to predict behavior or we can use relationships developed elsewhere to predict behavior in our area. These empirical relationships are usually costly and time consuming to produce and have only a limited chance of successfully predicting behavior outside of the area for which they were developed.

We may choose to classify land based on properties that we believe to be important to behavior and then attempt to document the behavior of these classes. For example, we may find that a specific soil type commonly fails when timber is removed and therefore conclude that this soil has a high sensitivity to mass movement following logging. This taxonomic approach is usually less expensive and time consuming than defining regression equations and may produce comparable or better results. Statistical procedures can and should be used to determine the probability of a specific soil exhibiting a specific behavior.

The probability of success with the use of these methods depends mostly on how wisely we choose the variables. Both procedures are risky because a property or properties not being used may actually be controlling the behavior. The relationships we define may fail if the properties controlling behaviour change.

In this study, we chose to use the taxonomic approach, but we modified it to incorporate more deterministic models when possible. Where our understanding of the processes involved was ill defined, we chose to use the taxonomic approach exclusively. Where our understanding was better but the data necessary to predict response could not be gathered precisely enough, we used a combination of the deterministic and taxonomic approaches. Where widely tested empirical relationships were available we used a combination of the empirical and taxonomic approaches. The deterministic or empirical model was used to define the range of response likely to be encountered under the range of conditions occurring in a given taxonomic class. The landscape unit based interpretations that follow represent purely taxonomic interpretations, whereas the delineation specific interpretations represent a combination of taxonomic, deterministic-taxonomic (e.g. mass movement hazard), and empirical-taxonomic (e.g. sediment hazard) interpretations.

Landscape unit based interpretations

For many of the interpretations requested of the Power River inventory there is no clear understanding of precisely how the site, soil, and vegetation properties of an area interact in response to management. Because interpretations were required, a taxonomic approach was used. Properties known to be important to the interpretation (even though the nature of the property interactions are unknown) were used as the basis for classifying areas of land into recurring types (landscape units). The landscape units were then described both in terms of the interpretive properties and the characteristics of the landscape setting. These descriptions were then interpreted based on empirical knowledge of the response of similar units to management.

Forestry values

Forestry values for landscape units were evaluated in terms of site class, limitations to regeneration, and present timber volume. All three categories were rated on the basis of existing conditions in the watershed. Site class is directly comparable to the British Columbia Ministry of Forests Inventory Branch site class used on forest cover maps. It was based on the best growth observed for each landscape unit. Limitations to regeneration were based on observed response following disturbance, the probable frequency of disturbance severe enough to destroy established regeneration, or the absence of regeneration expected to occur on a landscape unit. Present timber volume is only a rough evaluation used to estimate commercial interest in harvesting. Scrub indicates no commercial interest, low would indicate only marginal commercial interest, and medium to high indicates definite commercial interest. Low covers, for example, would only be of interest if readily accessible at a minimal cost. British Columbia Ministry of Forests inventory maps are available at appropriate scale and should be used for more precise timber estimates.

Wildlife values and concerns

Descriptions of the 20 landscape units were distributed to the Fish and Wildlife Branch of the British Columbia Ministry of Environment for evaluation by biologists and technicians familiar with the area. Each unit was rated for seasonal range use by deer and elk. Ratings were established as follows:

High: area identified as critical or prime winter range for deer or elk.

Moderate: area identified as definite elk winter range, definite spring and fall range for deer and elk, or as important travel corridors.

Low: areas identified as possible spring, fall, or winter range for deer and elk.

The final ratings for elk habitat, established by the Habitat Protection Officers of the British Columbia Ministry of Environment, were in close agreement with those based on the landscape unit descriptions. However, there were major discrepancies between the ratings based on the landscape unit descriptions and the final ratings of the Habitat Protection Officers when critical winter range for deer was considered. The primary reason for this discrepancy is the reliance on elevation, aspect, and the frequency of non-forested rock outcropping as primary factors in evaluating deer winter range. Of these data, only frequency of rock outcropping was available from the landscape unit descriptions. Further, many areas ultimately rated as critical deer winter range were not rated as potential winter range for deer based on the landscape unit descriptions. This suggests that elevation and aspect are overriding criteria in the evaluation and should be incorporated, either as overlays at appropriate scale or as mapping parameters, in any future work.

Fisheries concerns

Descriptions of the 20 landscape units were distributed to the Fish and Wildlife Branch of the British Columbia Ministry of Environment and to federal fisheries for evaluation and comment by biologists and technicians familiar with the area. Ratings were established on the basis of probable harvesting impacts on water quality as follows:

High:
- i) Areas where mass movements are probable and are likely to reach the main channel or tributary streams.
- ii) Areas of channel migration that are subject to channel diversion as a result of harvesting or road construction, or that have unstable channel banks.

Medium:
- i) Areas of moderate to high sediment hazard but lacking streams with gradients lower than 15%.
- ii) Areas of low sediment hazard but containing significant streams with gradients lower than 15%.

Low: Areas where harvesting is unlikely to have an impact on water quality.

Interpretations based on individual polygons

The varied interpretive needs of the project were met by retaining, on a polygon specific basis, the data on which the required intepretations are based. Thus, information not utilized in the landscape unit classification has not been lost and the map delineations can be regrouped for specific interpretations. Interpretive classifications and maps have been made for flood, torrent, mass movement, sediment, and avalanche hazards. These interpretations are discussed below.

Flood hazard

Flood hazard refers to probable inundation by main channel waters. Flooding by this definition is possible only on floodplain units, specifically Quineex and Klaskish soils. In addition, at least 20% of the map delineation must show evidence of flooding for the unit to be considered as having a flood hazard. Flood frequency is difficult to estimate. However, vegetation succession provides a good indication of the relative time period since an area was last disturbed and, indirectly, some estimate of probability of disturbance. Nonvegetated areas represent the earliest stage of succession and, indirectly, the extreme probability of disturbance. The *Elymus* community type is considered early successional (high flood frequency) and the *Tiarella* community type mid to late successional (moderate to low flood frequency). All other defined communities are considered early climax communities with no potential flood hazard. While inundation on early climax or climax communities is possible, flow velocities are unlikely to be high enough to cause disturbance, nor duration long enough to cause tree mortality.

Torrent hazard

Torrent hazard refers to the probability of debris or water torrents crossing a map delineation. Debris or water torrents are normally confined to gullies on steep terrain but become unconfined where the torrent encounters a sharp slope break at basal slopes where the energy is rapidly dissipated and deposition occurs.

Evidence of unconfined torrents was found only on basal slopes and was associated with Upsowis or Atush Trail soils. Frequency of torrents is difficult to estimate, however, vegetation succession gives a reasonable estimate of time since last disturbance and, indirectly, of frequency. Map delineations with Upsowis or Atush Trail soils and no evidence of early successional, *Elymus*, or midsuccessional, *Tiarella*, vegetation were considered to have no torrent potential. Map delineations with 10% to 20% early to midsuccessional vegetation on Upsowis or Atush Trail soils were classed as low torrent potential. Those with greater than 20% total cover of early and midsuccessional vegetation, of which less than 20% is early successional, were classed as moderate torrent potential. Those areas with at least 20% early successional vegetation were classified as having a high torrent potential.

There is little evidence of gully confined debris torrents visible on air photographs at the scale used. Therefore, frequency of gullying was used as the best estimate of torrent potential available. Debris and water torrents are generally caused by debris entering a gully and causing a temporary dam. When the dam breaks, a torrential flow results, which carries the debris from the dam and often scours the gully or channel. The greater the frequency of gullies the greater the probability of such dams forming. Therefore, map delineations lacking gullies were mapped as having no torrent potential. Delineations having few, common, and many gullies were mapped as having low, moderate, and high probabilities respectively. In addition, delineations having common to many failures or common to many gullies, or both were mapped as having an extreme torrent potential.

Mass movement hazard

Mass movement in this discussion refers to shallow planar or rotational failures in noncohesive granular materials. They are the common failures associated with relatively shallow soils over consolidated rock or highly compacted till. The problem of deep-seated slope instability is not considered to be a significant problem in the Power River watershed.

The slope model of Terzagi 1950 can be used to define broad classes of potential instability. Two critical slopes in evaluating a factor of safety are the slope at which well-drained, unconsolidated, noncohesive, granular materials will stand without failing and the angle at which the same materials will stand when saturated. Those two slopes can be determined from the model used to calculate the factor of safety.

Taken from O'Loughlin (1974) the factor of safety (F.S.) is calculated as

$$F.S. = \frac{Ca + (W_bZ \cos^2\alpha) \tan\phi}{W_sZ \sin \cos}$$

which reduces to $\frac{Ca + W_b \cos\alpha \tan\phi}{W_s \sin\alpha}$

where Ca = apparent soil cohesion

W_b = buoyant unit weight of soil

Z = depth to shear plane

α = slope angle of shear plane

ϕ = angle of internal friction

W_s = saturated unit weight of soil

Using a number of reasonable assumptions the critical slope limits below which soils should not be expected to fail can be derived for saturated (poorly drained) and unsaturated (well-drained) soils. The assumptions are as follow:

1) soils are saturated (water at the surface),
2) soils are lacking any apparent cohesion,
3) soils are at the low end of the bulk density range found,
4) estimated particle density is 2.65, and
5) the angle of internal friction is 35° (estimated from the angle at which road fill and talus slopes stand in the area).

The equation is solved using the following values or estimates:

Ws = unit weight of dry soil + unit weight of water. For a saturated soil the unit weight of water will be equal to the proportion of the soil occupied by pores or 1 - (bulk density/particle density) = 0.57

Ws = bulk density + [1-(bulk density/particle density)]
= 1.15 + 0.57

Wb = unit weight of saturated soil - unit weight of water

Solving for a 16.4° completely saturated slope the factor of safety is

$$F.S. = \frac{0 + 0.72 \cos 16.4 \tan 35}{1.72 \sin 16.4} = 1.00$$

indicating that, even under extreme conditions, slopes less than 16.4° (29%) would not be expected to fail. A similar calculation for well drained soils at 35° (70%) slopes also produces a factor of safety of 1 (70% is the angle of repose). Soils with a factor of safety less than 1 are considered unstable and soils with a factor of safety of 1 or greater are considered stable.

An analysis of slope data collected in the Power River watershed showed five major slope classes:

0-3% Usually found on floodplain sites or abandoned terraces.

3-15% Dominantly found on fluvial deposits formed by tributary streams.

15-32% Dominantly found on fluvial deposits formed at the base of steep slopes where the stream gradient changed significantly.

32-50% Usually found on morainal deposits in the basal slope or high elevation landscapes and showing little evidence of present or past failures.

50-80% Usually found on colluvial deposits or on morainal deposits showing signs of active failure.

The slope data tends to be supportive of the stability model in that slopes less than 30% showed no evidence of past or incipient failure. There was only one failure noted on the 32-50% slopes and the site showed surface water flow during rainstorms. Failures in the 50-80% range always showed evidence of saturated flow at slopes below 70%.

Based on this analysis, five mass movement hazard classes were proposed:

None These areas are not expected to fail under any conditions. Slopes less than 30%.

Low These soils are not expected to fail, but may do so under extreme conditions. Slopes between 30% and 49%.

Moderate These areas are not expected to fail under existing conditions, but may do so if water tables are present and the apparent cohesion contributed by roots is lost, or if water tables are raised as a result of hydrologic disruption. Slopes between 50% and 70%.

High These areas may be expected to fail as a result of a reduction in apparent cohesion following a disturbance or timber removal. Slopes greater than 70%.

Extreme These areas may be expected to fail even without disturbance as a result of ongoing geomorphic processes. Areas with recent failures are also considered extreme.

These classes ignore landscape features that produce a range of site conditions within a given map unit or delineation and they ignore features that would mitigate or aggravate the impact of a site specific failure. In an attempt to improve the usefulness of the interpretive classes, additional site and soil features were applied to each defined soil to modify the rating.

Differences in bulk density and the angle of internal friction will cause some variation around the derived critical slope values, but it is clear that nearly all floodplain and basal slope soils have slopes falling below the critical lower limit. These soils, including Quineex, Klaskish, Upsowis, Kayumin, Atush Trail, Aanimi, low slope Cuttle and Bunsby, are all considered to have no or low potential mass movement hazard.

Power River soils have slopes between 50% and 70% (only occasionally greater than 70%). They fall within the moderate hazard class but certain landscape features are used to modify this rating. If the slope of the map delineations is not continuous (broken or hummocky), any failures that occur are likely to be small and of limited extent so the mass movement hazard is considered low. If the map delineation slope is relatively continuous, mass movements may be larger and travel farther so the mass movement hazard is considered moderate. If the map delineation is gullied there is a likelihood of localized steeper slopes and the probability of long distance transport in the gullies is high. Under these conditions, mass movement hazard is considered high.

Battle soils commonly exceed 70% slope and as such are rated as having a high mass movement hazard but, in addition, they are often gullied. When this occurs the hazard is considered extreme. Furthermore, the hazard rating of any map delineation showing past mass movements is considered high and if such evidence is common or frequent the hazard is considered extreme.

Tanakmis (steep) soils present a special case. They are deep, noncohesive granular deposits (colluvial aprons and fans) and, as such, are not prone to shallow planar failures despite slopes which frequently attain 70%. They are unlikely to fail even when subjected to road construction but will present problems with cutbank and sidecast migration. Mass movement hazard on Tanakmis soils is considered low.

Sediment hazard

Sediment hazard refers to the potential for a map delineation to deliver sediments to the main channel. It is based on both the erodability of the soil and the ability of the drainage system to deliver sediments. The erosion nomograph of Wischmeier et al. (1971) was used to evaluate the inherent erodability of the soil. Soils of the Power River watershed can be grouped into three erodability classes: Low- (K value 0.03 to 0.05) includes Klaskish and Upsowis soils; Medium- (K value 0.05 to 0.20) includes Atush Trail soils. High- (K value 0.25 to 0.35) includes Aanimi, Bunsby, Cuttle, Kayumin, Power River, and Quineex soils.

All the soils with low erodability are low slope, coarse textured, water-worked deposits with low silt and clay contents. Many are frequently flooded or subject to active channel migration, so the potential impact of management is low and there is little or no silt size material to produce sediment. Sediment hazard for these units is low.

Soils in the moderate erodability classes are deep, well-drained, highly permeable soils that show little evidence of surface flow except in deep, well-channelized drainage lines. They are stable units with a well developed ground cover of mosses, herbs, and shrubs. Timber removal without serious surface disturbance is unlikely to produce serious erosion or sediment yield; however, with disruption of the ground cover erosion could become a problem in disturbed areas. Sediment hazard is rated as moderate.

Soils in the high erodability class present a more difficult rating problem. Quineex soils, which have high silt and no gravel content, are not usually subject to overland flow of appreciable velocity and, being level, do not normally present erosion problem. They do, however, frequently have permanent or temporary channels with near vertical channel banks which, if disturbed, could produce large volumes of sediment. They are also subject to disturbance by periodic channel migration, which can produce large sediment loads. Because of these factors Quineex soils are rated as having a high sediment hazard.

Kayumin and Cuttle soils in basal or valley side slope positions usually have low to moderate slopes with deranged drainage lines and short complex slopes. Flow velocity in streams is usually low, and short slope lengths reduce the erosion potential. Ground cover is well developed and if undisturbed will prevent erosion. If the ground cover is disturbed, some localized erosion will occur, which may be delivered to the main channel. Sediment hazard is considered low.

Power River and Cuttle soils on steep valley side slopes, when they support the _Tsuga_-_Tiarella_ shrub variant, _Tsuga_, or _Thuja_ vegetation types, have well-developed ground cover, which prevents erosion. Drainages are usually small, bedrock-controlled, and well established, but road construction will produce large areas of exposed cut banks and fillslopes and, unless carefully designed, will disrupt the natural drainage system. Steep slope Cuttle and Power River soils are rated low for sediment hazard following timber removal, but have a high sediment hazard associated with road construction. PowerRiver soils that support the _Tsuga_-_Tiarella_ fern variant vegetation type have active surfaces and low ground cover. They usually show some evidence of splash erosion. Sediment hazard following timber removal is therefore rated as moderate. Sediment hazard associated with road construction is rated high, as it is for Kayumin on steep slopes.

Aanimi soils in basal slope positions usually have moderate continuous slopes. Drainage lines are well incised and often have steep sides. A well-developed ground cover protects the soils from erosion, but destruction of the ground cover or disruption of natural drainage lines could lead to serious localized erosion. The established drainage lines would provide an efficient delivery of the sediments produced, to the main channel. Sediment hazard is considered moderate.

Battle soils on steep valley side slopes show frequent gullies, long, continuous, steep slopes, gully associated slope failures, and frequent areas of poorly developed ground cover. Timber removal may increase the effect of raindrop impact and lead to decreased slope stability thereby accelerating erosion on exposed soils and delivering debris to stream beds. Road construction may increase mass wasting and will expose large areas of erodible cut banks and fill slopes. Sediment hazard is high following timber removal and extreme following road construction.

The hazard rating assigned to each map delineation is the rating of the most hazardous soil which occupies greater than 30% of the map delineation.

Interpretive and derived maps

It is often convenient, during the planning of watershed development, to compare the distribution of land types, expected responses, or resource values and to physcially overlay these maps to check for potentially conflicting resource uses. To assist with these procedures, maps displaying the interpretations presented in Section VII were plotted at a scale of 1:15 840. Two additional maps, not discussed in Section VII were plotted as well. One, a map titled Bedrock Control, was produced to identify the proximity of bedrock to the soil surface and a second, titled Resource Concerns, presented the relative resource values for wildlife, fisheries, and forestry on one map. The Resource Concerns map provided a useful basis for discussion but, because of the problems identified in the discussion on wildlife interpretations for deer winter range, were not definitive.

Reduced versions of these maps, together with comparable reductions of the polygon and landscape maps, are incluced in the map pocket at the back of this report.

REFERENCES

British Columbia Ministry of Forests. 1978. Forest Planning Handbook. Planning Division, Victoria, B.C. 142 pp.

Ceska, A.; Roemer, H. 1971. A computer program for identifying species-releve groups in vegetation studies. Vegetatio 23:255-277.

Crum, H.A.; Steere, W.C.; Anderson, L.E. 1973. A new list of mosses of North America north of Mexico. Bryologist 76(1):85-130

Halm, J. 1978. UBC:BMD07 Stepwise discriminant analysis. Adapted from UCLABMD Documentation. Computing Centre, University of British Columbia, Vancouver, B.C.

Klinka, K. and S. Phelps. 1979. Environment-vegetation tables by a computer program. Vancouver, B.C., University of British Columbia, Faculty of Forestry. 24 pp.

Moon, D.E.; Brierley, J.A. 1984. Land resource inventory of Mill and Woodfibre Creeks watershed, British Columbia. Land Resource Research Centre, Contribution No. 83-62 Agriculture Canada, C.E.F., Ottawa. In press.

Mueller-Dombois, D.; Ellenberg, H. 1974. Aims and methods of vegetation ecology. John Wiley & Sons, New York. 574 pp.

Muller, J.E. 1977. Geology of Vancouver Island and Gulf Islands. Geological Survey of Canada, open file 463 (maps).

Nie, H.H.; Hull, C.H.; Jenkins, J.C.; Steinbrenner, K; Bent, D.H. 1975. SPSS Statistical Package for the Social Sciences. McGraw-Hill Publications, New York. 675 pp.

O'Loughlin, C. 1974. The effects of timber removal on the stability of forest soils. J. Hydrol. (Dunedin) 13(2):121-134

Patterson, J.M.; Whitaker, R.A. 1978. Hierarchical grouping analysis with optional contiguity constraint: UBC CGROUP. Computing Centre, Univ. of British Columbia, Vancouver, B.C.

Taylor, R.L.; MacBryde, B. 1977. Vascular plants of British Columbia. Tech. Bull. No. 4. The Botanical Garden, Univ. of British Columbia, Vancouver, B.C. UBC Press, Vancouver, B.C. 754 pp.

Terzagi, K. 1950. Mechanism of landslides. In: Application of geology to engineering practice. Geol. Soc. Am., Berkey Volume pp. 83-123.

Walmsley M.; Utzig, G.; Vold, T.; Moon, D; van Barneveldt, J. 1980. Describing Ecosystems in the Field. RAB Tech. Pap. 2. Land Management Rep. No. 7. Ministry of Environment, Parliament Buildings, Victoria, B.C. 225 pp.

Wischmeier, W.H.; Johnson, C.B.; Cross, B.V. 1971. A soil erodability nomograph for farmland and construction sites. J. Soil Water Conserv. 26(5):189-193

APPENDIXES

APPENDIX A: SPECIES LISTS

A1: Alphabetical listing by scientific name

Scientific and common names follow Taylor and MacBryde, 1977.

