

PRELIMINARY DESCRIPTION, MAPPING, AND  
INTERPRETATION OF THE VEGETATION OF  
THE GREATER VANCOUVER REGIONAL DISTRICT

QK  
203  
.B8  
H83  
1976

QK  
203 .  
.B8  
H83  
1976

Preliminary description,  
mapping, and interpretation of  
the vegetation of the Greater  
Vancouver regional district.

QK  
203  
.B8  
H83  
1976

Preliminary description,  
mapping, and interpretation of  
the vegetation of the Greater  
Vancouver regional district.

LITERATURE  
ENVIRONMENT CANADA  
PUBLICATIONS

LAND

BVAEP Vancouver, Env. Can. Lib./Bib.



36 012 112

EGION,

V6E 2M7

PRELIMINARY DESCRIPTION, MAPPING, AND  
INTERPRETATION OF THE VEGETATION OF  
THE GREATER VANCOUVER REGIONAL DISTRICT

CONTRACT REPORT

TO

ENVIRONMENT CANADA  
FORESTRY SERVICE, PACIFIC FOREST RESEARCH CENTRE,  
VICTORIA, B.C.

W. F. HUBBARD

M. A. M. BELL

BIOCON RESEARCH LTD.

JANUARY, 1976

LIBRARY  
ENVIRONMENT CANADA  
PACIFIC REGION

LANDS DIRECTORATE, PACIFIC REGION  
ROOM 904 - 1001 W. PENDER ST.  
VANCOUVER, B.C.  
V6E 2M7

102314

## TABLE OF CONTENTS

ABSTRACT

ACKNOWLEDGEMENTS

INTRODUCTION

LIST OF VEGETATION UNITS

SECTION I - DESCRIPTION OF UNITS

SECTION II - PRELIMINARY LAND USE INTERPRETATION

LITERATURE CITED

APPENDIX I - VEGETATION MAPS OF THE GVRD

## ABSTRACT

The vegetation of the Greater Vancouver Regional District was studied both on aerial photographs and in the field. As a result of this examination, 53 vegetation units and 6 land utilization units were defined, described and mapped at a scale of 1:50,000. Interpretation of the results of specific types of land use for each vegetation was carried out and is tabulated within the report.

#### ACKNOWLEDGEMENTS

Thanks are extended to Mr. Adolf Ceska and Mr. Stephen Mitchell who aided in plant identification and to Mr. David Clark and Mr. Russell George who carried out much of the photography for this report. Thanks also to Dr. Hans Roemer, who gave invaluable technical assistance and to Miss Stacey Bavis and Miss Julie Edwards who aided in field reconnaissance. A special thanks to Mrs. Barbara Smith who typed and proofread this manuscript.

VEGETATION OF THE  
GREATER VANCOUVER REGIONAL DISTRICT

The Greater Vancouver Regional District occupies the southwest corner of the mainland of British Columbia and is bounded on the south by the Canadian - American International Border; on the west by the Gulf of Georgia and Howe Sound; on the north by a line running from a point on the east coast of Howe Sound at approximately the same latitude as Mt. Brunswick, to a point somewhat north of Pitt Lake and on the east by Pitt Lake, Pitt River, the Fraser River, and the Surrey - Langley border. Included within this area are the cities of Vancouver, New Westminster, and North and West Vancouver, as well as the communities of Cloverdale, Coquitlam, Deep Cove, Ladner, Lion's Bay, Port Coquitlam, Port Moody, Steveston, Tsawassen, and White Rock.

The entire area is characterized by a wet maritime climate, although considerable variation of climatic parameters occurs within the district. In general, precipitation is lowest in the south and west and increases to the north and east as well as with altitude. Minimum average annual rainfall recorded for the district is 36.29" for Ladner, at the mouth of the South Arm of the Fraser. Maximum figure for the district is 102.21" at Mosquito Creek on the slopes of North Vancouver. Vancouver city receives an average annual rainfall of 60.24". Temperatures are generally moderate, representative maximum and minimum average monthly temperatures being 65°F and 38°F respectively, recorded at

Vancouver city. Temperatures decrease with altitude. Snowfall is minimal in the southern portion of the area but increases to many feet per year in the northern mountains.

The area was explored during the late 18th century and the first European settlement came in the second quarter of the 19th century. Since this time the district has been subjected to continuous and intensive land use especially of the region south of Burrard Inlet.

At present, pressures for land use are rapidly increasing with expanding population. These pressures are resulting in extensive development of both upland and lowland areas not formally designated as parks or reserve land. So rapidly is this development proceeding, that what is written and mapped today may bear little relationship to what may be observed in the field in a year's time. Areas undergoing particularly intensive development include the south bank of the Fraser near Barnston Island, the area immediately south of Burnaby Mountain, the Surrey uplands immediately east of Burns Bog, the entire Steveston - Ladner area, Point Roberts, the area south of Mt. Seymour, and the hillsides above West Vancouver and Horseshoe Bay.

The entire district has been mapped in its entirety according to the terms of the contract. The map units described in detail on the following pages have been derived primarily on the basis of dominant species. These units will be found to correlate strongly with landform, soil moisture, and land use history. Fifty-six vegetation units and six units based on current land use have been defined.

In some cases, a map area is represented as containing the code number for more than one unit. This situation arises where an area

contains elements of two or more vegetation units, usually in conformance with variations in micro-relief or as a result of land use history.

Such combinations are represented in three distinct ways. Where a mosaic or combination of elements of two or more vegetation units is represented, the code number for each unit is presented, in order of dominance, and separated by a diagonal slash (i.e. 1/2). In areas of transition between one unit and another, the code numbers are separated by a hyphen (i.e. 1-2). Where information concerning original vegetation cover is available, the code number of that vegetation type is presented in brackets following the code number for the current vegetation type (i.e. 1(2)).

The following report is divided into two sections. In the first, each vegetation unit within the GVRD is described in detail. The second section consists of a series of tables, one for each vegetation unit, giving information concerning successional status and land use interpretation for that unit.

A vegetation list is included within this report as Appendix I. This list, while detailed, is not exhaustive, as a result of time limitations. Also included is a series of color transparencies, each depicting one vegetation unit within the GVRD.

## METHODOLOGY

The large area of the Greater Vancouver Regional District and the limited time available for study have necessarily imposed certain limitations upon the mapping procedures, and it is anticipated that a certain amount of refinement, both of maps and report will arise from an extensive long-term study.

The procedure followed involved, after initial familiarization with vegetation in the field, a concentrated study of the entire GVRD area as represented on aerial photographs of scale 1" = 40 chains. Discrete vegetation units were delineated directly upon the photos, following which, extensive field work was undertaken to identify and characterize the derived units. Due to the large number of units perceived and the shortness of time, no systematic sampling nor analysis were carried out.

Vegetative units have been derived on the basis of two criteria, vegetation and topographic factors. It is felt that these units will have particular relevance to the processes of land use management, for which this study is intended.

MAPPING UNITS WITHIN THE GVRD

A/ Marine Communities

- 1) *Zostera* Mud
- 2) *Salicornia* Mud Flats
- 3) *Carex - Scirpus* Tidal Marsh
- 4) *Elymus* Beach
- 5) *Potentilla - Aster* Back Beach
- 6) *Aira* Rocky Headlands

B/ Fresh Water Aquatic Communities

- 7) *Nuphar* Lakes
- 8) *Lemna* Ditches
- 9) *Typha - Scirpus* Water Margins
- 10) *Eleocharis* Gravel Lake Margins

C/ Swampland Communities

- 11) *Spiraea - Salix* Swampland
- 12) *Carex* Upland Swamps
- 13) *Carex* Alpine Basins
- 14) *Thuja - Alnus* Swamp Forest

D/ Alluvial Plain Communities

- 15) *Populus - Salix* Sandbar
- 16) *Populus - Acer* Floodplain Forest

17) *Picea* Alluvial Plain Forest

18) *Salix* - *Betula* Wet Forest

E/ Bog Margin Communities

19) *Betula* - *Spiraea* Peatland

20) *Betula* - *Pinus* Bog Margin

21) *Pinus* - *Gaultheria* Bog Forest

F/ Peat Bog Communities

22) *Gaultheria* - *Ledum* Bog Shrubland

23) *Vaccinium* - *Kalmia* Bog

24) *Sphagnum* - *Lysichitum* Bog

25) *Dulichium* Muck

26) *Empetrum* - *Habenaria* Upland Bog

27) *Eriophorum* - *Sphagnum* Upland Moor

G/ Wasteland Communities

28) *Solidago* Roadsides

29) *Rubus* - *Alnus* Wasteland

30) *Rubus* - *Spiraea* Wet Waste

31) *Juncus* Old Fields

32) *Epilobium* - *Hypochaeris* Cutovers

H/ Alder Regeneration Communities

33) *Alnus* - *Symporicarpos* Dry Banks

34) *Alnus* - *Polystichum* Wet Banks

35) *Alnus* - *Acer* Upland Regeneration Forest

36) *Alnus* Wetland Regeneration Forest

37) *Alnus* Juvenile Stands

## I/ Rock Communities

- 38) Talus Slopes
- 39) Sparsely Vegetated Rock Walls
- 40) *Rhacomitrium* Rock Bluffs
- 41) *Arbutus* - *Holodiscus* Dry Rock Slopes

## J/ Douglas Fir Subzone Coniferous Forest

- 42) *Pseudotsuga* - *Arbutus* Dry Forest
  - a) *Pinus* Uplands
  - b) *Berberis* Slopes
- 43) *Pseudotsuga* Slope Forest
  - a) *Gaultheria* Upper Slopes
- 44) *Polystichum* Lower Slopes
  - a) *Thuja* - *Gaultheria* Moist Forest
  - b) *Tsuga* - *Acer* Forest
- 45) *Thuja* - *Acer* Banks

## K/ Hemlock Zone Coniferous Forest

- 46) *Tsuga* - *Gaultheria* Upland Forest  
HC(F)
- 47) *Abies* - *Tsuga* Midslopes  
HB, HBC
- 48) *Blechnum* - *Tsuga* Seepage Slopes  
CH, CH(B)
  - a) *Blechnum* Lower Slopes
  - b) *Streptopus* Upland Slopes
- 49) *Thuja* - *Oplopanax* Stream Banks

L/ Hemlock Zone High Elevation Coniferous Forest

- 50) *Tsuga - Abies - Vaccinium* Upper Slopes
- 51) *Abies - Streptopus* Mid Slopes
- 52) *Thuja - Oplopanax* Lower Slopes

M/ Sub-alpine Communities

- 53) *Tsuga mertensiana - Abies* Sub-alpine Forest
- 54) *Tsuga - Cassiope* Sub-alpine Shrubland
- 55) *Cassiope - Phyllodoce* Sub-alpine Slopes

N/ Alpine Communities

O/ Lands Currently Under Active Management

- a) Parks and Other Areas of Maintained Turf
- b) Industrial Land
- c) Agricultural Land
- d) Schools and Public Buildings
- e) Urban Areas
- f) Miscellaneous

1) Zostera Mud (not mapped)

*Zostera* (eelgrass) dominated mud flats occur extensively in Boundary, Mud, and Semiahmoo Bays, along the foreshore of the Fraser Delta and at various places in Burrard Inlet. In these areas, tidal and river currents maintain moderately deep channels through widespread areas of mud. Eelgrass dominates these channels, usually in very dense patches. These channels are covered by all but the very lowest tides.

Two species are present within this unit, *Zostera marina* and *Zostera nana*, the former being both more common and more widely spread through the area than the latter (Forbes, 1972). These two species represent the only vascular plants occurring within this vegetation unit.

The substrate within this unit consists of mud or sandy mud with an admixture of shell.

2) Salicornia - Atriplex Mud Flats

*Salicornia* (glasswort) salt flats occur primarily in Mud and Boundary Bays, especially in the mud flats along the north shore of Boundary Bay, and also extensively between the mouths of the Serpentine and Nikomekl rivers. Small patches of this unit also occur at various points on Burrard Inlet, in areas characterized by a foreshore of muddy sand. Generally, this unit is bounded on the ocean side by mud colonized only by algal species, and on the landward side by dykeland, beach, or tidal marsh communities (see

below). Soil is generally thick, heavy mud, sometimes with a considerable admixture of sand and shell. The community is normally at least partially submerged at high tide.

Three sub-communities exist within this community;

a) *Suaeda* lower flats, b) *Salicornia* mid flats, and c) *Atriplex* upper flats.

a) *Suaeda* Lower Flats

This sub-community occupies fairly extensive areas near the mouths of the Serpentine and Nikomekl rivers. The unit consists solely of thickly scattered specimens of *Suaeda maritima* (seablite) shallowly rooted in the mud.

b) *Salicornia* Mid Flats

The mid flat area, characterizing an area slightly above the mean tide level, is present in all areas represented by this vegetation unit. This sub-community is characterized by an aggregation of vegetation into clumps and tussocks raised slightly above the surrounding mud. Dominant within these clumps is *Salicornia pacifica* (glasswort), which forms dense mats, within and near which may be found abundant *Triglochin maritimum* (arrow grass). Also present between these tussocks are scattered *Suaeda maritima* (seablite) and *Spergularia macrotheca* (sand spurry).

c) *Atriplex* Upper Flats

This sub-community, which occurs most commonly on the north shore of Boundary Bay, and in lesser quantities on most

muddy foreshores within the GVRD, is slightly higher above mean sea level than either of the previously described sub-communities. This unit is characterized by large areas of extremely densely growing *Atriplex patula* var. *littoralis* (silverscale) as well as *Salicornia pacifica* and attendant *Cuscuta salina* (dodder). Also present in smaller quantities are *Glaux maritima* (saltwort), *Plantago maritima* (sea plantain), and *Triglochin maritimum* (arrow grass). In places there also occurs on the landward side of this unit, very abundant *Distichlis spicata* (salt grass) as well as *Juncus balticus* (Baltic rush) and in some areas of wet seepage *Carex lyngbyei* (Lyngbey's sedge).

3) *Carex - Scirpus* Tidal Marsh

Estuarine tidal marshes are very extensive within the southern portion of the GVRD, occurring along the entire foreshore of the Fraser delta, and also, in certain locations on Boundary Bay. It is probable, however, that these extensive marshes are only a small fraction of those existing before the area was dyked and drained for agricultural purposes.

This vegetation unit is normally bounded on the seaward side by the *Zostera* community and on the landward side by dykeland, beach, or forest communities. The upper limits of this community are determined by high tide extremes. Soils range from sandy mud and clay to sand, frequently with an admixture of broken shell. There are two subcommunities; a) *Scirpus - Carex* subtidal marsh, and b) *Typha* upper marsh, in normal circumstances occurring in two

distinct bands.

a) *Scirpus* - *Carex* sub-tidal marsh

This sub-community is found very extensively on the Fraser Delta foreshore along the seaward sides of the various islands of the delta. It is almost completely submerged at high tide. Dominant is *Scirpus americanus* (bulrush) which forms a wide band between open water and higher ground. Also found here, but in smaller quantities is *Scirpus validus*. Slightly closer to high tide level there occur considerable quantities of *Carex lyngbyei* (Lyngbey's sedge) with *Juncus articulatus* (jointed rush) and occasional *Juncus balticus* (Baltic rush) becoming evident at slightly higher elevations yet. Also present in small numbers is *Typha latifolia* (cat-tail). Other species present include *Agrostis palustris* (creeping bent grass), *Deschampsia caespitosa* (little hair grass), *Equisetum palustre* (marsh horsetail), and *Triglochin maritimum* (arrowgrass).

b) *Typha* upper marsh

Dominant in this sub-community, which is only submerged at the highest tide level is *Typha latifolia* (cat-tail). Also present are *Calamagrostis nutkaensis* (Pacific reed grass), *Carex lyngbyei* (Lyngbey's sedge), *Deschampsia caespitosa* (tufted hair grass), *Plantago maritima* (sea plantain), *Potentilla pacifica* (Pacific silverweed), and *Scirpus americanus* (bulrush). All these are present in only small quantities.

4) Elymus Beach

The *Elymus* beach community occupies a relatively small area within the GVRD. It is found on parts of the north shore of Boundary Bay, fairly extensively on the east side of Point Roberts, at the mouth of the Nicomekl river on Crescent spit, in places on Howe Sound, and in fragmented form along the periphery of the White Rock highland and upper Burrard Inlet, and in places on the Fraser Delta foreshore. Most of these beach areas have been modified by recreational use, or, in the case of the White Rock area, the construction and maintenance of the Burlington - Great Northern railroad, which follows the beach line from Crescent Beach to Blaine. The embankment for this railroad has obliterated most of the upper beach zone. A similar situation occurs on parts of Howe Sound. As a result of both of these disruptive influences, much of the natural vegetation of this community type, especially in these locations, has been destroyed or supplanted by introduced or weedy species.

The soils of the beach community are sands and gravels with no apparent stratification.

The unit is characterized at its seaward edge by scattered specimens of *Cakile edulenta* (sea rocket) and *Honkenya peploides* (sea purslane) growing in the sand among the drift logs. In some areas, this seaward element is not present, its place being taken by the *Salicornia* - *Atriplex* community mentioned above. This arrangement is found on Crescent Spit, on the north shore of Boundary Bay, and at various points in Burrard Inlet.