Vascular species

Abies amabilis (Dougl.) Forbes	Pacific silver fir
Acer glabrum Torr. var. douglasii (Hook.) Dippel	Rocky Mountain maple
Achillea millefolium L.	common yarrow
Adenocaulon bicolor Hook.	trailplant
Adiantum pedatum L.	northern maidenhair fern
Agrostis exarata Trin.	spike bent grass
Agrostis spp. L.	bent grass
Alnus rubra Bong.	red alder
Alnus viridis (Chaix) DC. subsp. sinuata (Regel) Love & Love	sitka mountain alder
Anaphalis margaritacea (L.) B. & H.	common pearly everlasting
Angelica arguta Nutt.	sharp-toothed angelica
Aquilegia formosa Fisch.	sitka columbine
Athyrium filix-femina (L.) Roth.	common lady fern
Blechnum spicant (L.) Roth	deer fern
Boschniakia hookeri Walpers	Vancouver groundcone
Boykinia occidentalis Torr. & Gray	coast boykinia
Bromus sitchensis Trin.	Alaska bromegrass
Calamagrostis spp. Adans	small reed grass
Caltha leptosepala DC. var. biflora (DC.) G. Lawson	two-flowered white marsh-marigold
Carex canescens L.	hoary sedge
Care hoodii Boott	Hood's sedge
Carex mertensii Prescott	Mertens' sedge
Carex nigricans Meyer	black alpine sedge
Carex obnupta Bailey	slough sedge
Carex macloviana D'Urville subsp. pachystachya (Chamisso ex Steudel) Hulten	thick-headed sedge
Cassiope mertensiana (Bong.) G. Don	Mertens' cassiope
Chamaecyparis nootkatensis (D. Don) Spach	yellow cedar
Circaea alpina L.	alpine enchanter's-nightshade
Cladothamnus pyroliflorus Bong.	copperbush
Claytonia sibirica L.	siberian spring beauty
Clintonia uniflora (Schultes) Kunth	blue-bead clintonia

Coptis aspleniifolia Salisb.	spleenwort-leaved goldthread
Cornus canadensis L.	Canadian bunchberry
Drosera rotundifolia L.	round-leaved sundew
Dryopteris assimilis Walker	spiny shield fern
Eleocharis rostellata (Torr.) Torr.	beaked spike-rush
Elymus hirsutus Presl.	hairy wild rye grass
Empetrum nigrum L.	black crowberry
Epilobium brevistylum Barley	sierra willowherb
Epilobium ciliatum Raf.	purple-leaved willowherb
Erigeron peregrinus (Pursh) Greene	subalpine fleabane
Eriophorum angustifolium Honck.	narrow-leaved cotton-grass
Fauria crista-galli (Menzies ex Hooker) Makino	deer-cabbage
Fragaria vesca L.	wood strawberry
Galium triflorum Michx.	sweet-scented bedstraw
Gaultheria shallon Pursh	salal
Gentiana sceptrum Griseb.	king gentian
Gentiana spp. L.	gentian
Goodyera oblongifolia Raf.	large-leaved rattlesnake orchid
Gymnocarpium dryopteris (L.) Neum.	oak fern
Huperzia selago Bern.	fir club-moss
Juncus ensifolius Wikst.	sword-leaved rush
Juncus spp. L.	rush
Juncus supiniformis Engelm.	spreading rush
Linnaea borealis L.	northern twinflower
Listera cordata (L.) R. Br.	heart-leaved twayblade
Luzula parviflora (Ehrh.) Desv.	small-flowered wood-rush
Lycopodium clavatum L.	running club-moss
Lycopodium sitchense Rupr.	Alaska club-moss
Lysichiton americanum Hulten & St. John	American skunk-cabbage
Maianthemum dilatatum (Wood) Nels. & Macbr.	two-leaved false Solomon's-seal
Malus fusca Raf.	Pacific crab apple
Melica subulata (Griseb.) Scribn.	Alaska onion grass
Menziesia ferruginea Smith	rusty Pacific menziesia
Mimulus guttatus DC.	common monkeyflower
Moneses uniflora L.	one-flowered wintergreen
Mycelis muralis (L.) Dumortier	wall-lettuce
Oenanthe sarmentosa Presl ex DC.	Pacific oenanthe
Oplopanax horridus (Smith) Mig.	devil's-club
Orobanche uniflora L.	one-flowered broomrape
Osmorhiza chilensis H. & A.	mountain sweetcicely
Phyllodoce empetriformis (Smith) D. Don	red mountain-heather
Picea sitchensis (Bong.) Carr	Sitka spruce

Pinus contorta Dougl.	shore pine
Platanthera stricta Lindley	slender rein orchid
Pleuropogon refractus (Gray) Benth.	nodding semaphore grass
Poa marcida Hitchc.	weak blue grass
Polystichum munitum (Kaulf.) Presl.	western sword fern
Prenanthes alata (Hook.) D. Dietr.	western rattlesnakeroot
Prunella vulgaris L.	common self-heal
Ranunculus uncinatus D. Don	little-flowered buttercup
Rosa gymnocarpa Nutt.	baldhip rose
Rosa nutkana Presl.	nootka rose
Rubus pedatus J.E. Smith	five-leaved creeping raspberry
Rubus spectabilis Pursh	salmonberry
Sambucus racemosa L. subsp. *pubens* (A. Mich.) House var. *arborescens* (T. & G.) Gray	coastal American red elder
Selaginella wallacei Hienon.	Wallace's selaginella
Sparganium emersum Rehm.	simple-stemmed bur-reed
Stachys cooleyae Heller	Cooley's hedge-nettle
Stenanthium occidentale Gray	western mountainbells
Streptopus amplexifolius (L.) DC.	cucumberroot twistedstalk
Streptopus roseus Michx.	simple-stemmed twistedstalk
Taxus brevifolia Nutt.	western yew
Thuja plicata Donn	western red cedar
Tiarella laciniata Hook.	cut-leaved foamflower
Tiarella trifoliata L.	trifoliate-leaved foamflower
Tofieldia glutinosa (Michx.) Pers.	sticky false asphodel
Tolmiea menziesii (Pursh) T. & G.	piggy-back plant
Trautvetteria caroliniensis (Walt.) Vail	false bugbane
Trientalis europaea L. subsp. *arctica* (Fisch. ex Hook.) Hulten	northern starflower
Trisetum cernuum Trin.	nodding trisetum
Tsuga heterophylla (Raf.) Sarg.	western hemlock
Tsuga mertensiana (Bong.) Carr.	mountain hemlock
Vaccinium alaskaense Howell	Alaskan blueberry
Vaccinium deliciosum Piper	cascade blueberry
Vaccinium ovalifolium Smith	oval-leaved blueberry
Vaccinium parvifolium Smith	red huckleberry
Veratrum viride Ait.	green false hellebore
Veronica serpyllifolia L.	thyme-leaved speedwell
Viola glabella Nutt.	yellow wood violet
Viola sempervirens Greene	trailing evergreen yellow violet

Bryophytes

Dicranum spp. Hedw.	
Hylocomium splendens (Hedw.) B.S.G.	stairstep moss
Hypnum circinale Hook.	
Leucolepis menziesii (Hook.) Steere	
Mnium glabrescens Kindb.	
Mnium insigne Mitt.	
Plagiothecium undulatum (Hedw.) B.S.G.	
Pogonatum contortum (Brid.) Lesq.	
Pogonatum alpinum var. sylvaticum (Hoppe) Lawt.	
Polytrichum juniperinum Hedw.	hair cap moss
Rhacomitrium spp. Brid.	
Rhytidiadelphus loreus (Hedw.) Warnst.	
Rhytidiadelphus triquetrus (Hedw.) Warnst.	shaggy moss
Rhytidiopsis robusta (Hedw.) Broth.	
Sphagnum capillaceum (Weiss) Schrank	
Sphagnum squarrosum Crome	
Stokesiella oregana (Sull.) Robins.	

A2: Alphabetical listing by commmon name

Alaska bromegrass	*Bromus sitchensis* Trin.
Alaska club-moss	*Lycopodium sitchense* Rupr.
Alaska onion grass	*Melica subulata* (Griseb.) Scribn.
Alaskan blueberry	*Vaccinium alaskaense* Howell
American skunk-cabbage	*Lysichiton americanum* Hulten & St. John
Alpine enchanter's-nightshade	*Circaea alpina* L.
baldhip rose	*Rosa gymnocarpa* Nutt.
beaked spike-rush	*Eleocharis rostellata* (Torr.) Torr.
bent grass	*Agrostis* spp. L.
black alpine sedge	*Carex nigricans* Meyer
black crowberry	*Empetrum nigrum* L.
blue-bead clintonia	*Clintonia uniflora* (Schultes) Kunth
Canadian bunchberry	*Cornus canadensis* L.
cascade blueberry	*Vaccinium deliciosum* Piper
coast boykinia	*Boykinia occidentalis* Torr. & Gray
coastal American red elder	*Sambucus racemosa* L. subsp. *pubens* (A. Mich.) House var. *arborescens* (T. & G.) Gray
common lady fern	*Athyrium filix-femina* (L.) Roth.
common monkeyflower	*Mimulus guttatus* DC.
common pearly everlasting	*Anaphalis margaritacea* (L.) B. & H.
common self-heal	*Prunella vulgaris* L.
common yarrow	*Achillea millefolium* L.
Cooley's hedge-nettle	*Stachys cooleyae* Heller
copperbush	*Cladothamnus pyroliflorus* Bong.
cucumberroot twistedstalk	*Streptopus amplexifolius* (L.) DC.
cut-leaved foamflower	*Tiarella laciniata* Hook.
deer-cabbage	*Fauria crista-galli* (Menzies ex Hooker) Makino
deer fern	*Blechnum spicant* (L.) Roth.
devil's-club	*Oplopanax horridus* (Smith) Miq.
false bugbane	*Trautvetteria caroliniensis* (Walt.) Vail
green false hellebore	*Veratrum viride* Ait.
fir club-moss	*Huperzia selago* Bern.
five-leaved creeping raspberry	*Rubus pedatus* J.E. Smith

gentian	*Gentiana* spp. L.
hair cap moss	*Polytrichum juniperinum* Hedw.
hairy wild rye grass	*Elymus hirsutus* Presl
heart-leaved twayblade	*Listera cordata* (L.) R. Br.
hoary sedge	*Carex canescens* L.
Hood's sedge	*Carex hoodii* Boott
king gentian	*Gentiana sceptrum* Griseb.
large-leaved rattlesnake orchid	*Goodyera oblongifolia* Raf.
little-flowered buttercup	*Ranunculus uncinatus* D. Don
Merten's cassiope	*Cassiope mertensiana* (Bong.) G. Don
Merten's sedge	*Carex mertensii* Prescott
mountain hemlock	*Tsuga mertensiana* (Bong.) Carr.
mountain sweetcicely	*Osmorhiza chilensis* H. & A.
narrow-leaved cotton-grass	*Eriophorum angustifolium* Honck.
nodding semaphore grass	*Pleuropogon refractus* (Gray) Benth.
nodding trisetum	*Trisetum cernuum* Trin.
nootka rose	*Rosa nutkana* Presl
northern maidenhair fern	*Adiantum pedatum* L.
northern starflower	*Trientalis europaea* L. subsp. *arctica* (Fish. ex Hook.) Hulten
northern twinflower	*Linnaea borealis* L.
oak fern	*Gymnocarpium dryopteris* (L.) Neum.
one-flowered broomrape	*Orobanche uniflora* L.
one-flowered wintergreen	*Moneses uniflora* L.
oval-leaved blueberry	*Vaccinium ovalifolium* Smith
Pacific crab apple	*Malus fusca* Raf.
Pacific oenanthe	*Oenanthe sarmentosa* Presl ex DC.
Pacific silver fir	*Abies amabilis* (Dougl.) Forbs
piggy-back plant	*Tolmiea menziesii* (Pursh) T. & G.
purple-leaved willowherb	*Epilobium ciliatum* Raf.
red alder	*Alnus rubra* Bong.
red huckleberry	*Vaccinium parvifolium* Smith
red mountain-heather	*Phyllodoce empetriformis* (Smith) D. Don
Rocky Mountain maple	*Acer glabrum* Torr. var. *douglasii* (Hook.) Dippel
round-leaved sundew	*Drosera rotundifolia* L.
running club-moss	*Lycopodium clavatum* L.
rush	*Juncus* spp. L.

rusty Pacific menziesia	Menziesia ferruginea Smith
salal	Gaultheria shallon Pursh
salmonberry	Rubus spectabilis Pursh
shaggy moss	Rhytidiadelphus triquetrus (Hedw.) Warmst.
sharp-toothed angelica	Angelica arguta Nutt.
shore pine	Pinus contorta Dougl.
Siberian spring beauty	Claytonia sibirica L.
sierra willowherb	Epilobium brevistylum Barley
simple-stemmed bur-reed	Sparganium emersum Rehm.
simple-stemmed twistedstalk	Streptopus roseus Michx.
sitka columbine	Aquilegia formosa Fisch.
sitka mountain alder	Alnus viridis (Chaix) DC. subsp. sinuata (Regel) Love & Love
Sitka spruce	Picea sitchensis (Bong.) Carr
slender rein orchid	Platanthera stricta Lindley
slough sedge	Carex obnupta Bailey
small-flowered wood-rush	Luzula parviflora (Ehrh.) Desv.
small reed grass	Calamagrostis spp. Adans
spike bentgrass	Agrostis exarata Trin.
spiny shield fern	Dryopteris assimilis Walker
spleenwort-leaved goldthread	Coptis aspleniifolia Salisb.
spreading rush	Juncus supiniformis Engelm.
stairstep moss	Hylocomium splendens (Hedw.) B.S.G.
sticky false asphodel	Tofieldia glutinosa (Michx.) Pers.
subalpine fleabane	Erigeron peregrinus (Pursh) Greene
sweet-scented bedstraw	Galium triflorum Michx.
sword-leaved rush	Juncus ensifolius Wikst.
thick-headed sedge	Carex macloviana D'Urville subsp. pachystachya (Chamisso ex Steudel) Hulten
thyme-leaved speedwell	Veronica serpyllifolia L.
trailplant	Adenocaulon bicolor Hook.
trailing evergreen yellow violet	Viola sempervirens Greene
trifoliate-leaved foamflower	Tiarella trifoliata L.
two-flowered white marsh-marigold	Caltha leptosepala DC. var. biflora (DC.) G. Lawson
two-leaved false Solomon's-seal	Maianthemum dilatatum (Wood) Nels. & Macbr.
Vancouver groundcone	Boschniakia hookeri Walpers
wall-lettuce	Mycelis muralis (L.) Dumortier

Wallace's selaginella	*Selaginella wallacei* Hieron.
weak blue grass	*Poa marcida* Hitchc.
western hemlock	*Tsuga heterophylla* (Raf.) Sarg.
western mountainbells	*Stenanthium occidentale* Gray
western rattlesnakeroot	*Prenanthes alata* (Hook.) D. Dietr.
western red cedar	*Thuja plicata* Donn
western sword fern	*Polystichum munitum* (Kaulf.) Presl.
western yew	*Taxus brevifolia* Nutt.
wood strawberry	*Fragaria vesca* L.
yellow cedar	*Chamaecyparis nootkatensis* (D. Don) Spach
yellow wood violet	*Viola glabella* Nutt.

APPENDIX B: VEGETATION TABLES

B1: Vegetation types of the low elevation landscape units

Differential table produced using "A computer program for identifying species-releve groups in vegetation studies" (Ceska and Roemer 1971). Diagnostic species groups are listed on the left. The first four letters of the genus and the first three of the species are used for plant names. Complete names are given in Appendix A. Plots are grouped by vegetation type. Values given are cover classes according to the Domin-Krajina cover-abundance scale (percent cover was recorded in the field). Asterisks indicate that the criteria for species group membership were met.

B2: Vegetation types of the high elevation landscape units

Differential table produced using "A computer program for identifying species-releve groups in vegetation studies" (Ceska and Roemer 1971). Diagnostic species groups are listed on the left. The first four letters of the genus and the first three of the species are used for plant names. Complete names are given in Appendix A. Plots are grouped by vegetation type. Values given are cover classes according to the Domin-Krajina cover-abundance scale (percent cover was recorded in the field). Asterisks indicate that the criteria for species group membership were met.

B3: Vegetation tables for the vegetation types

Vegetation tables produced using "Environment-vegetation tables by a computer program" (Klinka and Phelps 1979) . Species are listed by stratum, in descending order of height. Percent (P) is the percentage of the plots in the type in which the species occurs. Mean species cover (MS) and the range of species cover values (RS) are reported in addition to cover values for species in each plot. Values are cover classes according to the Domin-Krajina cover abundance scale.

APPENDIX B1: Vegetation types of the low elevation landscape units

ELYMUS TYPE

PLOT NO.	11	16	23	49	50	10	46	54	08	24	25	22	26	27	30	47	17
NO. OF SPECIES	30	35	29	30	24	37	38	30	32	47	31	49	31	49	27	32	31
ELYMUS GROUP																	
ELYM HIR	6	5	5	1	2	5	2	3	6	5	5	3	2			5	5
MYCE MUR	1	1	1	3	1		1	1	1	1	1	1	1	1	1	1	
RANU UNC	2	1	2	1	1	1	1	1	2	3	3	3	1	1	1	1	3
ALNU RUB	5	5	9		7			7	4	7	3	4	7		8		
CARE CAN	1	1		1		1	1		3	1	5	6	4	1			
PLEU REF		3				3		3	5		5		1	1	2	1	4
TIARELLA GROUP																	
TIAR TRI	2	2	1	2	2	4	3	3	4	1	4	3	3	1	4	2	
POLY MUN	3	3	3	2	2	4	5	3	3	5	5	5	7	4	5	5	3
RUBU SPE	3	1	1	1	5	3	1	1	2	3	2	4	3	2	3	2	3
TIAR LAC	1	2	1	1		2	3	1		1			3	1	3	2	
TSUGA GROUP																	
TSUG HET B1										3	5				3		
HYLO SPL	2					5	5	4									
VACC ALA						1											
GAUL SHA												1			1		
ABIE AMA A1																	
RUBU PED																	
THUJA GROUP																	
THUJ PLI										4							
TSUG HET						4	3										
THUJ PLI																	

TIARELLA TYPE

PLOT NO.	28	29	51	12	05
NO. OF SPECIES	19	38	22	26	20
ELYMUS GROUP					
ELYM HIR					
MYCE MUR		1			
RANU UNC					
ALNU RUB					3
CARE CAN			1		
PLEU REF					
TIARELLA GROUP					
TIAR TRI	3	3	2	4	
POLY MUN	5	7	2	3	5
RUBU SPE	1	1		1	1
TIAR LAC	3	3	1	4	
TSUGA GROUP					
TSUG HET B1		3			1
HYLO SPL	8	4			
VACC ALA					
GAUL SHA					
ABIE AMA A1			6		
RUBU PED					
THUJA GROUP					
THUJ PLI		5			
TSUG HET					5
THUJ PLI					

TSUGA-TIARELLA TYPE

PLOT NO.	21	06	45	58	15	07	14	52	55	02	19	20	40	41	48	53	44
NO. OF SPECIES	39	31	28	26	36	31	35	22	24	30	26	35	24	22	28	22	26
ELYMUS GROUP																	
ELYM HIR																	
MYCE MUR																	
RANU UNC					1		1										
ALNU RUB				5													
CARE CAN																	
PLEU REF																	
TIARELLA GROUP																	
TIAR TRI	4	3	3	3	4	4	5	3	3	4	4	3	4	3	3	3	1
POLY MUN	5	4	7	6	5		4	2	1	2	1	3	1	1	5	3	3
RUBU SPE	1	1	4	1	3	1	3	1	1	1	3	5	3		2	3	1
TIAR LAC	2	2	3	3	4	1	5	2	3	2	3	2	4	3	3	3	1
TSUGA GROUP																	
TSUG HET B1	5	3	5	5	6	4		5	5	5	5	5	4	5	5	4	4
HYLO SPL	5		2		6	6	7	5	5	2	4	5	5	6	5	4	5
VACC ALA		3			4	7	5	6	6	6	7	5	7	7	5	5	3
GAUL SHA	1			1		1		2		4	1	7	5	5			7
ABIE AMA A1	4	2	6	5	6	4	5	7	8	4	7	4	6	6	7	8	5
RUBU PED		1			1	4		3	5	2	4		5	2	3	3	1
THUJA GROUP																	
THUJ PLI				5								5					4
TSUG HET	6	5				5	5			5					5		
THUJ PLI																	

THUJA TYPE

PLOT NO.	03	09	39	01	56	57	04
NO. OF SPECIES	30	26	19	28	17	21	18
ELYMUS GROUP							
ELYM HIR							
MYCE MUR							
RANU UNC							
ALNU RUB							
CARE CAN							
PLEU REF							
TIARELLA GROUP							
TIAR TRI	5	2	1				
POLY MUN	2	3	1	1			3
RUBU SPE			4				
TIAR LAC	3	2					
TSUGA GROUP							
TSUG HET B1	3	3	6	3	5	4	5
HYLO SPL	3	8	4	1	9	7	
VACC ALA	3	3	4	3			
GAUL SHA	7	7	9	9	7	8	9
ABIE AMA A1	4	4					
RUBU PED	5	1		1			
THUJA GROUP							
THUJ PLI	4	5	6	5		6	4
TSUG HET	4		4	5	1	5	5
THUJ PLI		5	3	1	5	4	2

TSUGA TYPE

PLOT NO.	42	43	59	60	18
NO. OF SPECIES	16	13	13	10	15
ELYMUS GROUP					
ELYM HIR					
MYCE MUR					
RANU UNC					
ALNU RUB					
CARE CAN					
PLEU REF					
TIARELLA GROUP					
TIAR TRI	1	3	1	4	
POLY MUN	1	1	1		
RUBU SPE					
TIAR LAC					
TSUGA GROUP					
TSUG HET B1	5			5	5
HYLO SPL	4	4		1	5
VACC ALA	4	3	1	1	6
GAUL SHA	7	8	5	3	7
ABIE AMA A1	5	3	4		5
RUBU PED					
THUJA GROUP					
THUJ PLI					
TSUG HET			7		
THUJ PLI					