At a point slightly higher on the beach there occur

frequent clumps of *Elymus mollis* (beach rye). These are accompanied by abundant *Lathyrus maritima* (beach pea) and in some places *Vicia gigantea* (giant vetch). Areas which are relatively undisturbed are also characterized by scattered *Ambrosia chamissonis* (burr weed), *Cakile edulenta* (sea rocket), and some *Plantago maritima* (sea plantain), as well as, in the north east corner of Boundary Bay, large areas of *Carex macrocephala* (mace headed carex), and on the delta foreshore, scattered *Rumex maritimus* (seaside dock). Various grassy species are also present in most areas. These include both native and introduced species.

Much of the beach community has been invaded by weedy or introduced species. These species are found primarily in the upper beach area. Here, evidence of human use, in the form of paths, roadways, and worn areas, is especially common. Vegetation in this portion of the beach includes *Achillea millefolium* (yarrow), *Aira praecox* (little hair grass), *Capsella bursa-pastoris* (shepherds purse), *Conyza canadensis* (horseweed), *Distichlis spicata* (salt grass), *Elymus mollis* (beach rye), *Grindelia integrifolia* (gumweed), *Hypochaeris radicata* (cat's ear), *Plantago lanceolata* (plantain), *Plantago major* (broad leaf plantain), *Poa macrantha* (seashore bluegrass), *Polygonum fowleri* (knotweed), *Rumex acetosella* (sheep sorrel), *Taraxacum officinale* (dandelion), and *Trifolium* spp. (clover). A more detailed categorization of the vegetation in this community will be presented in Appendix I. All of these species, and others not identifiable at the time of examination may be found scattered within the upper portion of the beach community. Along

the north shore of Semiahmoo Bay, there may also be found abundant *Convolvulus arvensis* (morning glory), *Senecio vulgaris* (ragwort), *Solidago canadensis* (goldenrod), and *Tanacetum vulgare* (tansy), especially near the railroad embankment.

5) Potentilla - Aster Back Beach

This community, as its name implies, occurs behind the beach area proper, and may in fact, be lower in elevation than the upper beach area. It is, however, further removed from marine influences. It is bordered on the seaward side by beach or salt marsh communities, usually the former. Soils are usually sands and gravels, with, in some cases, poorly developed horizons. Two sub-communities are present: a) *Potentilla* depressions, and b) *Aster* back beaches.

a) *Potentilla* Depressions

These depressions, averaging 20-50 ft.<sup>2</sup> are fairly common in the back beach community, especially near the north west corner of Boundary Bay. Conditions in these depressions are generally moister than in the surrounding back beach area. The dominant species here is *Potentilla pacifica* (Pacific silverweed). Other species present include *Atriplex patula* (silverscale), *Carex lyngbyei* (sedge), *Juncus articulatus* (jointed rush), and *Juncus balticus* (Baltic rush). In depressions further removed from the beach, there may also be found *Juncus effusus* (common rush), *Ranunculus repens* (creeping buttercup), and *Rumex crispus* (curl dock).

b) *Aster* Back Beach

Somewhat higher and considerably drier than the previous sub-community, this area is especially characterized by *Aster subspicatus* (purple aster). Other species are also present in considerable numbers. These include *Achillea millefolium* (yarrow), *Agrostis alba* var. *stolonifera* (creeping bent grass), *Aira praecox* (little hair grass), *Calamagrostis nutkaensis* (Pacific reedgrass), *Cirsium vulgare* (thistle), *Deschampsia caespitosa* (tufted hairgrass), *Festuca rubra* (fescue), *Hordeum vulgare* (barley), *Plantago lanceolata* (plantain), *Rumex acetosella* (sheep sorrel), and *Trifolium pratense* (red clover). Less common are *Erodium cicutarium* (cranes bill), *Geranium molle* (geranium) and *Sonchus asper* (sow thistle). At the highest points in this area are found scattered *Crataegus oxyacantha* (hawthorn), *Pyrus fusca* (Pacific crabapple), *Rosa gymnocarpa* (dwarf rose), and *Salix hookeriana* (Hooker's willow).

6) *Aira* Rocky Headlands

This vegetation unit is restricted in its occurrence, being limited to coastal headlands on Bowen Island and in the vicinity of Horseshoe Bay. These areas are characterized by large expanses of bare rock, broken by soil-containing crevices and pockets. Soils here are usually quite thin and contain relatively large amounts of windblown shell and salt. Vegetation within this unit usually contains elements of dry forest and rock bluff communities described later, but in this unit, vegetation is not continuous and marine

influences are strong.

The community is characterized especially by dwarfed and stunted specimens of *Arbutus menziesii* (arbutus) and *Pinus contorta* (lodgepole pine) growing in rock crevices. Shrub species, generally also found growing in crevices, include abundant *Amelanchier alnifolia* (service berry) and *Holodiscus discolor* (ocean spray), as well as lesser amounts of *Spiraea douglasii* (hardhack). These shrub species may also occur on the scattered patches of thin soil.

Most vegetated parts of this unit are characterized by little or no overstory or shrub layer. Dominant on these flat to slightly sloping areas of thin soil are herbaceous species including *Achillea millefolium* (yarrow), *Aira praecox* (little hair grass), *Collinsia parviflora* (blue eyed Mary), *Lupinus* sp. (lupine), *Plectritis congesta* (sea blush), and very abundant *Rumex acetosella* (sheep sorrel). Dominant moss here is *Polytrichum* sp.

7) *Nuphar* Lake Community

This community characterizes all of Burnaby lake except for a narrow channel of open water in the centre, probably of artificial origin, and also occurs in parts of other smaller lakes including Lost Lagoon, Beaver Lake, Deer Lake, and Mundy Lake as well as the lakes on Bowen island. The community is characterized by deep organic muck soils.

Dominant species in the community is *Nuphar polysepalum* (yellow pond lily). Also present in deeper portions of all lakes in the district are *Potamogeton* spp. (pondweed). *Menyanthes trifoliata* (buckbean) occurs scattered in the shallower portions of some lakes.

Near the margins of Burnaby Lake is extensive *Lemna minor* (duckweed).

8) *Lemna* Ditches

*Lemna* ditches occur extensively throughout the lowland areas of the Fraser and Pitt river valleys. The community characterizes most standing or slowly flowing bodies of water within the area. Dominant species is *Lemna minor* (duckweed) which in many cases totally covers these water bodies. Also present are *Callitricha hermaphroditica* and *Zannichellia palustris* (hornwort).

9) *Typha - Scirpus* Water Margins

This unit occurs very extensively in the southern half of the GVRD, especially within the Fraser delta and at the margins of water bodies within the lower Fraser valley. In the northern portion of the GVRD it is found principally on the margins of Pitt river and lake, especially at the mouth of Widgeon Creek.

Generally, the community forms relatively narrow bands along the margins of water bodies, but, at certain places, notably in Ladner Marsh and at the mouth of Widgeon Creek it forms very broad expanses. Two sub-communities are present; a) *Typha* Shallows, and b) *Lythrum - Scirpus* Water Margins.

a) *Typha* Shallows

This sub-community is found in all portions of the GVRD in fresh and brackish conditions, generally in the forms of thin or relatively thin bands of vegetation rooted in standing water. This format is especially characteristic of lake, river, and ditch margins. In marsh areas, it often occurs in broad

expanses. Soil is generally mud.

The dominant species in this sub-community is *Typha latifolia* (cat tail). Also present in smaller quantities at least in some areas are *Alisma plantago-aquatica* (water plantain), *Eleocharis palustris* (spike rush), *Phragmites communis* (reed), *Potentilla pacifica* (silverweed), *Sagittaria latifolia* (arrowhead) and *Scirpus microcarpus* (bulrush). At slightly higher elevations, especially on the banks of the Fraser, there are also found specimens of *Carex obnupta* (common sedge), *Equisetum palustre* (marsh horsetail), and *Juncus articulatus* (jointed rush).

b) *Lythrum - Scirpus* Water Margins

This community is found rooted in mud on the margins of fresh or brackish water bodies, at or just above mean water level. It occurs commonly near most lowland water bodies within the GVRD.

Dominant within this sub-community is *Scirpus cyperinus* (wool grass), rooted in the mud just below water level. Also present in varying but smaller quantities are many species including *Cicuta douglasii* (water hemlock), *Conium maculatum* (poison hemlock), *Echinochloa crusgallii* (water grass), *Festuca arundinacea* (reed fescue), *Potentilla palustris* (marsh cinquefoil), and *Sagittaria latifolia* (arrowhead) with very large quantities of *Lythrum salicaria* (purple loosestrife) and *Sidalcea hendersonii* (Henderson's Sidalcea) in Ladner Marsh.

Other species including *Agrostis alba* var. *palustris* (creeping bentgrass), *Caltha asarifolia* (yellow marsh marigold), *Carex obnupta* (common sedge) and other *Carex* spp., *Deschampsia caespitosa* (tufted hair grass), *Elymus mollis* (beach rye), *Juncus effusus* (common rush), *Juncus ensifolius* (dagger rush), *Myosotis laxus* (forget-me-not), and *Potentilla pacifica* (Pacific silverweed) are present generally above mean water level. In many areas there also occur within this zone, scattered specimens of *Iris pseudacorus* (yellow iris).