ASSOCIATED SPECIES

PICE SIT A1						4	7			4			7	7	5				7				4				4		5	4							6														
PICE SIT A3																							4																												
TSUG HET A1		3			3		5			6	5	5	5		5			9	5	7		8	7	8	4	6	7	7	6	7	4	8	6	5	6	6	7	5	8	6	4	7	6		6	5	7	8	7	8	5
VACC PAR	1	1			1	5	2			1	1	1	1		2	1	1	1	1		1	1	2	1	2	1	4	3	3	3	3	1	2	3	3	4	3	3	4	1	2	5	1	4	3	2	5	4	2	4	7
BLEC SPI		1			1	2		2		1	1	3	2		1	3	1	1	2	1	2	1	3	5	3	1	5	3	4	4	4	5	5	5	5	4	3	4	4	6	4	5	4	1	3	5	5	6	5	4	6
CIRC ALP		6	5		3		3	5		6	5	3	3	3		5	7		2	1	4						2		3																						
MIAN DIL						3	5	1				2	1	1	1	4		3	1		3		3	1	1		4	2	3	5	4	1	3	3	3	3	3	5		1			1		1						1
CLAY SIB	3	1	3	3	3	1	1	1	5	3	3	2	3	1		1	3	1	1	1	2				3	1								1																	
STAC COO	3	5	5	1	5	3	3	5	4	6	5	3	4	5	4	5	6		3	1	3		2		3	1	2		3																						
TOLM MEN	3	5	3	2	4	2		5	3	4	3	2	5	3	3	5	5			1	3					4																									
TRIS CER		5	4	5	5	3	5	7		4	3	5	5	1	2	1	3		5	2			1		1		1		4								1	1													
VIOL GLA	4	6	5	1	3	5	5	2	3	4	5	3	5	3	5		6		3	1	5		1		4	4	3		3					2				1													
STOK ORE																						3		4								1	1							3			1			4					
RHYT LOR													1		5	3								4								6	5				6		5	5			6			2					

APPENDIX B2: Vegetation types of the high elevation landscape units

	TSUGA TYPE		CHAMAE-CYPARIS TYPE						EMPE-TRUM TYPE		CAREX HOODII TYPE	
PLOT NO.	61	63	35	37	38	13	34	62	32	33	31	36
NO. OF SPECIES	24	25	32	33	34	28	35	38	28	25	17	20
TSUGA GROUP	*	*	*	*	*	*	*	*	*	*		
TSUG HET B1	4		3	4	4	4	4	3				
HYLO SPL			4	4	4	7	3	4	5	4		
VACC ALA	7	3	8	7	8	3	7	7	4	2		
GAUL SHA			3			6		4	4	3	1	
ABIE AMA A1	8	7	4	7	5		5					
RUBU PED	2	4	3	4	4		4	3	1			
	*	*	*	*	*	*	*	*	*	*		
CHAMAECYPARIS GROUP			*	*	*	*	*	*	*	*		
CHAM NOO			6	5	6	2	7	6	5	3		
TSUG MER A1			4	3	5	2	6	5	5	4		
TSUG MER B1	2		3	3	3	4	4	4	4	3		
			*	*	*	*	*	*	*	*		
EMPETRUM GROUP									*	*		
EMPE NIG									2	6		1
PHYL EMP			2			1		2	4	5		
ALNU SIN									2	2		
									*	*		
CAREX HOODII GROUP											*	*
CARE HOO								1			9	7
ERIG PER										1	2	3
FAUR CRI					3			1			4	2
DROS ROT											1	1
GENT SP.											2	1
TOLF GLU											2	3
ELEO ROS											4	6
AGRO SP.											2	2
ERIO ANG											1	7
											*	*
ASSOCIATED SPECIES			*	*	*	*	*	*	*		*	*
TSUG MER B2			1	1	1	6	2	3				
BLEC SPI	4		1	3	3	2	3	4	1	1		
CALT LEP			1				4		1	1	4	5
COPT ASP		1	3	4	5	1	4	1	1		2	3
RHYT LOR	5	5	9	9	9	7	7	4	7			2
SPAG CAP					4		1				7	7
			*	*	*	*	*	*	*		*	*

APPENDIX B3 : Vegetation tables for the vegetation types

Vegetation type: ELYMUS

ST.NO.	SPECIES	P	MS	RS	16	50	11	23	49	10	46	54	8	24	25	22	26	27	30	47	17
PLOT NUMBER		SYNTHETIC VALUES										SPECIES SIGNIFICANCE									
A1																					
1	ALNUS RUBRA	64.7	5.7	0-9	5.	7.	5.	9.	.	.	.	7.	4.	7.	3.	4.	7.	.	8.	.	.
2	TSUGA HETEROPHYLA	47.1	4.4	0-6	3.	3.	.	.	.	.	5.	.	.	6.	5.	5.	5.	.	5.	.	.
3	PICEA SITCHENSIS	35.3	4.8	0-7	.	.	.	.	.	4.	7.	.	.	4.	.	.	7.	7.	5.	.	.
4	THUJA PLICATA	5.9	1.2	0-4	.	.	.	.	.	.	.	.	.	4.	.	.	.	.	.	.	.
5	ACER GLABRUM VAR DOUGLASII	5.9	+.5	0-3	.	.	.	.	.	.	.	.	.	.	3.	.	.	.	.	.	.
A3																					
	ALNUS RUBRA	17.6	2.5	0-5	.	.	.	.	.	4.	3.	.	.	.	.	.	.	5.	.	.	.
	TSUGA HETEROPHYLA	11.8	1.4	0-4	.	.	.	.	.	4.	3.	.	.	.	.	.	.	.	.	.	.
B1																					
	PICEA SITCHENSIS	35.3	2.1	0-4	.	.	.	3.	.	.	.	.	.	3.	4.	2.	1.	.	3.	.	.
	ALNUS RUBRA	17.6	3.6	0-8	.	.	.	.	8.	.	.	.	.	.	.	.	3.	1.	.	.	.
	TSUGA HETEROPHYLA	17.6	2.3	0-5	.	.	.	.	.	.	.	.	.	3.	5.	.	.	.	3.	.	.
	ACER GLABRUM VAR DOUGLASII	17.6	1.6	0-4	.	.	.	.	.	.	2.	.	.	4.	.	.	3.	.	.	.	.
6	RUBUS SPECTABILIS	17.6	1.2	0-4	.	.	.	.	.	.	+.	.	.	1.	.	4.	.	.	.	.	.
7	MALUS FUSCA	5.9	+.5	0-3	.	.	.	.	.	.	.	.	.	.	.	.	.	3.	.	.	.
8	VACCINIUM PARVIFOLIUM	5.9	+.0	0-+	.	.	.	.	.	.	+.	.	.	.	.	.	.	.	.	.	.
B2																					
	RUBUS SPECTABILIS	100.0	3.3	1-5	1.	5.	3.	1.	1.	3.	1.	1.	2.	3.	2.	4.	3.	2.	3.	2.	3.
	VACCINIUM PARVIFOLIUM	70.6	2.3	0-5	1.	+.	1.	.	.	5.	2.	.	.	+.	+.	1.	+.	.	2.	1.	+.
9	ROSA GYMNOCARPA	17.6	+.0	0-+	.	.	+.	+.	.	.	+.	.	.	.	.	.	.	.	.	.	.
10	GAULTHERIA SHALLON	11.8	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	+.	.	.	+.	.	.
11	SAMBUCUS RACEMOSA	5.9	2.0	0-5	.	.	.	.	.	.	.	.	.	.	5.	.	.	.	.	.	.
	ALNUS RUBRA	5.9	+.0	0-2	.	.	.	.	.	.	.	.	.	.	.	2.	.	.	.	.	.
	PICEA SITCHENSIS	5.9	+.0	0-1	.	.	.	.	1.	.	.	.	.	.	.	.	.	.	.	.	.
12	VACCINIUM ALASKENSE	5.9	+.0	0-1	.	.	.	.	.	1.	.	.	.	.	.	.	.	.	.	.	.
13	MENZIESIA FERRUGINEA	5.9	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.	.	.

PLOT NUMBER		SYNTHETIC VALUES			16	50	11	23	49	10	46	54	8	24	25	22	26	27	30	47	17
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE																
14	VACCINIUM OVALIFOLIUM	5.9	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	+.	.	.	.	.	.
C																					
15	STACHYS COOLEYAE	100.0	5.1	1-6	5.	5.	3.	5.	1.	3.	3.	5.	4.	6.	5.	3.	4.	5.	4.	5.	6.
16	POLYSTICHUM MUNITUM	100.0	5.0	2-7	3.	2.	3.	3.	2.	4.	5.	3.	3.	5.	5.	5.	7.	4.	5.	5.	3.
17	GALIUM TRIFLORUM	100.0	2.3	+-3	1.	2.	1.	1.	3.	+.	1.	1.	+.	2.	+.	1.	3.	+.	2.	3.	3.
18	RANUNCULUS UNCINATUS VAR PARVIFL	100.0	2.2	+-3	+.	+.	2.	2.	+.	1.	1.	+.	2.	3.	3.	3.	+.	1.	1.	1.	3.
19	VIOLA GLABELLA	94.1	5.0	0-6	6.	3.	4.	5.	1.	5.	5.	2.	3.	4.	5.	3.	5.	3.	5.	.	6.
20	TOLMIEA MENZIESII	94.1	4.5	0-5	5.	4.	3.	3.	2.	2.	.	5.	3.	4.	3.	2.	5.	3.	3.	5.	5.
21	TIARELLA TRIFOLIATA	94.1	3.3	0-4	2.	2.	2.	1.	2.	4.	3.	3.	4.	1.	4.	3.	3.	1.	4.	2.	.
22	CLAYTONIA SIBERICA	94.1	3.2	0-5	1.	3.	3.	3.	3.	1.	1.	1.	5.	3.	3.	2.	3.	1.	.	1.	3.
23	ELYMUS HIRSUTUS	88.2	5.0	0-6	5.	2.	6.	5.	1.	5.	2.	3.	6.	5.	5.	3.	2.	.	.	5.	5.
24	TRISETUM CERNUUM	88.2	5.0	0-7	5.	5.	.	4.	5.	3.	5.	7.	.	4.	3.	5.	5.	1.	2.	1.	3.
25	MYCELIS MURALIS	88.2	1.3	0-3	+.	1.	+.	+.	3.	.	1.	1.	+.	1.	1.	+.	+.	+.	+.	1.	.
26	ATHYRIUM FELIX-FEMINA	76.5	3.1	0-5	+.	+.	.	.	.	1.	+.	+.	.	2.	3.	4.	3.	5.	3.	3.	3.
27	LUZULA PARVIFLORA	76.5	1.2	0-2	1.	.	1.	+.	1.	+.	2.	.	1.	1.	1.	+.	1.	.	1.	.	1.
28	CIRCEA ALPINA	70.6	5.0	0-7	6.	3.	.	5.	.	.	3.	5.	.	6.	5.	3.	3.	3.	.	5.	7.
29	TIARELLA LACINATA	70.6	2.1	0-3	2.	.	1.	1.	1.	2.	3.	1.	.	1.	.	.	3.	1.	3.	2.	.
30	CAREX CANESCENS	64.7	3.4	0-6	+.	.	+.	.	+.	1.	1.	.	3.	1.	5.	6.	4.	1.	.	.	.
31	MELICA SUBULATA	64.7	3.4	0-5	5.	.	2.	3.	1.	3.	2.	4.	4.	3.	4.	.	.	.	.	.	3.
32	BLECHNUM SPICANT	64.7	1.6	0-3	+.	+.	.	.	.	2.	.	2.	.	+.	1.	3.	2.	.	+.	3.	+.
33	PLEUROPOGON REFRACTUS	58.8	3.3	0-5	3.	.	.	.	.	3.	.	3.	5.	.	5.	.	+.	1.	2.	+.	4.
34	CAREX OBNUPTA	47.1	4.6	0-9	.	.	.	+.	.	7.	.	.	3.	.	1.	2.	1.	9.	.	2.	.
35	MIANTHEMUM DILATATUM	47.1	2.7	0-5	.	.	.	.	.	3.	5.	1.	.	.	.	2.	+.	1.	1.	4.	.
36	POA MARCIDA	47.1	2.3	0-5	5.	+.	.	+.	.	.	+.	.	.	1.	.	.	2.	.	.	3.	1.
37	AGROSTIS EXARATA	41.2	3.5	0-5	.	3.	.	.	3.	.	1.	3.	.	.	5.	5.	.	.	.	5.	.
38	BOYKINIA OCCIDENTALIS	41.2	1.4	0-3	.	.	.	.	.	.	1.	.	.	1.	3.	2.	+.	.	1.	3.	.
39	TRAUTVETTERIA CAROLINIENSIS	41.2	+.6	0-1	.	.	.	.	.	.	.	+.	.	1.	.	1.	1.	1.	1.	.	+.
40	VERATRUM VIRIDE	35.3	3.1	0-5	.	.	.	.	.	4.	.	+.	5.	+.	5.	.	.	.	1.	.	.
41	PRUNELLA VULGARIS	35.3	1.4	0-3	.	.	3.	3.	1.	.	.	.	.	.	2.	.	+.	.	.	1.	.
42	OSMORHIZA CHILENSIS	35.3	+.1	0-1	.	.	.	+.	+.	.	.	.	+.	.	+.	1.	.	.	.	.	1.

ST.NO.	SPECIES	P	MS	RS	16	50	11	23	49	10	46	54	8	24	25	22	26	27	30	47	17
	PLOT NUMBER	SYNTHETIC VALUES									SPECIES SIGNIFICANCE										
43	ADIANTUM PEDATUM	35.3	+.0	0-+	+.	.	.	.	+.	.	.	.	.	.	.	.	+.	+.	+.	.	+.
44	CAREX MERTENSII	29.4	1.3	0-3	+.	.	.	.	.	2.	.	.	3.	.	.	+.	.	.	.	.	3.
45	ADENOCAULON BICOLOR	29.4	+.6	0-2	2.	.	.	.	1.	.	.	1.	.	.	.	.	+.	.	.	.	1.
46	AQUILEGIA FORMOSA	29.4	+.0	0-+	+.	.	+.	+.	.	.	.	.	+.	+.	.	.	.	.	.	.	.
47	BROMUS SITCHENSIS	23.5	4.0	0-7	.	7.	.	.	7.	.	.	3.	.	.	.	.	.	.	.	3.	.
48	OENANTHE SARMENTOSA	23.5	2.3	0-5	.	.	.	.	.	.	.	.	.	.	3.	.	+.	5.	3.	.	.
49	VERONICA SERPYLLIFOLIA	23.5	+.0	0-+	.	.	+.	.	.	.	.	.	+.	.	+.	+.	.	.	.	.	.
50	CAREX MACLOVIANA SSP PACHYSTACH	17.6	+.2	0-2	.	.	1.	.	.	.	.	.	+.	.	2.	.	.	.	.	.	.
51	EPILOBIUM BREVISTYLUM	17.6	+.0	0-+	+.	.	.	.	.	.	.	.	+.	.	+.	.	.	.	.	.	.
52	LYSICHITUM AMERICANUM	11.8	1.4	0-4	.	.	.	.	.	.	.	.	.	.	.	.	.	4.	3.	.	.
53	ACHILLEA MILLEFOLIUM	11.8	+.0	0-2	.	.	2.	+.	.	.	.	.	.	.	.	.	.	.	.	.	.
54	DRYOPTERIS ASSIMILIS	11.8	+.0	0-+	.	.	.	.	.	+.	.	.	+.	.	.	.	.	.	.	.	.
55	EPILOBIUM CILIATUM	11.8	+.0	0-+	.	.	.	.	.	.	.	.	.	.	+.	.	.	.	.	+.	.
56	JUNCUS SP	11.8	+.0	0-+	.	.	.	.	.	.	.	.	+.	.	.	+.	.	.	.	.	.
57	OROBANCHE UNIFLORA	11.8	+.0	0-+	.	.	.	.	.	.	.	.	+.	.	.	.	.	.	.	.	+.
58	STREPTOPUS AMPLEXIFOLIUS	11.8	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	+.	.	.	.	+.	.
59	ANGELICA ARGUTA	5.9	1.2	0-4	.	.	.	.	.	.	.	.	.	.	.	.	.	4.	.	.	.
60	VIOLA SEMPERVIRENS	5.9	1.2	0-4	.	.	.	.	.	.	4.	.	.	.	.	.	.	.	.	.	.
61	FRAGARIA VESCA	5.9	+.0	0-2	.	.	2.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
62	ANAPHALIS MARGARITACEAE	5.9	+.0	0-+	.	.	.	.	.	.	.	.	+.	.	.	.	.	.	.	.	.
63	CORNUS CANADENSIS	5.9	+.0	0-+	.	.	.	.	.	+.	.	.	.	.	.	.	.	.	.	.	.
64	GYMNOCARPIUM DRYOPTERIS	5.9	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	+.	.	.	.	.	.
65	PRENANTHES ELATA	5.9	+.0	0-+	.	.	.	+.	.	.	.	.	.	.	.	.	.	.	.	.	.
66	STREPTOPUS ROSEUS	5.9	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.	.	.
DH																					
67	RHYTIDIADELPHUS LOREUS	64.7	5.9	0-8	6.	7.	6.	.	8.	8.	8.	7.	7.	.	4.	5.	.	.	.	.	4.
68	LEUCOLEPIS MENZIESII	64.7	5.2	0-9	6.	.	3.	3.	2.	.	1.	4.	5.	6.	.	.	9.	.	5.	.	7.
69	EURINCHIUM OREGANUM	64.7	4.9	0-7	.	3.	7.	4.	5.	5.	4.	.	.	6.	5.	.	4.	.	5.	.	2.
70	MNIUM GLABRESCENS	58.8	4.3	0-6	4.	.	6.	.	.	3.	2.	.	4.	.	5.	5.	3.	.	4.	.	5.
71	POGONATUM MACOUNII	41.2	2.4	0-4	.	.	1.	.	4.	2.	2.	.	3.	4.	.	3.	.	.	.	.	.
72	MNIUM INSIGNE	35.3	3.3	0-6	.	4.	.	4.	2.	.	1.	4.	.	6.	.	.	.	.	.	.	.

PLOT NUMBER		SYNTHETIC VALUES			16	50	11	23	49	10	46	54	8	24	25	22	26	27	30	47	17
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE																
73	HYLOCOMIUM SPLENDENS	23.5	3.1	0-5	.	.	2.	.	.	5.	5.	4.	.	.	.	.	.	.	.	.	.
74	LIVERWORT THALOSE	17.6	2.2	0-5	2.	.	.	.	.	.	.	5.	.	.	.	.	.	.	.	.	3.
75	SPHAGNUM SQUARROSUM	11.8	1.2	0-4	.	.	.	.	.	1.	.	.	.	.	.	.	.	.	.	.	4.
	TSUGA HETEROPHYLA	11.8	+.0	0-+	.	.	.	.	+.	+.	.	.	.	.	.	.	.	.	.	.	.
76	POGONATUM CONTORTUM	5.9	+.5	0-3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3.
77	DICRANUM SP	5.9	+.0	0-2	.	.	.	.	.	.	.	.	.	.	2.	.	.	.	.	.	.
	PICEA SITCHENSIS	5.9	+.0	0-+	.	.	.	.	.	+.	.	.	.	.	.	.	.	.	.	.	.
DW																					
	RHYTIDIADELPHUS LOREUS	17.6	2.2	0-5	.	.	.	.	.	.	.	.	.	.	.	.	+.	.	5.	3.	.
	PICEA SITCHENSIS	17.6	+.0	0-+	+.	.	.	.	.	.	.	.	.	.	.	.	+.	+.	.	.	.
78	POLYTRICHUM JUNIPERINUM	11.8	+.5	0-3	+.	.	.	.	.	.	.	.	.	.	.	.	.	.	3.	.	.
	HYLOCOMIUM SPLENDENS	11.8	+.0	0-1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.	1.	.
	TSUGA HETEROPHYLA	11.8	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	.	+.	+.	.	.	.
	LIVERWORT THALOSE	5.9	3.0	0-7	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	7.	.
79	SPAGNUM CAPILLACEUM	5.9	1.2	0-4	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	4.	.
	MNIUM GLABRESCENS	5.9	+.0	0-2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2.	.
	ALNUS RUBRA	5.9	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.	.

Vegetation type: TIARELLA

ST.NO.	SPECIES	P	MS	RS	28	29	51	12	5
	PLOT NUMBER	SYNTHETIC VALUES			28	29	51	12	5
					SPECIES SIGNIFICANCE				
A1									
1	TSUGA HETEROPHYLA	100.0	7.7	5-9	9.	5.	7.	5.	8.
2	PICEA SITCHENSIS	20.0	4.6	0-7	.	7.	.	.	.
3	ABIES AMABILIS	20.0	4.1	0-6	.	.	6.	.	.
4	THUJA PLICATA	20.0	3.4	0-5	.	5.	.	.	.
5	ALNUS RUBRA	20.0	1.5	0-3	.	.	.	.	3.
A3									
	ALNUS RUBRA	20.0	3.4	0-5	.	5.	.	.	.
	TSUGA HETEROPHYLA	20.0	3.4	0-5	.	.	.	.	5.
B1									
	TSUGA HETEROPHYLA	40.0	1.7	0-3	.	3.	.	.	1.
B2									
6	VACCINIUM PARVIFOLIUM	80.0	1.3	0-1	1.	1.	.	1.	1.
7	RUBUS SPECTABILIS	80.0	+.7	0-1	+.	+.	.	1.	+.
	ALNUS RUBRA	20.0	3.4	0-5	.	.	5.	.	.
8	ROSA GYMNOCARPA	20.0	+.2	0-1	.	1.	.	.	.
C									
9	POLYSTICHUM MUNITUM	100.0	5.4	2-7	5.	7.	2.	3.	5.
10	BLECHNUM SPICANT	100.0	1.7	+-2	1.	2.	+.	2.	+.
11	TIARELLA TRIFOLIATA	80.0	3.3	0-4	3.	3.	2.	4.	.
12	TIARELLA LACINATA	80.0	3.3	0-4	3.	3.	1.	4.	.
13	ATHYRIUM FELIX-FEMINA	80.0	2.6	0-3	3.	3.	.	2.	1.
14	CLAYTONIA SIBERICA	80.0	1.4	0-2	+.	1.	1.	2.	.
15	LUZULA PARVIFLORA	80.0	+.7	0-1	+.	1.	+.	+.	.
16	VIOLA GLABELLA	60.0	3.7	0-5	.	3.	+.	5.	.
17	MELICA SUBULATA	60.0	3.2	0-4	.	3.	3.	4.	.
18	CIRCEA ALPINA	60.0	2.6	0-4	.	2.	+.	4.	.
19	MIANTHEMUM DILATATUM	60.0	2.4	0-3	3.	1.	.	3.	.
20	STACHYS COOLEYAE	60.0	2.4	0-3	.	3.	1.	3.	.

PLOT NUMBER		SYNTHETIC VALUES P	MS	RS	28	29	51	12	5
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE				
21	GALIUM TRIFLORUM	60.0	1.2	0-2	.	+.	1.	2.	.
22	TRAUTVETTERIA CAROLINIENSIS	60.0	1.2	0-2	+.	1.	.	2.	.
23	DRYOPTERIS ASSIMILIS	60.0	1.0	0-1	1.	.	.	1.	+.
24	TRISETUM CERNUUM	40.0	3.5	0-5	.	5.	2.	.	.
25	TOLMIEA MENZIESII	40.0	1.6	0-3	.	.	+.	3.	.
26	BROMUS SITCHENSIS	40.0	1.0	0-2	.	+.	2.	.	.
27	POA MARCIDA	40.0	1.0	0-2	.	2.	+.	.	.
28	ADIANTUM PEDATUM	40.0	+.0	0-+	.	+.	.	+.	.
29	ADENOCAULON BICOLOR	20.0	+.2	0-1	.	1.	.	.	.
30	BOYKINIA OCCIDENTALIS	20.0	+.2	0-1	.	1.	.	.	.
31	GYMNOCARPIUM DRYOPTERIS	20.0	+.2	0-1	1.	.	.	.	.
32	AGROSTIS EXARATA	20.0	+.0	0-+	.	.	+.	.	.
33	CAREX CANESCENS	20.0	+.0	0-+	.	.	+.	.	.
34	MYCELIS MURALIS	20.0	+.0	0-+	.	+.	.	.	.
35	MONESES UNIFLORA	20.0	+.0	0-+	+.	.	.	.	.
36	STREPTOPUS AMPLEXIFOLIUS	20.0	+.0	0-+	+.	.	.	.	.
37	STREPTOPUS ROSEUS	20.0	+.0	0-+	.	+.	.	.	.
38	VERATRUM VIRIDE	20.0	+.0	0-+	.	+.	.	.	.
39	VIOLA SEMPERVIRENS	20.0	+.0	0-+	.	+.	.	.	.
DH									
40	RHYTIDIADELPHUS LOREUS	80.0	5.2	0-7	5.	7.	4.	3.	.
41	EURINCHIUM OREGANUM	80.0	4.8	0-7	3.	7.	.	1.	2.
42	HYLOCOMIUM SPLENDENS	40.0	5.2	0-8	8.	4.	.	.	.
43	LEUCOLEPIS MENZIESII	40.0	4.9	0-7	.	4.	.	7.	.
44	POGONATUM MACOUNII	40.0	3.0	0-4	.	4.	.	3.	.
45	LIVERWORT THALOSE	20.0	1.5	0-3	.	.	.	3.	.
46	MNIUM INSIGNE	20.0	1.5	0-3	.	3.	.	.	.
47	MNIUM GLABRESCENS	20.0	+.2	0-1	.	.	.	1.	.
	PICEA SITCHENSIS	20.0	+.0	0-+	.	.	+.	.	.
	TSUGA HETEROPHYLA	20.0	+.0	0-+	.	.	.	+.	.

PLOT NUMBER		SYNTHETIC VALUES			28	29	51	12	5
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE				
DW									
	EURINCHIUM OREGANUM	20.0	1.5	0-3	.	.	.	.	3.
	LIVERWORT THALOSE	20.0	+.2	0-1	.	.	.	.	1.
48	HYPNUM CIRCINALE	20.0	+.0	0-+	.	.	.	.	+.
	MNIUM GLABRESCENS	20.0	+.0	0-+	.	.	.	.	+.
49	PLAGIOTHECIUM UNDULATUM	20.0	+.0	0-+	.	.	.	.	+.
DR									
	EURINCHIUM OREGANUM	20.0	2.4	0-4	.	.	.	.	4.
50	RHYTIDIADELPHUS TRIQUETRUS	20.0	1.5	0-3	.	.	.	.	3.
	LIVERWORT THALOSE	20.0	+.2	0-1	.	.	.	.	1.
	PLAGIOTHECIUM UNDULATUM	20.0	+.0	0-+	.	.	.	.	+.

Vegetation type: TSUGA-TIARELLA

ST.NO.	SPECIES	P	MS	RS	21	6	45	58	15	53	7	14	52	55	48	2	19	20	40	41	44
A1																					
1	TSUGA HETEROPHYLA	100.0	7.1	4-8	7.	8.	4.	6.	7.	5.	7.	6.	7.	4.	7.	8.	6.	5.	6.	6.	8.
2	ABIES AMABILIS	100.0	6.1	2-8	4.	2.	6.	5.	6.	8.	4.	5.	7.	8.	7.	4.	7.	4.	6.	6.	5.
3	PICEA SITCHENSIS	29.4	3.6	0-6	4.	.	.	.	4.	.	.	5.	4.	.	6.	.	.	.	.	.	.
4	THUJA PLICATA	17.6	3.1	0-5	.	.	.	5.	.	.	.	.	.	.	.	.	.	5.	.	.	4.
5	ALNUS RUBRA	5.9	2.0	0-5	.	.	.	5.	.	.	.	.	.	.	.	.	.	.	.	.	.
A3																					
	TSUGA HETEROPHYLA	35.3	4.3	0-6	6.	5.	.	.	.	.	5.	5.	.	.	5.	5.	.	.	.	.	.
	ABIES AMABILIS	35.3	3.5	0-5	4.	.	.	.	.	.	4.	5.	.	.	4.	4.	5.	.	.	.	.
	PICEA SITCHENSIS	5.9	1.2	0-4	4.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	ALNUS RUBRA	5.9	+.0	0-1	.	1.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
B1																					
	TSUGA HETEROPHYLA	94.1	5.2	0-6	5.	3.	5.	5.	6.	4.	4.	.	5.	5.	5.	5.	5.	5.	4.	5.	4.
	ABIES AMABILIS	58.8	3.9	0-5	.	.	5.	3.	4.	.	2.	.	.	4.	.	3.	.	4.	4.	5.	4.
6	VACCINIUM ALASKENSE	17.6	3.1	0-7	.	2.	.	.	.	.	7.	.	.	.	.	2.	.	.	.	.	.
7	RUBUS SPECTABILIS	17.6	1.2	0-4	+.	.	+.	.	4.	.	.	.	.	.	.	.	.	.	.	.	.
8	MENZIESIA FERRUGINEA	17.6	+.0	0-1	.	1.	.	.	.	.	+.	.	.	.	.	.	.	.	.	.	+.
B2																					
9	VACCINIUM PARVIFOLIUM	100.0	3.3	+-4	2.	+.	2.	+.	4.	3.	3.	3.	3.	3.	3.	1.	2.	3.	3.	4.	4.
	RUBUS SPECTABILIS	94.1	3.2	0-5	1.	1.	4.	1.	3.	3.	+.	3.	+.	+.	2.	+.	3.	5.	3.	.	+.
	VACCINIUM ALASKENSE	82.4	5.6	0-7	.	3.	.	.	4.	5.	7.	5.	6.	6.	5.	6.	7.	5.	7.	7.	3.
10	GAULTHERIA SHALLON	58.8	4.5	0-7	+.	.	.	+.	.	.	+.	.	2.	.	.	4.	1.	7.	5.	5.	7.
	TSUGA HETEROPHYLA	41.2	1.9	0-4	.	+.	1.	.	.	.	2.	.	4.	2.	.	.	.	3.	.	2.	.
	MENZIESIA FERRUGINEA	35.3	1.2	0-3	+.	+.	.	.	.	.	+.	.	.	.	.	1.	.	.	.	3.	3.
11	OPLOPANAX HORRIDUM	5.9	+.5	0-3	.	.	.	.	.	.	.	.	.	.	.	.	.	3.	.	.	.
12	VACCINIUM OVALIFOLIUM	5.9	+.0	0-2	2.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
C																					
13	BLECHNUM SPICANT	100.0	4.9	1-5	3.	5.	3.	1.	5.	4.	3.	4.	4.	4.	3.	5.	5.	5.	5.	4.	4.
14	TIARELLA TRIFOLIATA	100.0	4.1	1-5	4.	3.	3.	3.	4.	3.	4.	5.	3.	3.	3.	4.	4.	3.	4.	3.	1.

Column groups: PLOT NUMBER (21 … 44); SYNTHETIC VALUES (P, MS, RS); SPECIES SIGNIFICANCE (plot columns).

PLOT NUMBER		SYNTHETIC VALUES			21	6	45	58	15	53	7	14	52	55	48	2	19	20	40	41	44
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE																
15	TIARELLA LACINATA	100.0	3.5	+-5	2.	2.	3.	3.	4.	3.	+.	5.	2.	3.	3.	2.	3.	2.	4.	3.	+.
16	POLYSTICHUM MUNITUM	94.1	4.8	0-7	5.	4.	7.	6.	5.	3.	.	4.	2.	1.	5.	2.	1.	3.	+.	+.	3.
17	MIANTHEMUM DILATATUM	88.2	3.8	0-5	3.	+.	1.	.	4.	5.	2.	3.	5.	4.	3.	+.	3.	3.	3.	3.	.
18	RUBUS PEDATUS	70.6	3.5	0-5	.	+.	.	.	1.	3.	4.	.	3.	5.	3.	2.	4.	.	5.	2.	+.
19	DRYOPTERIS ASSIMILIS	64.7	1.6	0-3	1.	+.	+.	.	2.	2.	+.	3.	1.	1.	3.	.	.	1.	.	.	.
20	ATHYRIUM FELIX-FEMINA	58.8	3.1	0-5	2.	+.	5.	5.	1.	3.	.	1.	.	+.	1.	.	.	2.	.	.	.
21	STREPTOPUS AMPLEXIFOLIUS	52.9	+.0	0-+	.	.	+.	.	.	.	+.	.	+.	+.	+.	.	+.	+.	+.	+.	.
22	COPTIS ASPLENIFOLIA	47.1	3.1	0-5	.	.	.	.	3.	4.	3.	3.	3.	.	.	.	2.	.	5.	3.	.
23	MONESES UNIFLORA	47.1	+.0	0-+	+.	+.	.	.	.	+.	+.	+.	.	.	.	+.	+.	.	+.	.	.
24	VIOLA GLABELLA	41.2	2.3	0-4	1.	.	4.	4.	3.	+.	.	3.	.	.	.	.	.	2.	.	.	.
25	CORNUS CANADENSIS	41.2	1.2	0-3	.	.	.	.	.	.	3.	.	.	.	.	2.	+.	+.	1.	1.	1.
26	LUZULA PARVIFLORA	41.2	+.8	0-2	+.	.	.	.	+.	2.	.	2.	.	1.	+.	.	.	.	+.	.	.
27	TRISETUM CERNUUM	35.3	1.4	0-4	1.	.	+.	.	1.	1.	.	4.	.	.	+.	.	.	.	.	.	.
28	STREPTOPUS ROSEUS	35.3	+.0	0-+	+.	+.	.	.	+.	.	.	+.	.	.	.	+.	+.	.	.	.	.
29	STACHYS COOLEYAE	29.4	1.4	0-3	2.	.	3.	1.	2.	.	.	3.	.	.	.	.	.	.	.	.	.
30	GALIUM TRIFLORUM	29.4	1.0	0-3	+.	.	3.	2.	+.	.	.	.	.	.	.	.	.	+.	.	.	.
31	LISTERA CORDATA	29.4	+.0	0-+	.	+.	.	.	.	.	.	.	.	.	.	+.	.	.	+.	+.	+.
32	TRAUTVETTERIA CAROLINIENSIS	23.5	+.0	0-1	1.	.	.	.	+.	.	.	.	+.	.	.	.	.	1.	.	.	.
33	ADIANTUM PEDATUM	17.6	2.4	0-5	.	.	4.	5.	.	.	.	.	.	.	.	.	.	+.	.	.	.
34	POA MARCIDA	17.6	1.3	0-4	+.	.	.	.	2.	.	.	4.	.	.	.	.	.	.	.	.	.
35	CLAYTONIA SIBERICA	17.6	+.9	0-3	.	.	3.	1.	.	.	.	.	.	.	.	.	.	1.	.	.	.
36	CIRCEA ALPINA	11.8	+.9	0-3	.	.	.	.	2.	.	.	3.	.	.	.	.	.	.	.	.	.
37	LYSICHITUM AMERICANUM	11.8	+.5	0-3	+.	.	.	.	.	.	.	.	.	.	.	.	.	3.	.	.	.
38	VIOLA SEMPERVIRENS	11.8	+.0	0-1	1.	.	.	.	.	.	.	.	.	.	.	.	.	.	1.	.	.
39	RANUNCULUS UNCINATUS VAR PARVIFL	11.8	+.0	0-+	.	.	.	.	+.	.	.	+.	.	.	.	.	.	.	.	.	.
40	TOLMIEA MENZIESII	5.9	1.2	0-4	.	.	.	4.	.	.	.	.	.	.	.	.	.	.	.	.	.
41	MELICA SUBULATA	5.9	+.5	0-3	.	.	.	.	.	.	.	3.	.	.	.	.	.	.	.	.	.
42	ADENOCAULON BICOLOR	5.9	+.0	0-+	.	.	.	.	+.	.	.	.	.	.	.	.	.	.	.	.	.
43	BOYKINIA OCCIDENTALIS	5.9	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	.	.	+.	.	.	.
44	GYMNOCARPIUM DRYOPTERIS	5.9	+.0	0-+	.	.	.	.	.	+.	.	.	.	.	.	.	.	.	.	.	.

PLOT NUMBER	SYNTHETIC VALUES P	MS	RS	21	6	45	58	15	53	7	14	52	55	48	2	19	20	40	41	44
ST.NO. SPECIES	P	MS	RS	SPECIES SIGNIFICANCE																
45 LYCOPODIUM CLAVATUM	5.9	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+.
DH																				
46 RHYTIDIADELPHUS LOREUS	94.1	8.1	0-9	8.	.	5.	5.	8.	9.	6.	7.	9.	9.	8.	5.	9.	8.	8.	9.	7.
47 HYLOCOMIUM SPLENDENS	88.2	5.3	0-7	5.	.	2.	.	6.	4.	6.	7.	5.	5.	5.	2.	4.	5.	5.	6.	5.
48 EURINCHIUM OREGANUM	76.5	4.3	0-5	5.	2.	.	4.	.	.	5.	5.	3.	1.	4.	5.	1.	1.	.	3.	5.
49 MNIUM GLABRESCENS	47.1	3.1	0-5	4.	.	3.	5.	3.	.	.	3.	.	.	.	.	2.	4.	.	.	+.
50 POGONATUM CONTORTUM	35.3	1.0	0-3	.	.	+.	.	1.	.	.	3.	.	.	.	.	1.	1.	.	.	+.
51 LIVERWORT THALOSE	29.4	3.1	0-5	1.	.	4.	5.	+.	.	.	.	.	.	.	.	.	5.	.	.	.
TSUGA HETEROPHYLA	23.5	+.0	0-+	+.	.	.	.	+.	.	+.	.	.	.	+.	.	.	.	.	.	.
52 POGONATUM MACOUNII	17.6	1.4	0-4	2.	.	.	4.	.	.	.	.	.	.	2.	.	.	.	.	.	.
53 SPAGNUM CAPILLACEUM	11.8	+.1	0-2	.	.	.	.	.	.	.	.	.	.	.	.	.	1.	2.	.	.
54 LEUCOLEPIS MENZIESII	5.9	1.2	0-4	.	.	.	4.	.	.	.	.	.	.	.	.	.	.	.	.	.
55 MNIUM INSIGNE	5.9	+.0	0-2	2.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PICEA SITCHENSIS	5.9	+.0	0-+	.	.	.	.	+.	.	.	.	.	.	.	.	.	.	.	.	.
56 RHACOMITRIUM SP	5.9	+.0	0-+	.	.	.	.	.	.	.	.	.	.	.	.	.	+.	.	.	.
DW																				
RHYTIDIADELPHUS LOREUS	29.4	4.1	0-6	.	4.	.	.	.	.	.	.	.	.	6.	6.	5.	.	.	.	5.
EURINCHIUM OREGANUM	17.6	1.2	0-4	.	4.	.	.	.	.	.	.	.	.	.	+.	1.	.	.	.	.
57 PLAGIOTHECIUM UNDULATUM	17.6	+.0	0-+	.	+.	.	.	.	.	+.	+.	.	.	.	.	.	.	.	.	.
TSUGA HETEROPHYLA	17.6	+.0	0-+	.	.	.	.	.	.	.	+.	.	+.	+.	.	.	.	.	.	.
58 HYPNUM CIRCINALE	11.8	1.2	0-4	.	4.	.	.	.	.	.	.	.	.	.	1.	.	.	.	.	.
LIVERWORT THALOSE	11.8	1.2	0-4	.	4.	.	.	.	.	1.	.	.	.	.	.	.	.	.	.	.
HYLOCOMIUM SPLENDENS	11.8	1.1	0-3	.	.	.	.	.	.	.	.	.	.	3.	.	.	.	.	.	3.
59 DICRANUM SP	11.8	+.0	0-1	.	.	.	.	.	.	1.	.	.	.	.	+.	.	.	.	.	.
MNIUM GLABRESCENS	11.8	+.0	0-+	.	+.	.	.	.	.	.	.	.	.	.	+.	.	.	.	.	.
PICEA SITCHENSIS	11.8	+.0	0-+	.	.	.	.	.	.	.	+.	.	+.	.	.	.	.	.	.	.
60 RHYTIDIADELPHUS TRIQUETRUS	5.9	1.2	0-4	.	4.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
ABIES AMABILIS	5.9	+.0	0-+	.	.	.	.	.	.	.	.	.	+.	.	.	.	.	.	.	.
61 POLYTRICHUM JUNIPERINUM	5.9	+.0	0-+	.	.	.	.	.	.	.	+.	.	.	.	.	.	.	.	.	.
DR																				
RHYTIDIADELPHUS LOREUS	5.9	2.0	0-5	.	.	5.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Vegetation type: TSUGA

PLOT NUMBER		SYNTHETIC VALUES			42	43	59	60	18
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE				
A1									
1	TSUGA HETEROPHYLA	100.0	7.7	5-8	7.	8.	7.	8.	5.
2	ABIES AMABILIS	80.0	4.8	0-5	5.	3.	4.	.	5.
A3									
	TSUGA HETEROPHYLA	20.0	4.6	0-7	.	.	7.	.	.
B1									
	TSUGA HETEROPHYLA	60.0	5.0	0-5	5.	.	.	5.	5.
	ABIES AMABILIS	40.0	4.4	0-5	5.	.	.	.	5.
B2									
3	GAULTHERIA SHALLON	100.0	7.0	3-8	7.	8.	5.	3.	7.
4	VACCINIUM PARVIFOLIUM	100.0	5.3	2-7	5.	4.	2.	4.	7.
5	VACCINIUM ALASKENSE	100.0	4.6	+-6	4.	3.	1.	+.	6.
6	MENZIESIA FERRUGINEA	60.0	1.8	0-3	3.	1.	+.	.	.
7	RUBUS SPECTABILIS	60.0	+.0	0-+	+.	+.	+.	.	.
	TSUGA HETEROPHYLA	40.0	3.5	0-5	5.	.	.	.	1.
C									
8	BLECHNUM SPICANT	100.0	5.6	4-6	5.	6.	5.	4.	6.
9	POLYSTICHUM MUNITUM	80.0	3.0	0-4	1.	3.	1.	4.	.
10	LISTERA CORDATA	40.0	+.0	0-+	+.	+.	.	.	.
11	MIANTHEMUM DILATATUM	20.0	+.0	0-+	.	.	.	.	+.
DH									
12	RHYTIDIADELPHUS LOREUS	100.0	6.8	4-9	6.	6.	4.	4.	9.
13	EURINCHIUM OREGANUM	100.0	5.3	3-6	5.	6.	4.	5.	3.
14	HYLOCOMIUM SPLENDENS	80.0	4.3	0-5	4.	4.	.	+.	5.
	TSUGA HETEROPHYLA	40.0	+.0	0-+	.	.	+.	.	+.
DW									
15	PLAGIOTHECIUM UNDULATUM	20.0	+.0	0-+	.	.	.	.	+.