10) *Eleocharis* Gravel Lake Margins

This vegetation unit is relatively limited in occurrence within the GVRD, being restricted to the gravelly areas on the margins of certain small lakes in the northern upland areas. These areas are dominated by *Eleocharis palustris* (spike rush), with some *Carex* spp. (sedges) and occasional specimens of *Lobelia dortmannii* (water lobelia), all rooted in standing water. Small thickets of *Myrica gale* (sweet gale) are often present on these margins above water level. These are also growing in combination with specimens of *Carex* sp. (sedge).

11) *Spiraea - Salix* Swampland

This community occurs very extensively in most low lying portions of the GVRD, especially in areas adjacent to or on the margins of peatlands and on stream banks. Here the soil is deep silt, sometimes overlain or lensed with a layer of peat soil. The unit is also found in upland areas in depressions characterized by

poor drainage. Conditions are wet. Areas showing extensive amounts of this community type include the south bank of the Fraser river adjacent to Barnston Island, the area surrounding Burnaby Lake, much of the area surrounding Burns Bog, Lulu Island, the north bank of the Fraser river in Burnaby and New Westminster and the Pitt River lowlands.

The dominant, and in some cases, almost the sole species in the community is *Spiraea douglasii* (hardhack), which forms extremely dense thickets, some of which cover a very large area. Also usually present in smaller amounts are *Carex obnupta* (sedge), *Myosotis laxus* (forget-me-not), *Potentilla palustris* (marsh cinquefoil) and *Ranunculus repens* (creeping buttercup). In areas of peat soil, some *Gaultheria shallon* (salal) may be present with the *Spiraea*.

In slightly higher areas, there also occur a large number of shrub and small tree species, including *Betula glandulosa* (swamp birch), *Cornus stolonifera* (red osier dogwood), *Lonicera involucrata* (black twinberry), *Physocarpus capitatus* (ninebark), *Prunus emarginata* (choke cherry), *Pyrus fusca* (Pacific crab-apple), and large quantities of *Salix* spp. (willow).

#### 12) *Carex* Upland Swamps

This community type is restricted in its occurrence to poorly drained pockets and lake margins in mid altitude upland areas of the northern section of the GVRD. At no time does this unit form very large expanses. It often forms transitions with other units, to be described later, especially upland peat bogs and

cedar swamps. Soils are deep muds, often with some organic content.

These swamp areas are dominated totally by *Carex obnupta* (common sedge) with limited occurrence of other sedge species.

Also present in much smaller amounts are *Potentilla palustris* (marsh cinquefoil) and *Ranunculus flammula* (creeping buttercup).

These swamp areas are often lined with a fringe of *Salix* sp.

(willow) or *Spiraea douglasii* (hardhack), especially when occurring on lake borders. Frequently, there is an occurrence of bog or *Salix* marsh species within this vegetation unit.

13) *Carex* Alpine Basins

This vegetation unit is limited in occurrence to depressions and pockets within the alpine areas of the northern portion of the GVRD. These pockets rarely occur below an elevation of 4500' within this area and are seldom very large. Conditions within these areas are moist to wet, and soils are black mineral soil, often with a large admixture of organic material. These are generally snow basin areas.

Dominant within these areas is *Carex nigricans* (black sedge). Other species present include *Hieracium gracile* (slender hawkweed), and *Juncus drummondii* (Drummond's rush).

14) *Thuja - Alnus* Swamp Forest

This vegetation unit occurs fairly frequently in both the northern and the southern portions of the GVRD, especially in areas of less than 50"/year precipitation. The unit is characteristic of

concave creek bottoms and seepage depressions, and, while common, does not occupy large continuous areas. Soils are mineral in nature, sometimes with a small admixture of organic material and are extensively gleized. Conditions are wet, standing or slowly flowing water usually occurring at the lowest points.

A dense overstory is present within these stands. Dominant within this overstory is *Thuja plicata* (western red cedar). Also fairly common are specimens of *Alnus rubra* (red alder), and especially near water bodies, *Salix lasiandra* (Pacific willow). Less common within the unit is *Acer macrophyllum* (broad leaf maple), while occurring only very occasionally are *Picea sitchensis* (Sitka spruce) and *Tsuga heterophylla* (western hemlock).

A shrub layer is generally present, being especially dense on the margins of water bodies. Dominant is *Cornus stolonifera* (red osier dogwood). Also present in most areas are varying quantities, depending upon specific moisture conditions, of *Lonicera involucrata* (black twinberry), *Rubus parviflorus* (thimbleberry), *Rubus spectabilis* (salmonberry), and *Sambucus racemosa* (elderberry).

The herb layer within these stands varies in density, but is generally sparse and dominated by abundant *Lysichiton americanum* (skunk cabbage). Other species present in at least some areas include *Angelica* sp. (angelica), *Circaeal alpina* (Enchanter's night shade), *Geum macrophyllum* (large leaf avens), *Maianthemum dilatatum* (false lily of the valley), *Mentha arvensis* (mint), *Mitella ovalis* (oval leaf mitrewort), *Oenanthe sarmentosa* (water parsley), and *Veronica americana* (American speedwell). Mosses and liverworts,

mainly epiphytic, are common. Dominant mosses include *Brachythecium* sp., with *Fontinalis* sp., growing in flowing water.

15) *Populus - Salix* Sandbars

This vegetation unit is restricted to the sandbars and banks of the Fraser, Pitt, and Coquitlam rivers, in areas only a few feet above mean river level. Inundation of this unit is a yearly event. Soils are sands or gravels with no horizon development and drainage varies with soil texture from fair to excellent. Growing conditions are variable but the rooting zone of larger plants is usually moist to wet. Two sub-types of this unit exist,

- a) *Salix - Populus* Thickets, and b) *Juncus* Sand Flats.

a) *Salix - Populus* Thickets

This sub-unit occupies inner and upper portions of bars on the Fraser and its tributaries, and merges at its upper limits with the *Populus - Acer* Floodplain community to be described below. Soil is generally sandy clay with little or no horizon development. Drainage is poor, and growth conditions moist. Inundation generally occurs for 1-2 days in every year, with standing water present for a considerably longer period.

Dominant in the overstory is *Populus trichocarpa* (black cottonwood), widely spaced specimens of which rise high above a dense second story of *Prunus emarginata* (choke cherry), *Pyrus fusca* (Pacific crab-apple), and various species of willow including *Salix hookeriana* (Hooker's willow), *Salix scouleriana* (Scouler's willow), and *Salix sitchensis* (Sitka willow). A

very dense shrub layer is usually also present, containing such species as *Cornus stolonifera* (red osier dogwood), *Lonicera involucrata* (black twinberry), *Spiraea douglasii* (hardhack) and young *Salix* spp. (willow). An understory of *Equisetum palustre* (marsh horsetail) is usually present, often accompanied by scattered *Equisetum hyemale* (scouring rush) and *Juncus effusus* (common rush), with *Carex obnupta* (sedge), and *Typha latifolia* (cat tail), in wetter areas.

b) *Juncus* Sand Flats

The *Juncus* sand flat unit occurs extensively in small patches on most of the islands and bars of the Fraser river not normally submerged. It is characterized by large areas of bare sand dotted with individual plants of various species, most of which take on a spreading mat-like form. Substrate is generally sand or silt, with little or no horizon development. Drainage is good, and except during times of inundation, which under normal circumstances occurs every year, conditions are quite dry.

This unit contains no tree or shrub layer and the herb layer is highly discontinuous with no one species dominant. Among species occurring within this zone are *Arenaria* sp. (sandwort), *Calamagrostis nutkensis* (Pacific reed grass), *Carex* spp. (sedges), *Festuca* sp. (fescue), *Juncus articulatus* (jointed rush), *Juncus balticus* (Baltic rush), *Juncus bufonius* (toad rush), *Juncus ensifolius* (dagger leaf rush), *Melilotus alba* (sweet clover), *Polygonum aviculare* (knotweed), *Senecio*

*vulgaris* (common ragwort), and *Trifolium repens* (white clover).

16) *Populus - Acer* Floodplain Forest

This vegetation unit characterizes bottomland areas immediately adjacent to all of the major rivers of the GVRD as well as Burnaby Lake, especially areas which have never been completely cleared. Terrain within this unit is flat and low lying and soils are fine textured river silts and silt loams without extensive horizon development. Drainage is generally fair to poor, and growth conditions vary between moist and wet. Two sub-units exist,

a) *Populus* Floodplain Forest, and b) *Alnus - Rubus* Wetlands.

a) *Populus* Floodplain Forest

Floodplain forests, or their remnants are found most commonly in the delta area, both on the Fraser itself as well as fringing the many tributaries, creeks, and sloughs within this area. It is also found extensively bordering Ladner Marsh, Burnaby Lake, and some portions of Pitt Lake. Soils are deep river silts, drainage is fair and growth conditions very moist.

Dominant in the overstory of this sub-community is *Populus trichocarpa* (black cottonwood), sometimes in pure stands, but more commonly forming an upper canopy over a dense layer of *Alnus rubra* (red alder). Less abundant, but often present are large specimens of *Acer macrophyllum* (broad leaf maple). Specimens of *Betula papyrifera* (paper birch) may also be present, especially near bogs and in some areas occasional

*Picea sitchensis* (Sitka spruce) and *Populus tremuloides* (trembling aspen) are found. The community is characterized by an extremely dense shrub layer. Dominant is *Rubus spectabilis* (salmonberry). Other common species present include *Cornus stolonifera* (red osier dogwood), *Lonicera involucrata* (black twinberry), *Physocarpus capitatus* (ninebark), *Salix sitchensis* (Sitka willow), *Sambucus racemosa* (elderberry), and *Viburnum edule* (squashberry). The herb layer varies with cover and soil conditions from very sparse to moderately abundant. Most common species include *Athyrium filix-femina* (lady fern), *Disporum hookerii* (Hooker's fairy bells), *Equisetum hyemale* (scouring rush), *Lysichiton americanum* (skunk cabbage), *Maianthemum dilatatum* (false lily of the valley), *Mentha arvensis* (wild mint), *Ranunculus repens* (creeping buttercup), and *Stachys cooleyi* (cat mint).

b) *Alnus* - *Rubus* Wetland Forest

This sub-unit occurs very extensively in wet lowland areas in the GVRD, especially near the Fraser and Pitt rivers and around the various lowland lakes including those on Bowen Island, where extensive clearing has occurred in the relatively recent past. In general, growth conditions are similar to those described above, but slightly drier. The overstory is younger and less tall than in the previously described sub-community, and undergrowth is very considerably denser.

Dominant in the very dense overstory is *Alnus rubra*

(red alder), with smaller quantities of *Populus trichocarpa* (black cottonwood) and *Prunus demissa* (wild cherry), in some areas. In some places, there may also be scattered specimens of *Thuja plicata* (western red cedar). A sparse second story of *Acer circinatum* (vine maple), *Salix lasiandra* (Pacific willow), and *Salix sitchensis* (Sitka willow) is normally present.

The shrub layer is normally very dense and is completely dominated by *Rubus spectabilis* (salmon berry). Also present in much smaller quantities are other shrub species including *Cornus stolonifera* (red osier dogwood), *Prunus emarginata* (choke cherry), *Rubus laciniatus* (Himalayan blackberry), *Rubus procerus* (wild blackberry), *Rubus parviflorus* (thimbleberry), *Sambucus racemosa* (elderberry), and *Symporicarpus albus* (snowberry), the exact species composition of any given area being dependent upon micro-variations in topography, soil moisture, and soil texture.

The understory is generally quite sparse and contains *Equisetum arvense* (horsetail), and *Lysichiton americanum* (skunk cabbage) in moister areas, with *Athyrium filix-femina* (lady fern), *Maianthemum dilatatum* (false lily of the valley), *Mentha arvensis* (wild mint), *Mitella ovalis* (mitrewort), *Oenanthe sarmentosa* (water parsley), *Ranunculus repens* (creeping buttercup), *Urtica* sp. (nettle), and *Veronica americana* (speedwell) abundant in areas characterized by drier conditions.

17) Picea Alluvial Plain Forest

This vegetation unit is now rare within the GVRD, being

found only in small disturbed patches along the Fraser river near the Patullo Bridge and west of the Pitt river. Once however, before the extensive dyking, draining, and clearing of the last century, it was dominant in many parts of the Fraser delta area, as is attested by the many relicts within this portion of the GVRD. These areas, now occupied by farmland, are characterized by flat topography and very deep alluvial soils. Drainage is moderately good to fair and growth conditions are usually moist.

Dominant within the overstory is *Thuja plicata* (western red cedar), usually of excellent growth. Also very common are fine specimens of *Picea sitchensis* (Sitka spruce) with some *Tsuga heterophylla* (western hemlock). Some deciduous species are also present in smaller quantities, usually in moist areas or near watercourses. These include moderate numbers of *Alnus rubra* (red alder) as a second story as well as occasional *Acer macrophyllum* (broad leaf maple) and *Populus trichocarpa* (black cottonwood).

The shrub layer within this stand type is quite dense. Dominant species is generally *Rubus spectabilis* (salmonberry) but other species including *Aruncus sylvester* (goatsbeard), *Physocarpus capitatus* (ninebark), *Rosa nutkana* (Nootka rose), *Sambucus racemosa* (elderberry), and *Symporicarpos albus* (snowberry) may also be present in some quantity.

The herb layer varies considerably in density with over-story conditions. Species complement is very large, different combinations of species existing under different sets of conditions. Common species include *Athyrium filix-femina* (lady fern), *Carex* sp.

(sedge), *Circaea alpina* (false nightshade), *Dicentra formosa* (bleeding heart), *Disporum hookeri* (Hooker's fairy bells), *Galium triflorum* (bedstraw), *Geum macrophyllum* (large leaf avens), *Luzula parviflora* (wood rush), *Maianthemum dilatatum* (false lily of the valley), *Mitella ovalis* (mitrewort), *Polystichum munitum* (sword fern), *Smilacina stellata* (false Solomon's seal), *Streptopus amplexifolius* (twisted stalk), *Thalictrum occidentale* (meadow rue), *Tiarella trifoliata* (foam flower), *Trautvetteria grandis* (false bugbane), and *Viola glabella* (wood violet). Common mosses in a rather scant moss layer are *Eurhynchium stokesii*, *Leucolepis menziesii*, *Mnium insigne*, and *Mnium punctatum*.

18) *Salix - Betula* Wet Forest

This vegetation unit occurs in bottomland areas adjacent to peat bogs, especially at various points along the Fraser and Pitt rivers, and in the large islands of the Fraser delta. The soils of this unit are generally peat or peat and river silt in a layered formation. The community is characteristic of wet low lying areas of little or no relief. Drainage is poor, there being, in many cases, standing water for part of the year. At times this community type occurs in a mosaic formation with the *Populus* wetland forest community described above.

In this unit, the overstory is dominated by *Betula papyrifera* (paper birch), usually about 25-40 feet in height. Also present in the overstory are occasional specimens of *Populus tremuloides* (trembling aspen), *Prunus emarginata* (choke cherry), *Salix hookeriana* (Hooker's willow), and *Salix sitchensis* (Sitka willow).

The shrub layer is very dense and tangled and is dominated by *Rubus spectabilis* (salmonberry) with lesser quantities of *Cornus stolonifera* (red osier dogwood), *Lonicera involucrata* (black twinberry), *Physocarpus capitatus* (ninebark), *Sambucus racemosa* (elderberry), *Spiraea douglasii* (hardhack) and *Viburnum edule* (squashberry), as well as younger and smaller specimens of *Salix* spp. (willow). The understory in this stand is sparse. Among species found are *Athyrium filix-femina* (lady fern), *Disporum hookerii* (Hooker's fairy bells), *Equisetum hyemale* (scouring rush), and *Maianthemum dilatatum* (false lily of the valley), with *Lysichiton americanum* (skunk cabbage) in some areas.

19) Betula - Spiraea Peatland

At present, this community type like the above is quite restricted in its occurrence in the GVRD as a result of drainage and cultivation. It is still found on the periphery of those peat bogs which have, as yet, been undisturbed, especially those on the Pitt and upper Fraser rivers. Soil in this community type is fairly thin peat, sometimes with lenses of silt. Topography is essentially flat, with some slope away from the centre of the bog. Drainage is generally quite poor. At present this community is most common on the peat areas south of Burnaby and near the Deas tunnel. Another area near the freeway is in the process of being removed at the time of writing.

The overstory in this community is composed exclusively of *Betula papyrifera* (paper birch), 15'-25' in height. The shrub layer is moderately dense in some areas, less so in others. It

consists almost exclusively of *Spiraea douglasii* (hardhack), with occasional specimens of *Betula glandulosa* (swamp birch) and *Cornus stolonifera* (red osier dogwood). The understory also varies in density from sparse to quite dense. Dominant is *Gaultheria shallon* (salal), with considerable quantities of *Pteridium aquilinum* (bracken fern). Also present in very small quantities are dwarfed specimens of *Polystichum munitum* (sword fern). In some areas are found considerable amounts of *Ledum groenlandicum* (labrador tea) and *Vaccinium uliginosum* (bog blueberry), with scattered specimens of *Empetrum nigrum* (crowberry). In open areas there is an extensive moss layer composed of *Polytrichum juniperinum*.