Vegetation type: THUJA

PLOT NUMBER		SYNTHETIC VALUES			9	3	39	56	57	1	4
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE						
A1											
1	TSUGA HETEROPHYLA	85.7	5.7	0-7	4.	6.	7.	.	6.	6.	5.
2	THUJA PLICATA	85.7	5.3	0-6	5.	4.	6.	.	6.	5.	4.
3	ABIES AMABILIS	28.6	2.9	0-4	4.	4.	.	.	.	.	.
4	CHAMAECYPARUS NOOTKATENSIS	14.3	3.1	0-5	.	.	.	.	5.	.	.
A3											
	TSUGA HETEROPHYLA	85.7	4.9	0-5	.	4.	4.	1.	5.	5.	5.
	THUJA PLICATA	42.9	4.2	0-5	.	.	5.	.	5.	4.	.
	CHAMAECYPARUS NOOTKATENSIS	14.3	1.2	0-3	.	.	.	.	3.	.	.
5	TAXUS BREVIFOLIA	14.3	1.2	0-3	.	.	.	.	.	3.	.
	ABIES AMABILIS	14.3	+.5	0-2	.	.	.	.	.	2.	.
6	ALNUS VIRIDIS SSP SINUATA	14.3	+.5	0-2	.	.	.	.	2.	.	.
B1											
	TSUGA HETEROPHYLA	100.0	5.1	3-6	3.	3.	6.	5.	4.	3.	5.
	THUJA PLICATA	85.7	4.3	0-5	5.	.	3.	5.	4.	1.	2.
	ABIES AMABILIS	42.9	1.3	0-2	2.	1.	.	.	.	2.	.
	CHAMAECYPARUS NOOTKATENSIS	28.6	3.2	0-5	.	.	.	5.	3.	.	.
7	MENZIESIA FERRUGINEA	28.6	2.4	0-4	4.	.	.	.	.	.	3.
8	VACCINIUM ALASKENSE	28.6	2.0	0-4	4.	+.	.	.	.	.	.
	TAXUS BREVIFOLIA	28.6	1.4	0-3	.	.	.	.	3.	1.	.
9	VACCINIUM PARVIFOLIUM	14.3	2.0	0-4	4.	.	.	.	.	.	.
B2											
10	GAULTHERIA SHALLON	100.0	8.5	7-9	7.	7.	9.	7.	8.	9.	9.
	VACCINIUM PARVIFOLIUM	100.0	3.8	+-5	2.	+.	5.	4.	3.	1.	2.
	MENZIESIA FERRUGINEA	85.7	2.6	0-3	3.	1.	.	3.	3.	1.	1.
	VACCINIUM ALASKENSE	57.1	3.1	0-4	3.	3.	4.	.	.	3.	.
	TSUGA HETEROPHYLA	57.1	2.8	0-4	.	2.	2.	4.	.	.	3.

PLOT NUMBER		SYNTHETIC VALUES			9	3	39	56	57	1	4
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE						
	CHAMAECYPARUS NOOTKATENSIS	14.3	2.0	0-4	.	.	.	4.	.	.	.
11	RUBUS SPECTABILIS	14.3	2.0	0-4	.	.	4.	.	.	.	.
	THUJA PLICATA	14.3	2.0	0-4	.	.	.	4.	.	.	.
	ABIES AMABILIS	14.3	+.0	0-1	.	.	.	.	.	1.	.
12	ROSA GYMNOCARPA	14.3	+.0	0-+	+.	.	.	.	.	.	.
C											
13	BLECHNUM SPICANT	100.0	5.1	1-6	4.	6.	5.	1.	3.	4.	5.
14	CORNUS CANADENSIS	71.4	2.6	0-3	3.	3.	.	3.	1.	2.	.
15	POLYSTICHUM MUNITUM	71.4	2.2	0-3	3.	2.	+.	.	.	+.	3.
16	LISTERA CORDATA	57.1	+.4	0-1	1.	+.	+.	.	+.	.	.
17	TIARELLA TRIFOLIATA	42.9	3.1	0-5	2.	5.	+.	.	.	.	.
18	RUBUS PEDATUS	42.9	3.1	0-5	+.	5.	.	.	.	1.	.
19	MIANTHEMUM DILATATUM	42.9	+.6	0-1	.	1.	.	.	1.	+.	.
20	TIARELLA LACINATA	28.6	1.5	0-3	2.	3.	.	.	.	.	.
21	COPTIS ASPLENIFOLIA	14.3	3.1	0-5	.	5.	.	.	.	.	.
22	LINNEAE BOREALIS	14.3	1.2	0-3	.	.	.	3.	.	.	.
23	VIOLA SEMPERVIRENS	14.3	1.2	0-3	.	3.	.	.	.	.	.
24	LYCOPODIUM CLAVATUM	14.3	+.0	0-1	.	.	.	1.	.	.	.
25	BOSCHNIAKIA HOOKERI	14.3	+.0	0-+	.	.	.	.	.	+.	.
26	GOODYERA OBLONGIFOLIA	14.3	+.0	0-+	.	.	.	.	+.	.	.
27	STREPTOPUS ROSEUS	14.3	+.0	0-+	.	+.	.	.	.	.	.
DH											
28	RHYTIDIADELPHUS LOREUS	100.0	6.0	3-7	7.	5.	7.	6.	7.	3.	3.
29	HYLOCOMIUM SPLENDENS	85.7	6.5	0-9	8.	3.	4.	9.	7.	1.	.
30	EURINCHIUM OREGANUM	85.7	4.0	0-5	4.	5.	2.	3.	4.	.	+.
	TSUGA HETEROPHYLA	28.6	+.4	0-1	.	1.	.	.	.	1.	.
31	PLAGIOTHECIUM UNDULATUM	28.6	+.0	0-+	.	.	+.	.	+.	.	.
	THUJA PLICATA	14.3	+.0	0-1	.	.	.	.	.	1.	.
32	POGONATUM MACOUNII	14.3	+.0	0-+	+.	.	.	.	.	.	.

PLOT NUMBER		SYNTHETIC VALUES			9	3	39	56	57	1	4
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE						
DW											
	RHYTIDIADELPHUS LOREUS	42.9	4.3	0-6	.	5.	.	.	.	6.	2.
	EURINCHIUM OREGANUM	42.9	2.5	0-4	.	3.	.	.	.	1.	4.
33	DICRANUM SP	28.6	+.1	0-1	.	1.	.	.	.	.	+.
	HYLOCOMIUM SPLENDENS	14.3	+.5	0-2	.	.	.	.	.	2.	.
34	HYPNUM CIRCINALE	14.3	+.5	0-2	.	.	.	.	.	.	2.
DR											
	RHYTIDIADELPHUS LOREUS	14.3	3.1	0-5	5.	.	.	.	.	.	.

Vegetation type: CHAMAECYPARIS

PLOT NUMBER		SYNTHETIC VALUES			13	34	38	35	37
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE				
A1									
1	CHAMAECYPARUS NOOTKATENSIS	100.0	5.9	2-7	2.	7.	6.	6.	5.
2	TSUGA MERTENSIANA	100.0	5.1	2-6	2.	6.	5.	4.	3.
3	ABIES AMABILIS	80.0	5.4	0-7	.	5.	5.	4.	7.
4	TSUGA HETEROPHYLA	40.0	5.4	0-8	.	.	.	5.	8.
5	THUJA PLICATA	20.0	3.4	0-5	.	.	.	5.	.
A3									
	ABIES AMABILIS	20.0	3.4	0-5	.	.	.	.	5.
	TSUGA HETEROPHYLA	20.0	1.5	0-3	.	.	.	.	3.
	TSUGA MERTENSIANA	20.0	1.5	0-3	.	.	.	.	3.
B1									
	TSUGA HETEROPHYLA	100.0	4.3	3-4	4.	4.	4.	3.	4.
	TSUGA MERTENSIANA	100.0	4.0	3-4	4.	4.	3.	3.	3.
	ABIES AMABILIS	80.0	5.0	0-5	.	4.	5.	4.	5.
	CHAMAECYPARUS NOOTKATENSIS	60.0	4.0	0-5	5.	4.	.	2.	.
	THUJA PLICATA	40.0	2.0	0-3	3.	.	.	2.	.
B2									
6	VACCINIUM ALASKENSE	100.0	7.5	3-8	3.	7.	8.	8.	7.
	TSUGA MERTENSIANA	100.0	4.3	1-6	6.	2.	1.	1.	1.
	TSUGA HETEROPHYLA	80.0	3.7	0-5	5.	2.	1.	.	2.
7	VACCINIUM PARVIFOLIUM	80.0	3.0	0-4	+.	1.	4.	.	3.
	ABIES AMABILIS	80.0	2.8	0-3	.	2.	3.	2.	3.
8	CLADOTHAMNUS PYROLIFLORUS	60.0	4.5	0-5	3.	5.	.	5.	.
	CHAMAECYPARUS NOOTKATENSIS	60.0	4.2	0-6	6.	2.	2.	.	.
9	MENZIESIA FERRUGINEA	60.0	3.6	0-5	2.	.	5.	.	2.
10	GAULTHERIA SHALLON	40.0	4.3	0-6	6.	.	.	3.	.
11	PHYLLODOCE EMPETRIFORMIS	40.0	1.0	0-2	+.	.	.	2.	.
	THUJA PLICATA	20.0	3.4	0-5	5.	.	.	.	.

PLOT NUMBER		SYNTHETIC VALUES			13	34	38	35	37
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE				
12	VACCINIUM OVALIFOLIUM	20.0	1.5	0-3	3.	.	.	.	.
C									
13	COPTIS ASPLENIFOLIA	100.0	4.4	+-5	+.	4.	5.	3.	4.
14	BLECHNUM SPICANT	100.0	3.1	1-3	2.	3.	3.	1.	3.
15	LISTERA CORDATA	100.0	1.8	+-2	+.	2.	2.	1.	1.
16	RUBUS PEDATUS	80.0	4.0	0-4	.	4.	4.	3.	4.
17	CORNUS CANADENSIS	80.0	3.3	0-4	3.	.	4.	3.	2.
18	LINNEAE BOREALIS	80.0	1.4	0-2	2.	+.	1.	1.	.
19	STREPTOPUS AMPLEXIFOLIUS	80.0	1.3	0-2	.	1.	+.	+.	2.
20	VERATRUM VIRIDE	60.0	1.9	0-3	.	3.	1.	1.	.
21	STREPTOPUS ROSEUS	60.0	1.4	0-2	.	2.	+.	.	2.
22	TIARELLA TRIFOLIATA	60.0	1.4	0-2	.	.	2.	+.	2.
23	CLINTONIA UNIFLORA	60.0	1.4	0-2	.	.	1.	1.	2.
24	PLATANTHERA STRICTA	60.0	+.0	0-+	.	.	+.	+.	+.
25	MONESES UNIFLORA	60.0	+.0	0-+	.	+.	+.	.	+.
26	CALTHA LEPTOSEPALA VAR BIFLORA	40.0	2.5	0-4	.	4.	.	1.	.
27	TRIENTALIS ARCTICUS	40.0	1.2	0-2	2.	1.	.	.	.
28	LYCOPODIUM CLAVATUM	40.0	+.4	0-1	+.	.	.	1.	.
29	FAURIA CRISTA-GALLI	20.0	1.5	0-3	.	.	3.	.	.
30	TIARELLA LACINATA	20.0	+.2	0-1	.	.	.	.	1.
31	ATHYRIUM FELIX-FEMINA	20.0	+.0	0-+	.	.	+.	.	.
32	DRYOPTERIS ASSIMILIS	20.0	+.0	0-+	.	+.	.	.	.
	PHYLLODOCE EMPETRIFORMIS	20.0	+.0	0-+	.	+.	.	.	.
33	TRAUTVETTERIA CAROLINIENSIS	20.0	+.0	0-+	.	.	+.	.	.
34	VIOLA SEMPERVIRENS	20.0	+.0	0-+	.	.	+.	.	.
DH									
35	RHYTIDIADELPHUS LOREUS	100.0	8.7	7-9	7.	7.	9.	9.	9.
36	HYLOCOMIUM SPLENDENS	100.0	5.2	3-7	7.	3.	4.	4.	4.
37	MNIUM GLABRESCENS	60.0	2.4	0-3	.	3.	3.	.	1.
38	RHYTIDIOPSIS ROBUSTA	40.0	4.4	0-6	.	6.	.	4.	.

PLOT NUMBER		SYNTHETIC VALUES			13	34	38	35	37
ST.NO.	SPECIES	P	MS	RS	SPECIES SIGNIFICANCE				
39	PLAGIOTHECIUM UNDULATUM	40.0	2.5	0-4	.	1.	.	.	4.
40	SPAGNUM CAPILLACEUM	40.0	2.4	0-4	.	+.	4.	.	.
41	DICRANUM SP	40.0	+.0	0-+	+.	+.	.	.	.
42	EURINCHIUM OREGANUM	20.0	1.5	0-3	.	.	.	.	3.
43	CLADONIA SP	20.0	+.0	0-+	+.	.	.	.	.
44	LIVERWORT THALOSE	20.0	+.0	0-+	.	+.	.	.	.

Vegetation type: EMPETRUM

ST.NO.	SPECIES	P	MS	RS	32	33	SPECIES SIGNIFICANCE
A1							
1	TSUGA MERTENSIANA	100.0	5.1	4-5	5.	4.	
2	CHAMAECYPARUS NOOTKATENSIS	100.0	5.0	3-5	5.	3.	
B1							
	TSUGA MERTENSIANA	100.0	4.1	3-4	4.	3.	
	CHAMAECYPARUS NOOTKATENSIS	100.0	3.8	2-4	4.	2.	
3	ALNUS VIRIDIS SSP SINUATA	100.0	2.4	2-2	2.	2.	
4	PINUS CONTORTA	50.0	2.6	0-3	.	3.	
B2							
	CHAMAECYPARUS NOOTKATENSIS	100.0	6.5	5-7	5.	7.	
5	CLADOTHAMNUS PYROLIFLORUS	100.0	5.8	3-7	7.	3.	
6	EMPETRUM NIGRUM	100.0	5.3	2-6	2.	6.	
7	PHYLLODOCE EMPETRIFORMIS	100.0	5.1	4-5	4.	5.	
8	GAULTHERIA SHALLON	100.0	4.1	3-4	4.	3.	
9	VACCINIUM ALASKENSE	100.0	3.8	2-4	4.	2.	
10	VACCINIUM OVALIFOLIUM	100.0	2.9	1-3	1.	3.	
	PINUS CONTORTA	50.0	1.0	0-1	.	1.	
11	VACCINIUM PARVIFOLIUM	50.0	1.0	0-1	1.	.	
12	CASSIOPE MERTENSIANA	50.0	+.0	0-+	+.	.	
C							
13	CORNUS CANADENSIS	100.0	3.1	2-3	2.	3.	
14	BLECHNUM SPICANT	100.0	1.5	1-1	1.	1.	
15	CALTHA LEPTOSEPALA VAR BIFLORA	100.0	1.5	1-1	1.	1.	
16	TRIENTALIS ARCTICUS	100.0	1.2	+-1	1.	+.	
17	PLATANTHERA STRICTA	100.0	+.5	+-+	+.	+.	
18	LYCOPODIUM CLAVATUM	100.0	+.5	+-+	+.	+.	
19	VERATRUM VIRIDE	100.0	+.5	+-+	+.	+.	
20	COPTIS ASPLENIFOLIA	50.0	1.0	0-1	1.	.	
21	LINNEAE BOREALIS	50.0	1.0	0-1	1.	.	

PLOT NUMBER		SYNTHETIC VALUES			32	33	
ST.NO.	SPECIES	P	MS	RS			SPECIES SIGNIFICANCE
22	LISTERA CORDATA	50.0	1.0	0-1	1.	.	
23	RUBUS PEDATUS	50.0	1.0	0-1	1.	.	
24	ERIGERON PEREGRINUS VAR DAWSONI	50.0	+.0	0-+	.	+.	
DH							
25	HYLOCOMIUM SPLENDENS	100.0	5.1	4-5	5.	4.	
26	RHYTIDIOPSIS ROBUSTA	100.0	3.1	2-3	2.	3.	
27	RHYTIDIADELPHUS LOREUS	50.0	5.7	0-7	7.	.	
28	EURINCHIUM OREGANUM	50.0	2.6	0-3	.	3.	

Vegetation type: CAREX HOODII

ST.NO.	SPECIES	P	MS	RS	31	36
B2						
1	CLADOTHAMNUS PYROLIFLORUS	50.0	+.0	0-+	.	+.
2	EMPETRUM NIGRUM	50.0	+.0	0-+	.	+.
3	GAULTHERIA SHALLON	50.0	+.0	0-+	+.	.
4	VACCINIUM OVALIFOLIUM	50.0	+.0	0-+	+.	.
C						
5	CAREX HOODII	100.0	8.5	7-9	9.	7.
6	ERIOPHORUM ANGUSTIFOLIUM	100.0	5.7	1-7	1.	7.
7	ELEOCHARIS PAUCIFLORUS	100.0	5.5	4-6	4.	6.
8	CALTHA LEPTOSEPALA VAR BIFLORA	100.0	5.1	4-5	4.	5.
9	FAURIA CRISTA-GALLI	100.0	3.8	2-4	4.	2.
10	COPTIS ASPLENIFOLIA	100.0	3.1	2-3	2.	3.
11	ERIGERON PEREGRINUS VAR DAWSONI	100.0	3.1	2-3	2.	3.
12	TOLFIELDIA GLUTINOSA	100.0	3.1	2-3	2.	3.
13	AGROSTIS SP.	100.0	2.4	2-2	2.	2.
14	GENTIANA SP.	100.0	1.7	+-2	2.	+.
15	TRIENTALIS ARCTICUS	100.0	1.2	+-1	+.	1.
16	DROSERA ROTUNDIFOLIA	100.0	+.5	+-+	+.	+.
17	PLATANTHERA STRICTA	100.0	+.5	+-+	+.	+.
18	LYSICHITUM AMERICANUM	50.0	2.6	0-3	.	3.
19	CAREX NIGRICANS	50.0	1.0	0-1	1.	.
20	CALAMAGROSTIS SP.	50.0	+.0	0-+	.	+.
21	CORNUS CANADENSIS	50.0	+.0	0-+	.	+.
DH						
22	SPAGNUM CAPILLACEUM	100.0	7.5	7-7	7.	7.
23	RHYTIDIADELPHUS LOREUS	50.0	1.6	0-2	.	2.

Header: PLOT NUMBER — SYNTHETIC VALUES (P, MS, RS); plots 31, 36. SPECIES SIGNIFICANCE

APPENDIX C: SOIL DATA: SELECTED PROFILE DESCRIPTIONS

Aanimi Plot No. X02

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tsuga-Tiar(s)	200 m	13 %	mod.well	0 %	120 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
H	-9- 0	3.5	2.5 YR 2/2	0	0	0			
Ae	0- 3		10.0 YR 5/3	0	0	0	sl		
Bhf	3- 10	3.8	5.0 YR 3/3	30	0	0	sl	VW M SAB	
Bf1	10- 40	4.5	7.5 YR 4/6	15	20	20	sl	VW M SAB	
Bf2	40- 70	4.5	7.5 YR 4/4	15	20	20	sl	VW M SAB	
II Bf	70-120	4.6	7.5 YR 4/4	30	20	20	ls	SG	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
H				49.32	1.56	32	149.41	16.3	11.29	11.32	0.93	0.77				
Ae																
Bhf	53	35	12	5.58	0.30	19	28.79	6.1	0.80	0.76	0.11	0.08	2.54	0.61	4.74	0.60
Bf1	62	34	5	3.99	0.20	20	17.55	3.4	0.39	0.12	0.04	0.05	1.81	1.23	4.00	1.50
Bf2	62	34	5	3.38	0.20	17	18.85	3.9	0.56	0.09	0.03	0.05	1.70	1.13	3.83	1.44
IIBf	75	22	3	2.39	0.15	16	11.68	7.2	0.71	0.07	0.02	0.04	0.56	0.83	2.22	0.96

Atush Plot No. X14

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tsuga-Tiar(s)	90 m	3 %	Well	90 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
H	0- 3	3.8	7.5 YR 3/2	2	0	0			
Bhf1	3- 6	4.4	7.5 YR 4/4	2	0	0	sil	WM C SBK	
Bhf2	6- 12	4.5	7.5 YR 3/3	2	0	0	sil	WM MC SBK	
Bhf3	12- 43	4.7	10.0 YR 3/2	1	0	0	sil	WM C SBK	
II Bhf	43- 63	5.0	7.5 YR 3/3	50	7	0	sl	WM VC SBK	
III Bf1	63- 81	5.1	7.5 YR 3/2	30	0	0	ls	W C SBK	
III Bf2	81-130	5.3	5.0 YR 3/2	80	10	0	ls	SGR	
IV Bf	130-135+	5.3	7.5 YR 3/2	0	0	0	sl	MA	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
H	27	52	22	31.76	1.94	16	82.40	10.6	4.91	2.55	1.03	0.24	1.57	1.00	2.71	1.21
Bhf1	22	57	21	12.75	0.70	18	45.95	3.0	0.68	0.31	0.24	0.14	2.62	2.23	5.20	2.43
Bhf2	30	55	15	11.88	0.80	15	49.92	2.4	4.83	0.18	0.13	0.08	1.80	2.79	4.25	2.30
Bhf3	29	56	15	10.83	0.75	14	46.26	4.5	1.58	0.28	0.12	0.09	1.80	2.85	4.29	2.30
II Bhf	56	36	8	7.03	0.56	13	37.63	8.8	2.78	0.36	0.07	0.09	1.24	2.25	3.62	1.80
III Bf1	85	12	3	1.65	0.13	13	11.62	27.9	2.72	0.37	0.04	0.11	0.29	0.54	1.91	0.50
III Bf2	88	10	3	1.65	0.21	8	17.90	33.9	5.20	0.74	0.04	0.08	0.37	0.55	2.26	0.53
IV Bf	63	31	6	4.99	0.40	12	25.02	20.9	4.56	0.54	0.04	0.08	1.09	1.35	3.52	1.22

Battle Plot No. X01

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Thuja	210 m	29 %	imperfect	0 %	23 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
H	-14- 0	3.4		0	0	0			
Ae	0- 1			0	0	0	sl		
Bf	1- 23	3.8	5.0 YR 3/2	30	10	0	sl	VW F SAB	F M P
IIBm	23- 40+	4.5	2.5 Y 5/2	20	25	25	ls	MA	F M P 5.0 YR 4/6

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
H				52.62	1.27	42	135.27	21.7	19.79	7.59	1.46	0.53				
Ae																
Bf	62	30	8	4.37	0.26	17	19.90	6.5	0.69	0.39	0.14	0.07	1.13	0.40	2.69	0.40
IIBm	73	25	2	0.93	0.02	47	5.85	10.6	0.53	0.05	0.02	0.02	0.15	0.36	1.34	0.60

Battle Plot No. X41

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tsuga-Tiar(s)	170 m	50 %	Imperfect	0 %	90 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
F	-20--16			0	0	0			
H	-16- 0	3.4	10.0 R 2/1	0	0	0			
Ae	0- 1		10.0 YR 5/6	0	0	0	sl		
Bhf	1- 25	3.9	7.5 YR 5/6	20	10	15	l	W VC SBK	
Bfgj	25- 60	4.4	7.5 YR 4/6	20	10	15	sl	W VC SBK	C F D
Bhfgj	60- 90	4.3	5.0 YR 3/8	20	10	15	sl	W VC SBK	C M F
Bg	90-100		10.0 YR 3/3	20	10	15	sl	Ma	C F P 5.0 YR 5/8

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
F																
H				50.26	1.60	31	197.44	17.5	11.57	21.48	0.71	0.73				
Ae																
Bhf	47	36	17	6.65	0.30	22	38.80	3.6	0.70	0.47	0.12	0.10	2.92	0.88	4.34	1.17
Bfgj	53	37	10	3.72	0.20	19	27.83	3.2	0.70	0.09	0.03	0.06	3.40	1.36	6.29	1.49
Bhfgj	56	34	10	6.85	0.30	23	35.38	2.3	0.54	0.18	0.04	0.08	5.33	1.97	7.75	2.44
Bg																

Bunsby Plot No. X13

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Chamaecyparis	400 m	10 %	Rapid	0 %	4 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure		Mottles
H1	-16--10	3.4	10.0 R 2/1	0	0	0				
H2	-10- 0	3.3	10.0 R 2/2	0	0	0				
Ae(h)	0- 4	3.4	10.0 YR 4/2	20	0	0	sil	W	MA	
R	4- 0			0	0	0				

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
H1							110.93	19.4	10.60	9.02	1.32	0.53				
H2							136.46	16.8	6.46	14.55	1.25	0.67				
Ae(h)	29	61	11	13.43	0.40	34	27.37	9.3	1.25	0.72	0.37	0.20	0.30	0.23	1.22	0.14
R																

Bunsby Plot No. X34

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Chamaecyparis	680 m	50 %	Well	0 %	12 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure		Mottles
LF	-10- -9			0	0	0				
H	-9- 0			0	0	0				
Ae(h)	0- 2		7.5 YR 4/2	10	0	0	sl		Ma	
Bhf	2- 10	3.8	7.5 YR 3/2	10	0	0	l		Ma	F F P
R										

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
LF																
H																
Ae(h)																
Bhf	40	47	12	14.62	0.40	37	37.64	4.5	1.01	0.48	0.11	0.11	0.74	0.43	1.28	0.55
R																

Cuttle Plot No. X09

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Thuja	315 m	45 %	Well	10 %	47 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour			Gr	Co	St	Text	Structure	Mottles
F	-14- -7	5.0				0	0	0			
H	-7- 0	5.1	10.0	R	2/1	0	0	0			
Bhf1	0- 13	4.3	7.5	YR	4/6	5	15	0	sicl	W MC SBK	
Bhf2	0- 13	4.8	5.0	YR	3/3	5	15	0	sicl	W MC SBK	
Bhf3	13- 47	4.7	5.0	YR	3/3	5	30	0	sil	WM MC SBK	
R	47- 0					0	0	0			

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
F				49.25	1.63	30	130.33	40.9	45.13	5.66	2.09	0.42				
H				37.56	2.05	18	110.26	48.8	44.64	5.59	2.96	0.56				
Bhf1	9	62	29	9.87	0.40	25	41.16	5.5	1.46	0.43	0.26	0.12	3.14	1.39	9.06	2.20
Bhf2	13	59	28	14.21	1.01	14	59.48	20.3	9.51	1.65	0.77	0.16	3.93	2.24	7.71	2.41
Bhf3	25	50	24	11.57	0.80	14	50.48	16.8	6.62	1.31	0.39	0.15	3.59	1.69	7.16	1.80
R																

Cuttle Plot No. X57

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Thuja	360 m	20 %	Well	20 %	20 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour			Gr	Co	St	Text	Structure	Mottles
F	-18--17					0	0	0			
H	-17- 0	3.3	5.0	YR	2/1	0	0	0			
Ae	0- 3		7.5	YR	5/2	0	0	0	sil		C M P
Bf	3- 20	3.6	7.5	YR	4/6	15	50	0	sil	W WC SBK	C M P
Bhfg	20- 32	3.7	7.5	YR	4/2	0	0	0	sil		C F P
R	32- 0					0	0	0			

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
F																
H				52.47	1.30	40	125.83	17.1	6.61	12.61	1.53	0.81				
Ae																
Bf	23	57	20	4.65	0.15	31	28.40	5.1	4.52	0.77	0.09	0.08	1.02	0.48	6.20	0.63
Bhfg	29	54	17	5.38	0.24	22	29.98	5.0	0.52	0.79	0.08	0.10	0.78	0.46	3.38	0.42
R																

Kayumin Plot No. X38

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Chamaecyparis	570 m	30 %	Poor	0 %	32 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour		Gr	Co	St	Text	Structure			Mottles		
F	-10- -8				0	0	0							
H1	-8- -5		10.0 R	2/1	0	0	0							
H2	-5- 0		5.0 YR	3/2	0	0	0							
Ae(h)	0- 3	4.9	7.5 YR	5/2	15	5	20	l	W	C	SBK	C F P	5.0 YR	5/6
Bhfg1	3- 18	5.1	10.0 YR	5/3	15	5	20	sl	W	VC	SBK	M F P	5.0 YR	4/6
Bhfg2	18- 32	4.0	5.0 YR	3/3	15	5	20	l	W	VC	SBK	C F P	7.5 YR	5/6
Bfg	32- 40	3.9	7.5 YR	5/8	15	5	20	l			MA	M M P	2.5 Y	5/4
Bg	40- 50+		5.0 Y	5/2	15	5	2	sl			MA	C F P	7.5 YR	5/8

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
F																
H1																
H2																
Ae(h)	46	36	18	14.42	0.70	21	54.70	9.7	4.67	0.41	0.09	0.15	1.33	3.80	4.97	3.51
Bhfg1	53	41	6	5.36	0.51	11	17.59	16.4	2.59	0.19	0.02	0.08	1.46	0.98	3.71	1.40
Bhfg2	43	45	12	6.31	0.33	19	36.02	3.4	0.71	0.23	0.20	0.09	2.59	0.94	3.96	1.25
Bfg	35	45	20	4.70	0.23	20	29.91	3.7	0.66	0.22	0.16	0.07	2.90	0.88	5.93	1.00
Bg																

Klaskish Plot No. X10

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Elymus	91 m	0 %	Poor	99 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour		Gr	Co	St	Text	Structure	Mottles
Ah	0- 4	3.9	5.0 YR	2/2	0	0	0	c	SGR	
Bf	4- 10	4.3	7.5 YR	3/4	0	0	0	ls	SGR	
II Bm	10- 35	5.1	5.0 Y	4/3	15	0	0	s	SGR	
II C	35- 80+	5.4	2.5 Y	5/4	50	15	5	s	SGR	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
Ah	37	17	46	15.15	1.25	12	44.85	14.2	4.03	1.68	0.53	0.11	1.11	0.53	1.90	0.67
Bf	85	13	2	1.90	0.10	19	8.40	14.2	0.93	0.19	0.05	0.03	0.33	0.32	1.18	0.30
II Bm	94	6	1	0.22	0.01	22	2.97	31.1	0.79	0.11	0.01	0.02	0.08	0.19	0.93	0.22
II C	95	6	0	0.26	0.02	13	3.07	45.9	1.29	0.09	0.01	0.02	0.08	0.17	1.19	0.22

Klaskish Plot No. X29

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tiarella	20 m	0 %	Poor	99 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
LF	-1- 0			0	0	0			
Ah	0- 3		7.5 YR 3/2	0	0	0	ls		
Bf	3- 18	4.5	10.0 YR 4/4	0	0	0	ls	Ma	
I + IIBf	18- 38	4.5		0	0	0	sl		
II Bf	38- 58	4.7	10.0 YR 3/3	0	0	0	l	W VC SBK	
III C	58-100			90	1	0	s	SGR	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
LF																
Ah																
Bf	81	14	5	1.86	0.11	17	9.28	26.7	2.03	0.37	0.03	0.05	0.32	0.36	1.47	0.34
I + IIBm	59	31	10	3.00	0.30	10	16.17	16.0	2.10	0.33	0.03	0.13	0.49	0.52	1.93	0.57
II Bf	44	43	13	4.69	0.30	16	19.28	19.8	3.34	0.35	0.04	0.08	0.85	0.86	2.59	0.80
III C																

Klaskish Plot No. X07

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tsuga-Tiar(s)	150 m	0 %	mod.well	0 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
LF	-11--10			0	0	0			
H	-10- 0	3.6	2.5 YR 2/2	0	0	0			
Ae	0- 3		7.5 YR 4/2	0	0	0	ls		
Bf1	3- 16	3.9	5.0 YR 5/8	0	0	0	ls	WM MC SBK	
Bf2	16- 39	4.6		0	0	0	ls	Ma	
II Bm	39- 49	4.5	2.5 Y 5/4	0	0	0	sl	W MC SBK	
III Bm	49- 63	4.5	2.5 Y 5/4	0	0	0	sl	W MC SBK	
IV C	63- 75			20	10	0	sl	SGR	
V C	75- 90			0	0	0	s	SGR	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
LF																
H				48.82	1.70	29	131.60	16.4	9.80	8.87	2.15	0.76				
Ae																
Bf1	78	17	5	3.11	0.13	24	18.71	4.1	0.45	0.22	0.05	0.04	1.30	0.41	2.43	0.43
Bf2	94	6	0	0.58	0.04	15	4.42	11.5	0.41	0.05	0.02	0.03	0.26	0.28	1.17	0.28
II Bm	48	45	7	2.68	0.10	27	16.93	3.9	0.48	0.06	0.03	0.09	1.21	1.01	3.19	1.14
III Bm	68	27	5	1.75	0.10	18	10.19	1.4	0.06	0.05	0.01	0.02	0.48	0.46	1.82	0.64
IV C																
V C																

Power Plot No. X43

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tsuga	170 m	60 %	Imperfect	10 %	120 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
F	-11- -5			0	0	0			
H	-5- 0			0	0	0			
Ae	0- 1		2.5 YR 6/4	15	10	20	l	W C SBK	
Bhf	1- 12	4.2	2.5 YR 3/6	15	10	20	l		
Bhfg	12- 50	4.5	7.5 YR 5/6	15	10	20	l	W VC SBK	C C P 5.0 YR 5/8
Bhfg2	50- 80	4.7	10.0 YR 4/4	15	10	20	l	W VC SBK	F M P 7.5 YR 5/8
Bhfg3	80-120+	4.5	10.0 YR 2/2	15	10	20	sl		F F P 7.5 YR 5/8

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
F																
H																
Ae																
Bhf	43	47	10	10.14	0.42	24	48.22	2.9	0.81	0.34	0.13	0.12	3.28	2.56	5.19	2.63
Bhfg	45	47	8	9.11	0.40	23	43.30	2.2	0.65	0.12	0.08	0.10	3.19	2.17	3.99	2.91
Bhfg2	48	43	9	9.43	0.40	24	39.19	1.6	0.40	0.09	0.04	0.08	2.08	2.26	3.69	3.37
Bhfg3	58	35	7	8.31	0.40	21	34.96	1.8	0.39	0.11	0.04	0.09	2.20	2.27	3.02	2.93

Power Plot No. X45

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tsuga-Tiar(f)	130 m	70 %	Imperfect	40 %	120 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
F + H	-24- 0	5.2	10.0 R 2/2	10	20	0			
Bhf	0- 28	5.1	5.0 YR 3/3	15	40	0	sil	W VC SBK	
Bhf2	28- 52	5.7	7.5 YR 3/2	50	2	0	sl	M C SBK	
Bhfgj	52- 64		10.0 YR 3/2	70	0	0	sl	W M SBK	C C D 5.0 YR 4/6
Cgj	64- 76		5.0 Y 5/3	70	0	0	sl	MA	C F F 10 YR 4/3
R									

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
F + H				50.24	1.32	38	99.28	54.0	48.38	4.62	0.29	0.30				
Bhf	36	50	14	12.51	0.71	18	52.21	12.7	5.67	0.72	0.10	0.12	2.35	2.62	3.62	3.89
Bhf2	72	64	4	6.47	0.45	14	39.14	20.2	7.30	0.50	0.03	0.08	1.01	1.64	3.09	2.78
Bhfgj																
Cgj																
R																

Quineex Plot No. X17

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Elymus	91 m	1 %	Poor	97 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
H	12- 0	4.6	5.0 YR 3/2	0	0	0		WM VC SBK	
Bhf	0- 28	4.5	5.0 YR 3/3	0	0	0	sl	W VC SBK	
II Bf1	28- 52	5.1	7.5 YR 3/2	50	1	0	s	SGR	
II Bf2	52- 75	5.1	10.0 YR 3/2	50	1	0	ls	SGR	
II Bm	75-110	5.1		50	1	0	s	SGR	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
H	48	34	19	20.56	1.00	21	63.35	15.9	9.01	0.75	0.21	0.08	1.07	1.33	3.07	1.94
Bhf	59	30	11	8.84	0.51	17	39.48	8.3	2.83	0.34	0.07	0.04	1.17	1.50	3.28	1.30
II Bf1	88	11	1	2.50	0.15	17	12.08	27.2	2.87	0.35	0.03	0.03	0.34	0.55	1.86	0.50
II Bf2	86	12	3	1.32	0.10	13	8.54	34.4	2.56	0.31	0.04	0.03	0.24	0.47	1.70	0.43
II Bm	92	8	0	0.84	0.08	11	7.04	25.3	1.52	0.21	0.02	0.03	0.13	0.19	1.21	0.40

Quineex Plot No. X47

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tiarella	95 m	0 %	Poor	100 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
Ah	0- 10	4.6	7.5 YR 3/4	0	0	0	sl	W C SBK	F F P 5.0 YR 5/8
Bfg	10- 40	4.4	10.0 YR 4/3	0	0	0	sl	WM VC SBK	C F P 2.5 YR 5/8
IIBg	40- 54	4.5	2.5 Y 4/4	5	0	0	ls	W VC SBK	C F P 7.5 YR 4/6
IIIBg	54- 78			95	0	0	s	SGR	
IVBfg	78-110	4.6	10.0 YR 4/3	0	0	0	ls	WM VC SBK	C M P 5.0 YR 5/8
VC	110-120			80	10	0	s	SGR	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
Ah	56	34	10	9.10	0.50	18	30.01	30.0	7.16	1.48	0.24	0.12	0.72	0.50	2.54	0.66
Bfg	68	27	5	2.76	0.21	13	14.38	7.4	0.88	0.11	0.04	0.04	0.68	0.71	2.86	0.66
IIBg	87	11	2	0.92	0.09	10	5.82	10.5	0.50	0.07	0.02	0.02	0.26	0.27	1.40	0.43
IIIBg																
IVBfg	73	24	3	1.65	0.16	10	10.50	10.3	0.88	0.12	0.04	0.04	0.42	0.43	2.24	0.61
VC																

Quineex Plot No. X21

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tsuga-Tiar(s)	20 m	0 %	Imperfect	0 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour		Gr	Co	St	Text	Structure	Mottles
H	-2- 0		10.0 R	2/1	0	0	0			
Bhf	0- 6	4.0	7.5 YR	4/5	5	0	0	l	W C SBK	
Bf	6- 34	4.7	10.0 YR	4/4	5	0	0	sl	W VC SBK	
II Bf	34- 50	4.8	10.0 YR	4/4	10	0	0	s	SGR	
III Bm	50- 94	4.9	2.5 Y	5/4	40	0	0	s	SGR	
IV Bg1	94-122	4.8	5.0 Y	5/3	0	0	0	sl	MA	2.5 YR 4/8
IV Bg2	122-146	4.9	5.0 Y	5/3	0	0	0	sl	MA	C C P 5.0 YR 5/8
V B	146-150	4.9			80	0	0	s		

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
H																
Bhf	40	48	12	5.08	0.30	17	22.59	5.2	0.68	0.31	0.11	0.08	2.00	0.98	3.89	1.25
Bf	65	30	5	1.85	0.10	19	9.95	5.9	0.50	0.03	0.02	0.04	0.70	0.86	2.32	0.85
II Bf	88	9	3	0.76	0.04	19	5.00	4.4	0.15	0.03	0.01	0.03	0.32	0.41	1.28	0.49
III Bm	96	2	2	0.33	0.02	17	3.32	7.8	0.14	0.06	0.01	0.05	0.14	0.18	0.76	0.26
IV Bg1	70	24	6	0.76	0.09	8	5.94	4.7	0.19	0.05	0.01	0.03	0.23	0.34	1.84	0.56
IV Bg2	79	19	2	0.50	0.06	8	3.92	16.1	0.57	0.02	0.01	0.03	0.24	0.41	1.22	0.47
V B	94	4	2	0.37	0.03	12	3.37	7.7	0.19	0.04	0.01	0.02	0.17	0.22	1.01	0.30

Qwushin Plot No. X36

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Carex	620 m	19 %	VPoor	1 %	100 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour		Gr	Co	St	Text	Structure	Mottles
Of	-28--18	4.1	10.0 YR	6/8	0	0	0			
Oh	-18- 0	4.1	5.0 YR	3/2	0	0	0			
Ahg	0- 18	4.3	5.0 YR	3/1	30	30	0	l		
A + C	18-100	4.3	5.6 Y	6/1	30	30	5	l		7.5 YR 6/8
R	100- 0				0	0	0			

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
Of				44.15	1.80	25	100.75	11.1	5.67	2.91	1.63	0.98				
Oh				41.55	1.40	30	85.86	3.7	2.29	0.56	0.10	0.23				
Ahg				13.77	0.50	28	38.23	6.5	2.04	0.28	0.02	0.15				
A + C	52	38	10	4.67	0.20	23	18.62	5.5	0.84	0.12	0.01	0.05	0.63	0.70	2.16	0.88
R																

Tanakmis Plot No. X05

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tiarella	205 m	65 %	Well	60 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour		Gr	Co	St	Text	Structure	Mottles
H	-8- 0	3.7	10.0 R	2/1	0	0	0			
Ae	0- 1				20	30	30	l		
Bhf	1- 4	3.8	2.5 YR	2/4	20	30	30	l	WM MC SBK	
Bhf1	4- 20	4.3	2.5 YR	3/5	20	30	30	l	SGr	
Bf1	20- 45	4.8	2.5 YR	4/8	20	30	30	sl	SGr	
Bf2	45- 60	4.8	7.5 YR	4/6	20	30	30	ls	SGr	
IIBf3	60-110	4.9	7.5 YR	4/6	20	30	30	ls	SGr	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
H				53.82	2.10	26	142.36	17.1	14.42	7.97	1.35	0.56				
Ae																
Bhf	48	38	14	6.61	0.45	15	39.36	6.3	1.33	0.93	0.13	0.10	3.82	0.68	6.47	0.73
Bhf1	52	39	9	5.61	0.30	19	31.16	7.2	1.33	0.72	0.10	0.09	3.20	1.06	5.92	1.20
Bf1	77	18	5	4.02	0.22	18	18.44	6.1	0.80	0.24	0.02	0.07	1.98	1.50	4.07	1.60
Bf2	79	19	2	2.08	0.12	17	12.49	9.5	0.84	0.27	0.02	0.05	0.91	0.82	2.57	1.05
IIBf3	78	19	3	2.16	0.10	22	12.05	13.3	1.20	0.30	0.03	0.07	0.76	0.75	2.21	0.80