20) *Betula - Pinus* Bog Margin

This vegetation unit represents only a very narrow band around the periphery of the major bogs and describes a distinct transitional area between the community described above and the pine bog forest described below. The community exists on moderately deep peat with extensive organic litter on the surface. Terrain is generally slightly sloped. As a result of the sloping surface and the absorbent qualities of the peat, drainage is good. The ground seemed quite dry at the time of first observation (October), but was at least partially submerged in late winter-early spring.

Dominant in the overstory is *Pinus contorta* (lodgepole pine), about 20' high, interspersed with some *Betula papyrifera* (paper birch) of about the same height. There were also occasional specimens of *Tsuga heterophylla* (western hemlock). There is only a very sparse shrub layer of *Spiraea douglasii* (hardhack) in this

community, but the herb layer is extremely dense and almost high enough to constitute a second shrub layer. Dominant here is *Gaultheria shallon* (salal). Also abundant are *Ledum groenlandicum* (labrador tea) and *Pteridium aquilinum* (bracken fern) with some *Empetrum nigrum* (crowberry) and *Vaccinium uliginosum* (bog blueberry).

21) *Pinus - Gaultheria Bog Forest*

This community type represents a major portion of the peat bog areas within the GVRD. Soil consists of very deep peat overlain with a thick layer of organic matter. Soil conditions are very acid. Topography is flat or slightly sloping. Relatively dry conditions prevail during summer and fall, but in winter and spring the water table is very high, and drainage poor. This community occurs extensively around all major bogs in the GVRD, and dominates some of the lake shores of Bowen Island and Burnaby.

The overstory of this community is a fairly open pure stand of *Pinus contorta* (lodgepole pine) of 15'-25' in height, which, as one proceeds toward the centre of the bog, gradually changes to open growing stunted trees, many of them dead, which often reach no more than 2'-3' in height. Some specimens of *Tsuga heterophylla* (western hemlock) may also be present. There is no tall shrub layer present. The low shrub layer, although not as high as in the previous community, is extremely dense, and is, as above, dominated by *Gaultheria shallon* (salal). *Pteridium aquilinum* (bracken fern) is also present, although not as abundantly as in the above community, and becomes almost non-existent as one proceeds toward

the centre of the bog. *Empetrum nigrum* (crowberry), *Kalmia polifolia* (bog laurel), *Ledum groenlandicum* (labrador tea), and *Vaccinium uliginosum* (bog blueberry) are all very abundant, as is *Polytrichum juniperinum* in the moss layer.

22) Gaultheria - Ledum Bog Shrubland

Further towards the centre of the bog than the *Pinus* - *Gaultheria* community described above, the *Gaultheria* - *Ledum* bog community also occupies a very large area within the GVRD, especially along the Fraser river, generally in mosaic with other bog units. In this community, the soil remains deep peat and organic matter, but terrain is generally more hummocky and soil moisture much greater. There are large amounts of this community in Burns Bog and near Barston Island, and smaller patches in other peat areas within the GVRD. Much of this community type as well as those described above has been appropriated for commercial blueberry production.

There is no overstory in this community, the only trees being a few scattered, very stunted and often dead *Pinus contorta* (lodgepole pine) and a very few equally stunted *Betula papyrifera* (paper birch). Generally, these are found at high points on small hummocks or mounds covered with extensive ground story vegetation. Dominant on these hummocks is *Ledum groenlandicum* (labrador tea). Also plentiful is *Gaultheria shallon* (salal), but this also is somewhat stunted, with very small leaves, a result probably of high acidity and high water table. Other species present on these hummocks are *Empetrum nigrum* (crowberry), *Vaccinium uliginosum* (bog

blueberry) and smaller amounts of *Andromeda polifolia* (bog rosemary), *Kalmia polifolia* (bog laurel), *Vaccinium myrtilloides* (velvet stem blueberry) and *Vaccinium oxycoccus* (bog cranberry).

In some areas are found scattered specimens of an escaped commercial blueberry (*Vaccinium corymbosum*) and commercial cranberries (*Vaccinium macrocarpon*). These hummocks are carpeted with *Polytrichum juniperinum*. Between the hummocks are areas of open peat, dry in October but probably submerged later in the year. Further toward the centre of the bog, these hummocks become further apart and are interspersed with other community types, described below.

23) *Vaccinium - Kalmia* Bog

This community type is characteristic of much of the centre of the major bog areas in the GVRD. It occurs in the form of small hummocks standing above the level of the surrounding bog. These hummocks are composed of peat, and are well drained. There are no trees, but there do occur on these hummocks, a very few, very stunted *Pinus contorta* (lodgepole pine), most of which are dead. Also occurring very occasionally are stunted *Salix* sp. (willow). The hummocks are dominated by a mat of ericaceous vegetation. Found in considerable quantities are *Empetrum nigrum* (crowberry), *Kalmia polifolia* (bog laurel), *Ledum groenlandicum* (labrador tea), *Vaccinium myrtilloides* (velvet stem blueberry), *Vaccinium oxycoccus* (bog cranberry), and *Vaccinium uliginosum* (bog blueberry), along with occasional, very dwarfed *Gaultheria shallon* (salal). The hummocks also show extensive *Polytrichum juniperinum*.

24) Sphagnum - Lysichitum Bog

This community occupies a position slightly lower than the one previously described and occurs between the hummocks of ericaceous vegetation and in the centre of the bog area. Conditions here are wet and the terrain is flat and studded with depressions.

Dominant throughout most of this community are extensive, very large and deep areas of *Sphagnum papillosum*, *Sphagnum rubellum* and *Sphagnum squarosum* with possibly other *Sphagnum* (peat moss) species. Throughout the community, rooted in the peat there occur plentiful but scattered *Agrostis aequivalvis* (slender bent-grass), *Carex* spp. (sedges), *Drosera rotundifolia* (sundew), *Eleocharis palustris* (spike rush), *Eriophorum chamissonis* (cotton-grass), *Juncus effusus* (common rush), *Juncus ensifolius* (dagger leafed rush), *Juncus oreganus* (Oregon rush), *Rhynchospora alba* (beakrush), *Rubus chamaemorus* (cloudberry), and *Scirpus caespitosus* (tufted clubrush). Also present, although rare is *Vaccinium oxycoccus* (bog cranberry). Scattered over the entire area are deep pockets in the sphagnum, filled with black organic muck soil. Rooted in each of these pockets is one specimen of *Lysichitum americanum* (skunk cabbage).

25) Dulichium Muck

This unit occurs in the most central areas of Burns Bog. Here there are extensive large patches of bare muck soil with the consistency of quicksand surrounded by large areas of the community described above. Within these muck areas, usually in several

inches of standing water, there occurs large amounts of *Dulichium arundinaceum*. It is possible that this unit has developed as a result of the extensive drainage currently being carried out here in association with peat harvesting.

26) *Empetrum - Habenaria* Upland Bog

This vegetation unit is characteristic of the upland areas of the GVRD, especially north of Burrard inlet where it occurs in small patches in rocky depressions and seepage areas and especially at the edges of upland lakes. It does not generally extend into sub-alpine elevations. These areas are generally shaded by dense forest. Substrate is peat, drainage is poor, and conditions are wet.

There is no tree layer within this unit, although there usually occurs a considerable number of stunted specimens of *Pinus contorta* (lodgepole pine), as well as occasional *Chamaecyparis nootkatensis* (yellow cedar), *Thuja plicata* (red cedar), and *Tsuga heterophylla* (western hemlock).

The shrub layer is generally quite sparse. Most common species are *Kalmia polifolia* (bog laurel) and *Ledum groenlandicum* (Labrador tea), with lesser quantities of *Andromeda polifolia* (bog rosemary), *Gaultheria shallon* (salal) and *Myrica gale* (sweet gale).

There are many herbaceous species within this unit. These include large quantities of such species as *Agrostis aequivalvis* (slender bentgrass), *Carex* spp. (sedges), *Eriophorum angustifolium* (cotton grass), *Juncus ensifolius* (dagger rush) and *Rhynchospora alba* (beakrush). Lesser quantities of forb species are also

present. These include *Coptis trifolia* (gold thread), *Drosera rotundifolia* (sundew), *Empetrum nigrum* (crowberry), *Gentiana sceptrum* (King's gentian), *Habenaria dilatata* (white rein orchid), *Lysichitum americanum* (skunk cabbage), *Rubus chamaemorus* (cloud- berry), *Spiranthes romanzoffia* (lady's tresses), *Toffieldia glutinosa* (false asphodel), *Vaccinium oxycoccus* (bog cranberry), *Vaccinium uliginosum* (bog blueberry), and *Veratrum viride* (false hellebore).

These species are rooted in a deep and extensive mat of sphagnum, dominant species being *Sphagnum squarosum*.

27) Eriophorum - Sphagnum Upland Moor

This unit is characteristic of open sub-alpine moors above 3500' in the mountains of the northern portion of the GVRD. Conditions here are wet the year round and the areas are characterized by deep peat over mineral soil. Slope varies from 0 to 10°. There is no tree or shrub layer within this unit, the dominant element here being *Eriophorum angustifolium* (cotton grass). Other herbaceous species include *Carex aquatilis* (water sedge), *Scirpus caespitosus* (tufted clubrush), and *Trientalis articata* (northern star-flower). These species are rooted within a deep mat of sphagnum which contains *Sphagnum magellanicum*, *S. mendocinum*, *S. plumulosum*, and *S. squarosum*.

28) Solidago Roadsides (not mapped)

This wasteland community occurs extensively throughout the lowland areas of the GVRD. It was first described for the outer

Fraser delta by McLaren (1972). Terrain is flat to sloping. Soil is generally sandy or gravelly, being residual material from road construction. Drainage is good. A similar community is found along the various railroad embankments in this area.

There is no overstory within this community, the only tree species being scattered young specimens of *Alnus rubra* (red alder) and *Salix* sp. (willow) which are periodically removed by road maintenance crews. A large number of weedy species and grasses are present within the community, specific occurrence being a function of soil moisture conditions. Among these species are *Agropyron repens* (quack grass), *Agrostis* sp. (bent grass), *Anaphalis margaritaceae* (pearly everlasting), *Bromus sitchensis* (Sitka brome), *Capsella bursa-pastoris* (Shepherds purse), *Chrysanthemum leucanthemum* (ox-eye daisy), *Cirsium vulgare* (common thistle), *Festuca rubra* (red fescue), *Holcus lanatus* (velvet grass), *Phleum pratense* (timothy), *Plantago lanceolata* (plantain), *Plantago major* (broad leafed plantain), *Poa compressa* (Canada bluegrass), *Polygonum aviculare* (knotweed), *Ranunculus repens* (creeping buttercup), *Tanacetum vulgare* (tansy), *Taraxacum officinale* (dandelion), *Trifolium pratense* (red clover) and *Trifolium repens* (white clover). *Solidago canadensis* (goldenrod) is very common in most areas. In wetter areas, *Carex* spp. (sedges) and *Juncus effusus* (common rush) are often found. In many places, some or all of these species are replaced or smothered by extensive *Rubus laciniatus* (Himalayan blackberry), *Rubus procerus* (blackberry) and sometimes *Convolvulus arvensis* (morning glory).

29) Rubus - Alnus Wasteland

This community represents waste areas in which soil moisture is fairly low and drainage good. Soils are sandy and gravelly loams. Topography is variable, most areas, however, being flat or relatively gently sloped. The community is most characteristic of upland areas, but may also occur in well drained lowlands. There are two sub-communities: a) *Alnus* brush, and b) *Salix - Rubus* wasteland.

a) *Alnus* Brush

The *Alnus* brush sub-community occurs on areas which have recently been abandoned, very often shortly after clearing. Soils here are generally, although not always coarse, and drainage is usually good. In the lowland areas however, *Alnus* brush stands may occur in quite moist areas. Characteristic of this sub-community is a very dense overstory of *Alnus rubra* (red alder), usually < 1" in diameter. Generally, there is very little else in the overstory, and often little else in the stand. When present, the shrub and herb layers are sparse and may contain such weedy species as *Anaphalis margaritaceae* (pearly everlasting), *Cytisus scoparius* (Scotch broom), *Hieracium albiflorum* (white hawkweed), *Hypochaeris radicata* (cats ear) and *Rubus procerus* (blackberry). *Rubus ursinus* (trailing blackberry) is usually present. Rarely such relict species as *Berberis nervosa* (oregon grape), *Gaultheria shallon* (salal), *Polystichum munitum* (sword fern) and *Pteridium aquilinum* (bracken fern) may be present.

b) Salix - Rubus Wasteland

This wasteland type occurs normally on fairly well drained soil with gentle rolling or flat topography. Conditions tend to be only moderately moist. The sub-community is most characteristic of upland areas within the GVRD, but also occurs in well drained lowland areas. The history of this sub-community includes fairly extensive disturbance by man. The community type is characteristic of abandoned vacant lots, dry fields, and hedgerows as well as other cleared and abandoned areas.

The sub-community type is characterized by large numbers of weedy species, in many cases introduced or escaped from cultivation. As a result of frequent disturbance and differential introduction, many species may be present in one part of the sub-community, and not in another.

Generally there is no closed overstory but rather scattered trees and dense tangled aggregations of shrubs in a weedy or grassy matrix. Most common tree species is *Alnus rubra* (red alder). Others usually present in most areas are *Crataegus douglasii* (hawthorn), *Populus trichocarpa* (cottonwood), *Populus tremuloides* (trembling aspen), *Pyrus fusca* (Pacific crab-apple), *Salix hookeriana* (Hooker's willow), and *Salix lasiandra* (Pacific willow). In most cases these do not show tree form, but rather exist as shrubs, often in tangled masses along with such other shrub species as *Cytisus scoparius* (Scotch broom), *Rosa nutkana* (Nootka wild rose),

*Rubus laciniatus* (Himalayan blackberry), and *Rubus procerus* (blackberry). Between these thickets are extensive areas of grasses and weedy species, many of which have been introduced. These species are generally similar to those of units #28 and 29 and will be dealt with in the appended species list.

30) *Rubus - Spiraea Wet Waste*

This community is the wetland equivalent to the *Rubus - Alnus* wasteland community described above. Here the terrain is flat and usually low-lying, whether in bottomlands or upland depressions. Drainage is fair to poor, and the soil is often wet. Soils are fine-textured, often with an impermeable hardpan layer.

No overstory is present in the community. The shrub layer is however, very abundant. Present in most areas are some of the following: *Alnus rubra* (red alder), *Betula glandulosa* (swamp birch), *Populus trichocarpa* (cottonwood), *Pyrus fusca* (Pacific crab-apple), *Prunus emarginata* (choke cherry), *Rubus parviflorus* (thimbleberry), *Salix* spp. (willow), *Sambucus racemosa* (elderberry), *Sorbus sitchensis* (mountain ash) and *Spiraea douglasii* (hardhack). In wetter places there are considerable amounts of *Physocarpus capitatus* (ninebark) and *Rubus spectabilis* (salmonberry). There are also large quantities of *Rubus laciniatus* (Himalayan blackberry) and *Rubus procerus* (blackberry) in more disturbed areas. *Equisetum hyemale* (horsetail) and *Ranunculus repens* (creeping buttercup) are common in the herb layer. Open areas between thickets are characterized by an abundance of weedy species. These include *Arctium minus* (burdock), *Cirsium* sp. (thistle), *Melilotus alba* (sweet melilot), *Rumex crispus* (curl dock), *Trifolium praetense*

(red clover), *Trifolium repens* (white clover), and *Urtica lyallii* (stinging nettle). In wetter areas are found *Carex* spp. (sedges), *Juncus effusus* (common rush), and *Polygonum aviculare* (knotweed). For more complete information see the appended species list (Appendix I).

31) *Juncus* Old Fields

This community is characteristic of old field areas of both lowlands and uplands of the GVRD. It is generally somewhat drier than the community type described above. Soil is fine textured silt or silt loam, drainage is poor to fair, and moisture conditions moist to wet. The community is dominated by extensively scattered tussocks of *Juncus effusus* (common rush), a species unpalatable to cattle. Other species present in lesser quantities include *Arctium minus* (burdock), *Bellis perennis* (English daisy), *Cirsium* spp. (thistle), *Plantago lanceolata* (plantain), *Plantago major* (broad leaved plantain), *Rumex crispus* (curled dock), *Taraxacum officinale* (dandelion) and *Trifolium pratense* (red clover), with *Ranunculus repens* (creeping buttercup) in wetter areas. Also present in considerable abundance are several species of domestic and introduced forage grasses.

32) *Epilobium - Hypochaeris* Cutovers

This unit characterizes areas, especially in the uplands and mountains of the north shore where logging has recently taken place. Topography here is variable but usually moderate to steeply sloping. Soils are generally colluvial or till based and vary in

texture from coarse to fine. Drainage is highly variable with topography and soil texture and moisture conditions vary from fairly dry to wet. Marsh and pond areas are common in depressions, at least partially a result of impeded drainage as a result of logging and road building.

The condition of the overstory is variable with both soil moisture and time since logging. Recently logged areas will be characterized by a few scattered veterans or immature specimens of inferior quality. Species identity varies with location. Older sites are dominated by dense stands of young *Alnus rubra* (red alder) with some *Acer macrophyllum* (broad leaf maple), and in most areas, extensive coniferous regeneration, usually *Pseudotsuga menziesii* (Douglas fir) and/or *Tsuga heterophylla* (western hemlock). This regeneration may be of artificial or natural origin.