Tanakmis Plot No. X06

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tsuga-Tiar(f)	185 m	50 %	Well	5 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour		Gr	Co	St	Text	Structure	Mottles
LF	-10- -9				0	0	0			
H	-9- 0	3.5	2.5 YR	2/2	0	0	0			
Ae	0- 7		5.0 YR	5/3	0	0	0	sl	Ma	
Bhf	7- 28	4.2	2.5 YR	3/2	20	30	30	sl	W MC SBK	
Bf	28- 65	4.9			20	30	30	sl	W MC SBK	
IIBf	65- 90	4.8	7.5 YR	4/4	20	30	30	ls	SGR	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
LF																
H				53.53	1.60	34	140.45	17.0	13.57	8.47	1.22	0.58				
Ae																
Bhf	58	36	6	8.12	0.40	20	45.38	1.9	0.50	0.20	0.10	0.08	5.02	2.12	7.28	1.90
Bf	78	19	3	3.62	0.20	18	22.88	1.3	0.11	0.04	0.11	0.03	1.87	1.72	3.70	1.70
IIBf	80	18	3	2.97	0.13	23	18.21	3.4	0.49	0.07	0.02	0.03	0.64	1.21	2.31	1.10

Upsowis Plot No. X16

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Elymus	90 m	4 %	Poor	99 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
LF	-13--11			0	0	0			
H	-11- 0	4.5		0	0	0			
Bhf	0- 9	5.1		5	10	0	sl	SGR	
II Bf	9- 30	5.2	5.0 YR 3/2	50	30	0	s	SGR	
III Bhf	30- 50	5.3		0	0	0	sl		
IV Bm	50- 64	5.3		50	0	0	s	SGR	
V Bhf	64- 71	5.4		0	0	0	l	WV C SBK	
VI Bhf	71- 84	5.6	5.0 YR 3/2	90	5	0	ls	SGR	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
LF																
H				30.44	1.23	25	100.83	23.4	21.22	1.97	0.23	0.17				
Bhf	59	31	10	12.88	0.61	21	48.38	28.9	12.84	0.93	0.10	0.11	0.76	1.36	3.04	1.11
II Bf	88	11	1	1.68	0.10	17	8.96	44.6	3.68	0.26	0.04	0.02	0.22	0.48	2.09	0.51
III Bhf	64	30	7	14.08	0.63	22	55.53	37.2	18.36	1.33	0.10	0.13	0.59	1.21	2.83	1.56
IV Bm	90	10	0	0.76	0.05	15	8.22	38.2	2.85	0.24	0.02	0.03	0.15	0.20	1.70	0.45
V Bhf	49	39	12	13.54	0.70	19	50.63	37.7	17.62	1.23	0.10	0.11	0.88	1.17	3.64	1.57
VI Bf	83	15	2	3.10	0.20	16	14.87	52.6	7.15	0.58	0.05	0.04	0.36	0.57	2.14	0.48

Upsowis Plot No. X15

Vegetation	Elev.	Slope	Drainage	Exp.Min	CTill
Tsuga-Tiar(s)	90 m	10 %	Imperfect	0 %	250 cm

Morphological Data

Horizon	Depth (cm)	pH	Colour	Gr	Co	St	Text	Structure	Mottles
LF	-1- 0			0	0	0			
Ah	0- 3		5.0 YR 3/2	0	0	0			
Bf	3- 16	4.2	5.0 YR 3/2	50	15	0	ls	SGR	
II Bf1	16- 46	4.7	5.0 YR 3/3	50	15	0	s	SGR	
II Bf2	46- 90+	4.8	10.0 YR 3/4	50	15	0	s	SGR	

Laboratory Data

Horizon	S	Si	Cl	Org C	N	C/N	CEC	BSat	Ca	Mg	K	Na	napFe	napAl	cbdFe	cbdAl
LF																
Ah																
Bf	78	18	4	3.22	0.30	11	16.71	9.0	1.05	0.31	0.09	0.05	0.58	0.49	2.61	0.47
II Bf1	91	8	1	0.65	0.05	13	7.75	14.5	0.93	0.11	0.03	0.05	0.15	0.35	1.87	0.44
II Bf2	88	11	1	0.55	0.04	14	4.95	18.2	0.75	0.12	0.01	0.02	0.14	0.31	1.77	0.40

APPENDIX D: INTERPRETATIONS LISTED BY POLYGON NUMBER

Polygon	Map Unit	Ha.	Forest Site Class	Mass Movement Hazard	Flood Hazard	Debris Torrent Hazard	Sediment Hazard (Roads)	Limitations to Regeneration	Wildlife Range	Verification Level
A00	Water	10								
A01	Sp/CFB	1	Good	None	None	Low	Low	Moderate	E(W)	Ground
A03	Ce/SCS	2	Moderate	Low	None	Low	High	Moderate	D(W)	Air photo
A04	Ba/SCS	8	Moderate	High	None	High	High	Moderate	E(W)D(W)	Ground
A05	Ce/MMS	22	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Ground
A07	He/SCS	36	Moderate	Low	None	Low	High	Moderate	D(W)	Air photo
A09	He/SCS	6	Moderate	Low	None	Low	High	Moderate	D(W)	Ground
A10	He/SCS	45	Poor	Moderate	None	Low	High	Moderate	D(W)	Helicopter
A11	Ce/SCS	8	Poor	Low	None	Low	Low	Moderate	D(W)	Ground
A12	He/MMB	5	Poor	Low	None	Low	Low	Slight	E(SF)D(Y)	Ground
A13	Sp/CTF	6	Moderate	None	Low	Low	Low	Moderate	E(W)D(SF)	Ground
A15	Al/CTF	1	Good	None	Extreme	Low	Low	Severe	E(W)	Ground
A16	Al/MTF	5	Good	None	Extreme	Low	High	Severe	E(W)D(SF)	Ground
A17	Sp/MTF	13	Good	None	High	Low	High	Moderate	E(W)	Ground
A18	Sp/MTF	3	Good	None	Moderate	Low	High	Moderate	E(W)	Ground
A19	Al/CTF	2	Low	None	Extreme	Low	Low	Severe	E(W)	Ground
A21	Ce/MMS	5	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
A22	Ce/SCS	3	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
A23	Ce/MMS	3	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
A24	Ba/SCS	5	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
A25	He/SCS	30	Poor	Low	None	Low	High	Moderate	D(W)	Helicopter
A26	Ce/MMS	5	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
A27	Ce/MMS	4	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
A28	MH/MMS	17	Low	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
A29	Ce/SCS	2	Poor	Low	None	Moderate	High	Moderate	D(W)	Air photo
A30	Ce/SCS	2	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
A31	He/SCS	30	Poor	Low	None	Moderate	High	Moderate	D(W)	Air photo
A32	MH/SCS	4	Low	Low	None	Low	High	Moderate	D(SF)	Air photo
A33	Ce/SCS	7	Low	Low	None	Low	High	Moderate	D(W)	Air photo
A34	Ce/MMS	7	Low	Low	None	Low	Low	Slight	E(SF)D(SF)	Ground
A36	Ce/SCS	13	Low	Low	None	Low	High	Moderate	D(W)	Air photo
A37	Ce/SCS	2	Low	Moderate	None	Low	Low	Moderate	D(W)	Air photo
A38	He/SCS	1	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
A39	He/SCS	1	Poor	Low	None	Low	High	Moderate	D(W)	Air photo
A40	Ba/SCS	52	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Helicopter
A41	He/SCS	8	Moderate	Moderate	None	Moderate	High	Moderate	D(W)	Air photo
A42	He/SCS	5	Moderate	Moderate	None	Low	High	Moderate	D(W)	Air photo
A43	Ce/MMS	6	Moderate	Low	None	Low	Low	Slight	E(SF)D(SF)	Helicopter
A44	He/SCS	5	Moderate	Low	None	Moderate	High	Moderate	D(W)	Helicopter
A45	He/MMB	8	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Air photo
A46	Ce/MMS	9	Moderate	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
A47	Ce/SCS	16	Moderate	Moderate	None	Moderate	Low	Moderate	D(W)	Helicopter
A48	He/MMB	7	Poor	Low	None	Low	Low	Slight	E(SF)D(Y)	Helicopter
A52	Ce/MMS	5	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Helicopter
A53	BY/SCS	13	Moderate	High	None	Extreme	High	Moderate	D(W)	Air photo
A54	He/MMB	6	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Helicopter

Listing of interpretations by delineation

Polygon	Map Unit	Ha.	Forest Site Class	Mass Movement Hazard	Flood Hazard	Debris Torrent Hazard	Sediment Hazard (Roads)	Limit-ations to Regen-eration	Wildlife Range	Verification Level
A55	He/SCS	3	Moderate	Moderate	None	Moderate	High	Moderate	D(W)	Air photo
A56	Ce/MMS	3	Moderate	Low	None	Low	Low	Slight	E(SF)D(SF)	Helicopter
A57	Ce/MMS	12	Moderate	Low	None	Low	Low	Slight	E(SF)D(SF)	Helicopter
A58	He/SCS	1	Moderate	Moderate	None	Low	High	Moderate	D(W)	Air photo
A59	Ba/CFB	1	Moderate	None	None	Low	Low	Slight	E(SF)D(Y)	Air photo
A61	Ce/SCS	1	Poor	Moderate	None	Low	Low	Moderate	D(W)	Air photo
A62	Ba/CFB	1	Moderate	None	None	Low	Low	Slight	E(SF)D(Y)	Air photo
A66	Ht/MMS	8	Low	Low	None	Extreme	Low	Severe	E(Su)D(Su)	Air photo
B01	Sp/MTF	12	Good	None	Moderate	Low	High	Moderate	E(W)	Ground
B02	Sp/MTF	6	Moderate	None	Moderate	Low	High	Moderate	E(W)	Ground
B06	Ba/CFB	3	Moderate	None	Moderate	Low	Low	Slight	E(SF)D(Y)	Ground
B07	Ba/MCB	6	Moderate	None	None	Moderate	Moderate	Slight	E(SF)D(Y)	Ground
B08	Ba/MCB	5	Moderate	None	None	Low	Moderate	Slight	E(SF)D(Y)	Ground
B09	Al/CTF	5	Good	None	Extreme	Low	Low	Severe	E(W)	Ground
B10	Ba/SCS	10	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Ground
B11	Ce/MMS	21	Poor	Moderate	None	Low	Low	Slight	E(SF)D(SF)	Helicopter
B12	YC/SCS	22	Poor	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
B13	He/SCS	19	Moderate	Moderate	None	Moderate	High	Moderate	D(W)	Helicopter
B14	Ce/MMS	12	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Helicopter
B16	MH/MMS	12	Low	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
B17	He/MMB	6	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Air photo
B19	Ba/SCS	19	Good	Moderate	None	Low	High	Moderate	E(W)D(W)	Ground
B20	Ce/MMS	6	Low	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
B21	Ce/MMS	12	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
B22	Ba/SCS	15	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
B23	MH/MMS	5	Low	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
B24	He/SCS	18	Poor	Low	None	Low	High	Moderate	D(W)	Air photo
B25	Ba/SCS	16	Moderate	Moderate	None	Moderate	High	Moderate	E(W)D(W)	Air photo
B26	BY/SCS	14	Moderate	Moderate	None	Low	High	Moderate	D(W)	Air photo
B27	YC/SCS	5	Moderate	Low	None	Low	High	Moderate	E(W)D(W)	Air photo
B28	MH/SCS	23	Poor	Low	None	Low	High	Moderate	E(SF)	Air photo
B29	YC/SCS	25	Moderate	High	None	Low	Extreme	Moderate	E(W)D(W)	Air photo
B30	Sp/MTF	1	Good	None	High	Low	High	Moderate	E(W)	Ground
B31	BY/SCS	5	Moderate	Low	None	Extreme	High	Moderate	D(W)	Air photo
B32	Ht/MMS	16	Low	Low	None	High	Low	Severe	E(Su)D(Su)	Air photo
B33	MH/SCS	44	Low	High	None	High	High	Moderate	D(SF)	Helicopter
B34	MH/MMS	5	Low	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
B35	Ht/MMS	20	Low	Low	None	Extreme	Low	Severe	E(Su)D(Su)	Air photo
B36	MH/SCS	11	Moderate	Moderate	None	Low	Low	Moderate	D(SF)	Air photo
B37	BY/SCS	13	Moderate	High	None	Extreme	High	Moderate	D(W)	Air photo
B38	BY/SCS	9	Moderate	High	None	Extreme	High	Moderate	D(W)	Air photo
B40	Ht/MMS	13	Low	Low	None	High	Low	Severe	E(Su)D(Su)	Air photo
B41	BY/SCS	6	Moderate	High	None	Extreme	High	Moderate	D(W)	Air photo
B42	Ht/MMS	5	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Helicopter
B43	Ht/MMS	7	Low	Low	None	Extreme	Low	Severe	E(Su)D(Su)	Helicopter
B44	BY/SCS	35	Moderate	High	None	Extreme	High	Moderate	D(W)	Helicopter

Listing of interpretations by delineation

Polygon	Map Unit	Ha.	Forest Site Class	Mass Movement Hazard	Flood Hazard	Debris Torrent Hazard	Sediment Hazard (Roads)	Limit-ations to Regen-eration	Wildlife Range	Verification Level
B45	Y/SCS	8	Moderate	Low	None	Moderate	High	Moderate	D(W)	Helicopter
B46	BY/SCS	5	Moderate	Moderate	None	Moderate	High	Moderate	D(W)	Air photo
B47	Ht/MMS	4	Moderate	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
B48	BY/SCS	3	Moderate	Low	None	Moderate	High	Moderate	D(W)	Air photo
B49	Ht/MMS	1	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
B50	MH/MMS	3	Moderate	Moderate	None	Moderate	High	Severe	E(SF)D(SF)	Air photo
B51	AVAL	7	Low	Low	None	Extreme	High	Severe	Not-rated	Air photo
B52	MH/SCS	3	Poor	Low	None	Low	High	Moderate	D(SF)	Air photo
B53	Ht/MMS	3	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
B54	BY/SCS	9	Moderate	Low	None	High	High	Moderate	D(W)	Air photo
B55	YC/SCS	9	Moderate	High	None	High	High	Moderate	E(W)D(W)	Air photo
B56	Ht/MMS	31	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
B57	MH/SCS	9	Low	High	None	High	High	Moderate	D(SF)	Air photo
B58	MH/SCS	11	Poor	High	None	High	High	Moderate	D(SF)	Air photo
B59	BY/SCS	36	Moderate	Moderate	None	Low	High	Moderate	D(W)	Air photo
B60	YC/SCS	4	Poor	Low	None	Low	Low	Moderate	E(W)D(W)	Ground
B61	MH/SCS	12	Poor	Moderate	None	Low	Low	Moderate	D(SF)	Air photo
B63	YC/SCS	14	Moderate	Moderate	None	Moderate	High	Moderate	E(W)D(W)	Air photo
B66	Ba/MCB	19	Moderate	None	None	Low	Moderate	Slight	E(SF)D(Y)	Ground
B67	Ce/MMS	7	Low	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
B68	YC/SCS	4	Moderate	Low	None	Low	High	Moderate	E(W)D(W)	Air photo
B69	Ht/MMS	3	Moderate	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
B70	Ba/MMB	2	Moderate	Low	None	Low	Moderate	Slight	D(W)	Ground
B88	Al/CTF	0	Low	None	Extreme	Low	Low	Severe	E(W)	Ground
C02	Ba/MMB	7	Moderate	Low	None	Low	Moderate	Slight	D(W)	Ground
C04	He/SCS	19	Moderate	Low	None	Moderate	High	Moderate	D(W)	Ground
C05	Ba/SCS	16	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
C06	He/MMB	0	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Ground
C08	He/SCS	3	Moderate	Low	None	Low	High	Moderate	D(W)	Air photo
C09	MH/SCS	17	Poor	Low	None	Moderate	High	Moderate	D(SF)	Air photo
C11	Ba/MMB	5	Moderate	Low	None	Low	Moderate	Slight	D(W)	Ground
C12	Al/MTF	3	Moderate	None	Extreme	Low	Low	Severe	E(W)D(SF)	Ground
C13	Ht/MMS	10	Poor	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
C14	Ba/SCS	59	Moderate	Moderate	None	Moderate	High	Moderate	E(W)D(W)	Ground
C15	Ba/SCS	17	Good	High	None	Extreme	High	Moderate	E(W)D(W)	Ground
C16	Ba/MMB	1	Moderate	Low	None	Low	Low	Slight	D(W)	Ground
C17	Ba/MMB	2	Moderate	Low	None	Low	Low	Slight	D(W)	Ground
C21	MH/SCS	14	Poor	Moderate	None	Low	High	Moderate	D(SF)	Air photo
C22	Sp/MTF	6	Good	None	Moderate	Moderate	High	Moderate	E(W)	Ground
C23	Ba/CFB	1	Moderate	None	None	Low	Low	Slight	E(SF)D(Y)	Ground
C24	Ba/MMB	2	Moderate	Low	None	Low	Moderate	Slight	D(W)	Ground
C26	Ba/MCB	4	Moderate	None	None	Low	Moderate	Slight	E(SF)D(Y)	Ground
C28	Ce/SCS	1	Moderate	Moderate	None	Low	High	Moderate	D(W)	Air photo
C29	YC/SCS	3	Poor	Low	None	Low	Low	Moderate	E(W)D(W)	Air photo
C30	YC/SCS	17	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
C31	MH/MMS	3	Low	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo

Listing of interpretations by delineation

Polygon	Map Unit	Ha.	Forest Site Class	Mass Movement Hazard	Flood Hazard	Debris Torrent Hazard	Sediment Hazard (Roads)	Limit-ations to Regen-eration	Wildlife Range	Verification Level
C32	YC/SCS	4	Poor	Moderate	None	Moderate	High	Moderate	E(W)D(W)	Air photo
C33	BY/SCS	15	Moderate	High	None	High	High	Moderate	D(W)	Air photo
C35	AVAL	7	Low	Low	None	Low	High	Severe	Not-rated	Air photo
C36	MH/MMS	2	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
C39	Ht/MMS	5	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
C41	He/MMB	5	Moderate	None	None	Low	Low	Slight	E(SF)D(Y)	Ground
C42	He/MMB	3	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Air photo
C88	Al/CTF	1	Low	None	Extreme	Low	Low	Severe	E(W)	Air photo
D01	Ba/SMS	12	Good	Extreme	None	Extreme	Extreme	Moderate	E(SF)D(SF)	Ground
D04	He/SCS	7	Good	Low	None	Low	High	Moderate	D(W)	Air photo
D05	MH/SCS	5	Poor	Low	None	Low	High	Moderate	D(SF)	Air photo
D06	BY/SCS	18	Moderate	High	None	Extreme	High	Moderate	D(W)	Helicopter
D07	BY/SCS	8	Moderate	High	None	High	High	Moderate	D(W)	Helicopter
D08	BY/SCS	10	Moderate	High	None	Extreme	High	Moderate	D(W)	Helicopter
D09	Ba/SMS	8	Moderate	Extreme	None	High	Extreme	Moderate	E(SF)D(SF)	Helicopter
D10	Ce/SCS	3	Poor	Extreme	None	Extreme	Low	Moderate	D(W)	Ground
D11	Ba/SMS	13	Moderate	Extreme	None	Extreme	Extreme	Moderate	E(SF)D(SF)	Ground
D12	Sp/CFB	1	Poor	None	None	Low	Low	Moderate	E(W)	Ground
D13	Ba/MMB	3	Moderate	Low	None	Low	Low	Slight	D(W)	Ground
D14	He/MMB	2	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Ground
D15	YC/SCS	8	Poor	Low	None	Low	Low	Moderate	E(W)D(W)	Air photo
D16	YC/SCS	8	Poor	Low	None	Low	High	Moderate	E(W)D(W)	Air photo
D17	YC/SCS	10	Poor	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
D19	Ht/MMS	2	Poor	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
D20	MH/SCS	7	Poor	Low	None	Low	High	Moderate	D(SF)	Air photo
D21	MH/SCS	8	Poor	Low	None	Low	High	Moderate	D(SF)	Air photo
D22	YC/SCS	5	Moderate	Moderate	None	Moderate	High	Moderate	E(W)D(W)	Air photo
D23	MH/MMS	6	Moderate	Low	None	Low	Low	Severe	E(SF)D(SF)	Helicopter
D24	MH/MMS	3	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
D25	BY/SCS	18	Poor	Low	None	High	High	Moderate	D(W)	Helicopter
D26	YC/SCS	11	Poor	High	None	Extreme	High	Moderate	E(W)D(W)	Air photo
D27	MH/SCS	40	Low	Extreme	None	Low	High	Moderate	D(SF)	Air photo
D28	YC/SCS	9	Poor	Moderate	None	Low	Low	Moderate	E(W)D(W)	Air photo
D29	YC/SCS	7	Poor	Extreme	None	Moderate	Low	Moderate	E(W)D(W)	Air photo
D30	He/SCS	4	Moderate	Moderate	None	Low	High	Moderate	D(W)	Air photo
D31	AVAL	2	Low	Low	None	Low	High	Severe	Not-rated	Air photo
D32	BY/SCS	15	Moderate	High	None	High	High	Moderate	D(W)	Air photo
D33	Ba/SCS	7	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
D35	MH/SCS	23	Poor	Moderate	None	Low	High	Moderate	D(SF)	Air photo
D36	Ba/SMS	13	Moderate	Moderate	None	Moderate	High	Moderate	E(SF)D(SF)	Helicopter
D37	Ht/MMS	18	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
D38	MH/SCS	7	Poor	Low	None	Low	Low	Moderate	D(SF)	Air photo
D39	Ht/MMS	47	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
D40	Ht/MMS	17	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
D69	BY/SCS	12	Poor	Low	None	Low	High	Moderate	D(W)	Air photo
D70	Ht/MMS	5	Poor	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo

Listing of interpretations by delineation

Polygon	Map Unit	Ha.	Forest Site Class	Mass Movement Hazard	Flood Hazard	Debris Torrent Hazard	Sediment Hazard (Roads)	Limitations to Regeneration	Wildlife Range	Verification Level
D71	MH/MMS	4	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
D72	YC/SCS	7	Poor	High	None	Extreme	High	Moderate	E(W)D(W)	Air photo
D98	Ba/SMS	6	Moderate	Extreme	None	High	Extreme	Moderate	E(SF)D(SF)	Ground
D99	Ba/MCB	4	Good	None	None	Low	Low	Slight	E(SF)D(Y)	Air photo
E01	Sp/CFB	1	Good	None	None	Low	Low	Moderate	E(W)	Ground
E02	YC/SCS	19	Poor	High	None	High	Low	Moderate	E(W)D(W)	Air photo
E03	Ba/CFB	6	Moderate	None	None	Low	Low	Slight	E(SF)D(Y)	Ground
E04	Ba/MCB	4	Moderate	None	None	Moderate	Moderate	Slight	E(SF)D(Y)	Ground
E05	He/SCS	8	Moderate	Low	None	Low	High	Moderate	D(W)	Helicopter
E06	He/SCS	7	Moderate	Low	None	Low	High	Moderate	D(W)	Helicopter
E07	He/SCS	14	Poor	Low	None	Low	High	Moderate	D(W)	Helicopter
E09	Ba/SCS	11	Moderate	High	None	Extreme	High	Moderate	E(W)D(W)	Helicopter
E11	Al/MTF	16	Good	None	Extreme	Low	High	Severe	E(W)D(SF)	Ground
E12	Ba/SCS	51	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Helicopter
E13	He/SCS	4	Moderate	Moderate	None	Low	High	Moderate	D(W)	Air photo
E14	MH/MMS	18	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
E15	MH/SCS	5	Poor	Moderate	None	Low	Low	Moderate	D(SF)	Helicopter
E16	MH/MMS	19	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
E17	YC/SCS	27	Poor	Low	None	Moderate	High	Moderate	E(W)D(W)	Helicopter
E18	Ce/MMS	5	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
E19	MH/MMS	16	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
E20	MH/MMS	8	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
E21	YC/SCS	9	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
E23	BY/SCS	9	Poor	Moderate	None	Low	High	Moderate	D(W)	Helicopter
E24	Ht/MMS	24	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Helicopter
E25	Ht/MMS	8	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
E26	BY/SCS	13	Moderate	Low	None	Low	High	Moderate	D(W)	Air photo
E27	YC/SCS	35	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
E28	Ht/MMS	19	Poor	Low	None	Low	Low	Severe	E(Su)D(Su)	Helicopter
E29	BY/SCS	19	Poor	Moderate	None	Low	High	Moderate	D(W)	Helicopter
E30	YC/SCS	24	Poor	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
E31	Ht/MMS	2	Poor	Moderate	None	Low	Low	Severe	E(Su)D(Su)	Air photo
E33	Al/MTF	3	Good	None	Extreme	Low	Low	Severe	E(W)D(SF)	Ground
E34	Al/MTF	15	Good	None	Extreme	Low	High	Severe	E(W)D(SF)	Ground
E36	MH/SCS	3	Poor	Moderate	None	Low	Low	Moderate	D(SF)	Helicopter
E37	YC/SCS	27	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
E88	Al/CTF	8	Low	None	Extreme	Low	Low	Severe	E(W)	Air photo
F01	Ht/MMS	2	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Ground
F02	MH/MMS	59	Low	Low	None	Low	Low	Severe	E(SF)D(SF)	Ground
F03	Ht/MMS	1	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Ground
F04	He/SCS	8	Poor	Low	None	Low	High	Moderate	D(W)	Air photo
F05	He/SCS	24	Poor	Moderate	None	Moderate	High	Moderate	D(W)	Helicopter
F06	Ce/MMS	9	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Ground
F07	He/SCS	24	Poor	Moderate	None	Low	High	Moderate	D(W)	Ground
F08	Al/CTF	5	Low	None	Extreme	Low	Low	Severe	E(W)	Ground
F09	He/SCS	11	Poor	High	None	High	High	Moderate	D(W)	Ground

Listing of interpretations by delineation

Polygon	Map Unit	Ha.	Forest Site Class	Mass Movement Hazard	Flood Hazard	Debris Torrent Hazard	Sediment Hazard (Roads)	Limit-ations to Regen-eration	Wildlife Range	Verification Level
F10	He/SCS	10	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
F11	Al/MTF	4	Moderate	None	Extreme	Low	High	Severe	E(W)D(SF)	Air photo
F12	Ba/MMB	28	Moderate	Low	None	Low	Moderate	Slight	D(W)	Ground
F13	Sp/MTF	9	Good	None	High	Low	High	Moderate	E(W)	Air photo
F14	Ba/CFB	3	Moderate	None	None	Low	Low	Slight	E(SF)D(Y)	Ground
F15	Ba/CFB	2	Moderate	None	None	Low	Low	Slight	E(SF)D(Y)	Ground
F16	Sp/MTF	5	Moderate	None	High	Low	High	Moderate	E(W)	Ground
F17	Sp/CTF	5	Moderate	None	High	Low	Low	Moderate	E(W)D(SF)	Ground
F18	Al/MTF	2	Moderate	None	Extreme	Low	Low	Severe	E(W)D(SF)	Ground
F20	Al/MTF	6	Good	None	Extreme	Low	High	Severe	E(W)D(SF)	Ground
F21	Sp/MTF	8	Good	None	High	Low	High	Moderate	E(W)	Ground
F22	Ba/CFB	2	Good	None	None	Low	Low	Slight	E(SF)D(Y)	Ground
F23	MH/MMS	4	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Ground
F24	MH/MMS	4	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Ground
F25	Ba/SCS	72	Moderate	Low	None	Low	High	Moderate	E(W)D(W)	Air photo
F26	He/SCS	32	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
F27	YC/SCS	11	Poor	Moderate	None	Low	High	Moderate	E(W)D(W)	Ground
F28	YC/SCS	3	Poor	Moderate	None	Low	High	Moderate	E(W)D(W)	Ground
F29	BY/SCS	32	Moderate	Moderate	None	Low	High	Moderate	D(W)	Ground
F30	BY/SCS	3	Poor	Low	None	Low	Moderate	Moderate	D(W)	Ground
F33	MH/MMS	1	Low	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
F34	BY/SCS	7	Poor	Low	None	Low	High	Moderate	D(W)	Ground
F35	Ht/MMS	8	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Ground
F36	YC/SCS	8	Poor	Moderate	None	Low	High	Moderate	E(W)D(W)	Ground
F37	Ht/MMS	18	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Ground
F38	MH/MMS	17	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Ground
F39	MH/MMS	2	Low	Low	None	Low	Low	Severe	E(SF)D(SF)	Ground
F40	Ht/MMS	19	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Ground
F41	BY/SCS	2	Poor	Low	None	Low	High	Moderate	D(W)	Ground
F43	YC/SCS	6	Poor	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
F44	Ce/SCS	5	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
F45	He/SCS	6	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
F46	YC/SCS	20	Poor	Low	None	Low	High	Moderate	E(W)D(W)	Air photo
F48	MH/SCS	10	Low	High	None	Extreme	Low	Moderate	D(SF)	Air photo
F50	He/MMB	2	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Air photo
F52	BY/SCS	7	Poor	Moderate	None	Low	High	Moderate	D(W)	Helicopter
F53	He/SCS	29	Poor	Moderate	None	Moderate	High	Moderate	D(W)	Helicopter
F54	Ht/MMS	2	Poor	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
F55	Ce/MMS	27	Low	Low	None	Low	Low	Slight	E(SF)D(SF)	Helicopter
F56	He/MMB	4	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Air photo
F57	BY/SCS	5	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
F58	Ht/MMS	4	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Ground
F88	Al/CTF	4	Low	None	Extreme	Low	Low	Severe	E(W)	Air photo
G01	Sp/MTF	2	Good	None	None	Low	High	Moderate	E(W)	Ground
G02	Ba/MCB	8	Moderate	None	None	Low	Low	Slight	E(SF)D(Y)	Ground
G03	Al/MTF	11	Good	None	Extreme	Low	Low	Severe	E(SF(D(Y)	Ground

Listing of interpretations by delineation

Polygon	Map Unit	Ha.	Forest Site Class	Mass Movement Hazard	Flood Hazard	Debris Torrent Hazard	Sediment Hazard (Roads)	Limit-ations to Regen-eration	Wildlife Range	Verification Level
G04	Ba/MCB	3	Moderate	None	None	Low	Moderate	Slight	E(SF)D(Y)	Ground
G05	Sp/CFB	2	Moderate	None	None	Low	Low	Moderate	E(W)	Ground
G06	Sp/CFB	3	Moderate	None	None	Low	Low	Moderate	E(W)	Ground
G07	He/MMB	2	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Ground
G08	Sp/MTF	6	Moderate	None	Low	Low	High	Moderate	E(W)	Ground
G09	Sp/CTF	2	Good	None	Moderate	Low	Low	Moderate	E(W)D(SF)	Ground
G10	Ba/MCB	3	Moderate	None	None	Low	Moderate	Slight	E(SF)D(Y)	Ground
G11	Ba/MMB	18	Moderate	Low	Low	Low	Moderate	Slight	D(W)	Ground
G12	Ba/MCB	4	Moderate	None	None	Low	Low	Slight	E(SF)D(Y)	Ground
G13	Ba/SCS	5	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Ground
G16	Ce/MMS	9	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Ground
G17	Ce/MMS	5	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
G18	Ce/MMS	7	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
G19	Ba/SCS	70	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
G20	Ce/SCS	19	Poor	Low	None	Low	High	Moderate	D(W)	Air photo
G21	Ce/SCS	5	Poor	Moderate	None	Low	Low	Moderate	D(W)	Air photo
G22	He/SCS	3	Poor	Low	None	Low	High	Moderate	D(W)	Air photo
G23	Ba/SCS	14	Moderate	High	None	Extreme	High	Moderate	E(W)D(W)	Air photo
G24	He/SCS	9	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
G25	Ba/SCS	5	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
G26	Ce/SCS	8	Poor	Moderate	None	Low	Low	Moderate	D(W)	Ground
G28	BY/SCS	22	Moderate	Moderate	None	Low	High	Moderate	D(W)	Air photo
G29	Ce/MMS	8	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Air photo
G30	MH/MMS	5	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
G31	MH/SCS	16	Poor	Moderate	None	Low	High	Moderate	D(SF)	Air photo
G32	Ht/MMS	3	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
G36	YC/SCS	8	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
G37	MH/SCS	5	Poor	Moderate	None	Low	High	Moderate	D(SF)	Air photo
G38	YC/SCS	20	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
G40	MH/SCS	30	Poor	High	None	High	High	Moderate	D(SF)	Air photo
G41	He/SCS	7	Moderate	Moderate	None	Moderate	High	Moderate	D(W)	Ground
G42	MH/MMS	25	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
G44	MH/SCS	11	Poor	Moderate	None	Low	High	Moderate	D(SF)	Air photo
G45	Ht/MMS	30	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
G46	Ba/CFB	3	Moderate	None	None	Low	Low	Slight	E(SF)D(Y)	Ground
G47	MH/SCS	43	Poor	Moderate	None	Low	Low	Moderate	D(SF)	Air photo
G88	Al/CTF	1	Low	None	Extreme	Low	Low	Severe	E(W)	Air photo
H01	Sp/CTF	5	Moderate	None	High	Low	Low	Moderate	E(W)D(SF)	Ground
H02	Ba/SCS	5	Moderate	Low	None	Moderate	High	Moderate	E(W)D(W)	Ground
H04	He/MMB	8	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Ground
H05	He/MMB	2	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Ground
H06	He/MMB	7	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Ground
H07	He/MMB	6	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Ground
H11	Al/CTF	1	Low	None	Extreme	Low	Low	Severe	E(W)	Ground
H13	He/MMB	2	Poor	Low	None	Low	Low	Slight	E(SF)D(Y)	Ground
H14	Ba/MMB	1	Moderate	Low	None	Low	Moderate	Slight	D(W)	Ground

Listing of interpretations by delineation

Polygon	Map Unit	Ha.	Forest Site Class	Mass Movement Hazard	Flood Hazard	Debris Torrent Hazard	Sediment Hazard (Roads)	Limitations to Regeneration	Wildlife Range	Verification Level
H15	Ba/MMB	2	Moderate	Low	None	Low	Moderate	Slight	D(W)	Ground
H16	He/SCS	4	Poor	Moderate	None	Low	High	Moderate	D(W)	Ground
H18	Ba/MCB	9	Moderate	None	None	High	Moderate	Slight	E(SF)D(Y)	Ground
H19	Sp/CTF	3	Moderate	None	Low	Low	Low	Moderate	E(W)D(SF)	Ground
H20	Ba/MMB	2	Moderate	Low	None	Low	Moderate	Slight	D(W)	Ground
H21	He/SCS	26	Poor	High	None	High	High	Moderate	D(W)	Ground
H22	Ba/SCS	46	Moderate	High	None	High	High	Moderate	E(W)D(W)	Ground
H24	Ba/SMS	12	Moderate	Extreme	None	High	Extreme	Moderate	E(SF)D(SF)	Ground
H25	Ba/SCS	11	Moderate	High	None	High	High	Moderate	E(W)D(W)	Ground
H28	He/SCS	22	Moderate	Moderate	None	Low	High	Moderate	D(W)	Air photo
H29	BY/SCS	10	Moderate	Moderate	None	Low	High	Moderate	D(W)	Ground
H30	Ce/SCS	31	Poor	Moderate	None	Low	High	Moderate	D(W)	Ground
H31	BY/SCS	7	Moderate	Moderate	None	Low	High	Moderate	D(W)	Ground
H33	He/SCS	18	Moderate	Moderate	None	Low	Low	Moderate	D(W)	Ground
H34	Ce/SCS	4	Moderate	Moderate	None	Low	High	Moderate	D(W)	Air photo
H35	Ba/SCS	8	Moderate	High	None	Extreme	High	Moderate	E(W)D(W)	Air photo
H36	Ba/SCS	22	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Ground
H37	Ba/MCB	3	Poor	Moderate	None	Low	High	Slight	E(SF)D(Y)	Ground
H38	Sp/CTF	1	Moderate	None	None	Low	Low	Moderate	E(W)D(SF)	Ground
H40	Ba/SCS	1	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Ground
H41	He/MMB	4	Moderate	Low	None	Low	Low	Slight	E(SF)D(Y)	Ground
H44	Ce/MMS	11	Moderate	Low	None	Low	Low	Slight	E(SF)D(SF)	Ground
H46	Ba/SCS	33	Moderate	Low	None	Low	High	Moderate	E(W)D(W)	Air photo
H47	Ba/SCS	21	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Ground
H50	Ba/SMS	27	Moderate	Extreme	None	High	Extreme	Moderate	E(SF)D(SF)	Ground
H56	MH/SCS	10	Poor	Low	None	Low	Low	Moderate	D(SF)	Air photo
H57	YC/SCS	96	Moderate	High	None	High	High	Moderate	E(W(D(W)	Air photo
H59	BY/SCS	25	Good	Moderate	None	Moderate	High	Moderate	D(W)	Air photo
H60	MH/SCS	33	Poor	Low	None	Low	High	Moderate	D(SF)	Air photo
H63	He/SCS	6	Poor	Low	None	Low	High	Moderate	D(W)	Ground
H65	He/SCS	5	Poor	Moderate	None	Low	High	Moderate	D(W)	Ground
H68	Ba/SCS	49	Good	High	None	High	High	Moderate	E(W)D(W)	Ground
H71	He/SCS	4	Moderate	Moderate	None	Low	Low	Moderate	D(W)	Air photo
H81	MH/MMS	32	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Ground
H83	Ce/SCS	4	Low	Extreme	None	Low	Low	Moderate	D(W)	Air photo
H85	Ce/SCS	10	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
H87	Ba/SCS	10	Moderate	High	Extreme	Extreme	High	Moderate	E(W)D(W)	Air photo
H91	Ce/MMS	6	Poor	Low	None	Low	Low	Slight	E(SF)D(SF)	Ground
H93	YC/SCS	10	Poor	High	None	High	High	Moderate	E(W)D(W)	Air photo
I05	AVAL	11	Low	High	None	High	High	Severe	Not-rated	Air photo
I06	AVAL	5	Low	Low	None	High	High	Severe	Not-rated	Air photo
I11	MH/SCS	11	Poor	Moderate	None	Low	Low	Moderate	D(SF)	Helicopter
I13	Ht/MMS	36	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
I16	MH/MMS	22	Low	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
I17	Ht/MMS	100	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
I20	Ba/SCS	2	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo

Listing of interpretations by delineation

Polygon	Map Unit	Ha.	Forest Site Class	Mass Movement Hazard	Flood Hazard	Debris Torrent Hazard	Sediment Hazard (Roads)	Limit-ations to Regen-eration	Wildlife Range	Verification Level
I26	YC/SCS	12	Poor	Low	None	Moderate	High	Moderate	E(W)D(W)	Air photo
I27	YC/SCS	3	Low	Low	None	Low	High	Moderate	E(W)D(W)	Air photo
I29	Ba/SCS	31	Moderate	High	None	High	High	Moderate	E(W)D(W)	Helicopter
J06	YC/SCS	35	Poor	Low	None	Low	High	Moderate	E(W)D(W)	Air photo
J07	MH/SCS	50	Poor	High	None	High	High	Moderate	D(SF)	Air photo
J08	YC/SCS	27	Poor	Low	None	Moderate	High	Moderate	E(W)D(W)	Air photo
J09	Ba/SCS	93	Moderate	High	None	Extreme	High	Moderate	E(W)D(W)	Air photo
J10	Ba/SCS	21	Moderate	Low	None	Moderate	High	Moderate	E(W)D(W)	Ground
K11	MH/SCS	81	Poor	High	None	High	High	Moderate	D(SF)	Helicopter
K12	Ba/SCS	8	Moderate	Low	None	Low	High	Moderate	E(W)D(W)	Ground
K13	Ba/MCB	8	Moderate	None	None	Low	Moderate	Slight	E(SF)D(Y)	Ground
K14	Ba/SCS	15	Moderate	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
K15	BY/SCS	71	Moderate	High	None	High	High	Moderate	D(W)	Helicopter
K16	AVAL	36	Low	Low	None	High	High	Severe	Not-rated	Air photo
L01	Ht/MMS	122	Low	Low	None	Low	Low	Severe	E(Su)D(Su)	Air photo
L02	MH/SCS	9	Poor	High	None	High	High	Moderate	D(SF)	Air photo
L03	BY/SCS	7	Poor	Moderate	None	Low	High	Moderate	D(W)	Air photo
L04	MH/SCS	6	Poor	Low	None	Low	High	Moderate	D(SF)	Air photo
L05	YC/SCS	19	Poor	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
L06	MH/SCS	34	Low	Low	None	Moderate	Low	Moderate	D(SF)	Air photo
L07	MH/SCS	19	Poor	High	None	High	High	Moderate	D(SF)	Air photo
L08	YC/SCS	16	Poor	Moderate	None	Low	High	Moderate	E(W)D(W)	Air photo
L09	MH/SCS	20	Poor	Low	None	Low	High	Moderate	D(SF)	Air photo
L10	BY/SCS	23	Moderate	None	None	High	Low	Moderate	D(W)	Air photo
L11	MH/MMS	10	Moderate	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
L12	MH/SCS	8	Low	Moderate	None	Low	High	Moderate	D(SF)	Air photo
L13	BY/SCS	11	Poor	High	None	High	High	Moderate	D(W)	Air photo
L14	MH/MMS	81	Poor	Low	None	Low	Low	Severe	E(SF)D(SF)	Air photo
L15	MH/SCS	14	Poor	Moderate	None	Low	Low	Moderate	D(SF)	Air photo
M01	BY/SCS	50	Moderate	High	None	High	High	Moderate	D(W)	Air photo
M02	MH/SCS	5	Moderate	Moderate	None	Low	Low	Moderate	D(SF)	Air photo
M03	MH/SCS	12	Moderate	Moderate	None	Low	Low	Moderate	D(SF)	Air photo
Z00	Water	62								