The shrub layer in this unit is generally extensive, species complement varying with elevation, soil moisture, and topography. Among species found at some point within this unit are *Acer circinatum* (vine maple), *Acer glabrum* (Douglas maple), *Alnus rubra* (red alder), *Alnus sinuata* (Sitka alder), *Arctostaphylos uva-ursi* (bearberry), *Aruncus sylvester* (goat's beard), *Berberis aquifolium* (tall Oregon grape), *Berberis nervosa* (Oregon grape), *Cornus stolonifera* (red osier dogwood), *Corylus cornuta* (hazelnut), *Gaultheria shallon* (salal), *Holodiscus discolor* (ocean spray), *Lonicera involucrata* (black twinberry), *Menziesia ferruginea* (false azalea), *Oplopanax*

*horridum* (Devil's club), *Pachistima myrsinites* (false box), *Physocarpus capitatus* (ninebark), *Ribes* spp. (wild currant), *Rosa gymnocarpa* (wild rose), *Rosa nutkana* (Nootka wild rose), *Rubus laciniatus* (Himalayan blackberry), *Rubus leucodermis* (black cap), *Rubus parviflorus* (thimbleberry), *Rubus pedatus* (bramble), *Rubus spectabilis* (salmonberry), *Rubus ursinus* (trailing blackberry), *Salix hookeriana* (Hooker's willow), *Salix lasiandra* (Pacific willow), *Salix sitchensis* (Sitka willow), *Sambucus racemosa* (elderberry), *Sorbus sitchensis* (mountain ash), *Spiraea douglasii* (hardhack), *Symphoricarpos albus* (snowberry), *Vaccinium alaskaense* (mountain blueberry), *Vaccinium caespitosum* (dwarf huckleberry), *Vaccinium membranaceum* (blue huckleberry), *Vaccinium ovalifolium* (tall blue huckleberry), *Vaccinium parvifolium* (red huckleberry), and *Viburnum edule* (squashberry).

Like the shrub layer, the herb layer is highly variable in composition with variations in topography, elevation, and soil moisture. Generally, this layer is characterized by remnants of the species occurring here under natural conditions, together with various weedy and/or introduced species. These include *Achillea millefolium* (yarrow), *Anaphalis margaritacea* (pearly everlasting), *Antennaria* sp. (pussytoes), *Epilobium angustifolium* (fireweed), *Equisetum arvense* (horsetail), *Hieracium albiflorum* (white hawkweed), *Hypochaeris radicata* (cat's ear), *Pteridium aquilinum* (bracken), *Taraxacum officinale* (dandelion), and *Trifolium* spp. (clover). In wet areas, where drainage has been impeded, wetland species including *Carex* spp. (sedges) and *Juncus ensifolius* (dagger rush) are commonly found.

33) *Alnus - Symphoricarpos* Dry Banks

This vegetation unit is restricted to the southern and western portion of the GVRD, occurring primarily on dry banks with a western exposure which have been more or less disturbed by cutting or other activities. The unit is most common on Point Grey, Point Roberts and Bowen Island. Soil is well drained sandy clay loam to sandy gravelly loam. Slope is between 20° and 60° in a westerly or south-westerly direction. Growth conditions are generally quite dry.

Dominant in the overstory is fairly plentiful *Alnus rubra* (red alder) with some *Acer macrophyllum* (broad leaf maple). Also present are some examples of *Pseudotsuga menziesii* (Douglas fir), both relicts and new growth. Present in a second story is plentiful *Holodiscus discolor* (ocean spray) with some *Salix lasiandra* (Pacific willow).

The shrub layer varies in density from very extensive to scattered. Species present, at least in some areas, include *Berberis aquifolium* (Oregon grape), *Gaultheria shallon* (salal), *Rosa gymnocarpa* (dwarf wild rose), *Rosa nutkana* (Nootka rose), *Rubus laciniatus* (Himalayan blackberry), *Rubus procerus* (blackberry), *Rubus parviflorus* (thimbleberry), and *Symporicarpos albus* (snowberry).

The herb layer is dominated by *Rubus ursinus* (trailing blackberry). Also present in open areas are many weedy species including *Achillea millefolium* (yarrow), *Bromus sterilis* (brome grass), *Hypochaeris radicata* (cat's ear), *Poa praetensis* (blue

grass), and *Plantago lanceolata* (plantain).

34) *Alnus - Polystichum* Wet Slopes

Many areas within the southern and western portions of the GVRD are characterized by this community type. It occurs on many slopes and banks with exposure other than west or southwest. Slope of these areas ranges from 10° to about 45°. Conditions are generally moist, there often being at least some seepage. Soils are clay to sandy clay loam.

Dominant in the rather open overstory of this community is *Alnus rubra* (red alder) with fairly abundant *Acer macrophyllum* (broad leaf maple). *Thuja plicata* (western red cedar), *Tsuga heterophylla* (western hemlock), and sometimes *Abies grandis* (grand fir) and *Pseudotsuga menziesii* (Douglas fir) are also present in some quantity. There is a second story of scattered *Acer circinatum* (vine maple).

The shrub layer is quite extensive and consists mainly of *Symporicarpos albus* (snowberry) and *Rubus parviflorus* (thimbleberry). Also present in some areas are *Osmaronia cerasiformis* (Indian plum), *Rubus procerus* (blackberry), *Rubus spectabilis* (salmonberry), *Vaccinium parvifolium* (red huckleberry) and occasional *Rhamnus purshiana* (cascara). The understory is quite sparse. Dominant in all areas is *Polystichum munitum* (sword fern) with *Gaultheria shallon* (salal) and *Rubus ursinus* (trailing blackberry) also present, especially in drier areas. *Athyrium filix-femina* (lady fern), *Impatiens noli-tangere* (jewelweed), and *Petasites frigidus* (coltsfoot) are common in wetter areas.

35) Alnus - Acer Uplands Regeneration Forest

This community is the most extensive in the southern portion of the GVRD, being found covering large portions of all upland areas, and is also found fairly extensively on slopes above the north shore. Slope ranges from 0° to 10°. Moisture conditions are generally mesic to moist, drainage being moderately good. Soils range from sandy dry loam to sandy gravelly loam.

Dominant in the overstory of this community type is *Alnus rubra* (red alder). Also present in considerable numbers are *Acer macrophyllum* (broad leaf maple) and *Populus trichocarpa* (cottonwood). The community is also characterized by scattered young *Pseudotsuga menziesii* (Douglas fir) and *Thuja plicata* (western red cedar) with, on north slopes, fairly extensive *Tsuga heterophylla* (western hemlock). These conifers are generally of < 8" dbh. A second story is usually present, consisting invariably of *Acer circinatum* (vine maple), which in some areas is very abundant, usually with some specimens of *Cornus nuttallii* (flowering dogwood). Scattered *Corylus cornuta* (hazelnut), *Osmaronia cerasiformis* (Indian plum), *Prunus emarginata* (choke cherry), and *Salix scouleriana* (Scouler's willow) may be present.

The shrub layer may contain any of *Cornus stolonifera* (red osier dogwood), *Rubus parviflorus* (thimbleberry), *Rubus spectabilis* (salmonberry), *Spiraea douglasii* (hardhack), *Symporicarpos albus* (snowberry) and *Vaccinium parviflorum* (red huckleberry), both density and species composition depending upon specific conditions of soil moisture.

The herb layer is characterized by *Polystichum munitum* (sword fern) in varying quantities depending on soil moisture. Also found is *Rubus ursinus* (trailing blackberry) and in most areas, *Achlys triphylla* (vanilla leaf), *Berberis nervosa* (Oregon grape), *Gaultheria shallon* (salal) and *Pteridium aquilinum* (bracken fern).

36) *Alnus* Wetland Regeneration Forest

This vegetation unit bears considerable resemblance to the unit described above, but conditions within this unit are considerably moister. The two are often transitional. It occurs fairly extensively in poorly drained upland and lowland portions of the south half of the GVRD, and is also common on Bowen Island and near Pitt Lake. This unit is usually quite level, slope ranging from 0-2°. Drainage is fair to poor and soils usually clays or clay loams.

Completely dominant in a very dense overstory within this unit is *Alnus rubra* (red alder), with a sparse second story of *Acer circinatum* (vine maple). Fairly abundant young *Thuja plicata* (western red cedar) are present along with occasional specimens of *Tsuga heterophylla* (western hemlock).

The shrub layer is generally very dense. Dominant is *Rubus spectabilis* (salmonberry), with moderate quantities of *Sambucus racemosa* (elderberry). Much less plentiful are *Cornus stolonifera* (red osier dogwood), *Ribes* sp. (wild currant), and *Rubus parviflorus* (thimbleberry).

The understory is generally very sparse. Species present

in less moist conditions include *Athyrium filix-femina* (lady fern), *Equisetum arvense* (horsetail), *Maianthemum dilatatum* (false lily of the valley), *Polystichum munitum* (sword fern), *Ranunculus repens* (creeping buttercup), and *Viola glabella* (wood violet). In moister areas there may occur occasional specimens of *Cicuta douglasii* (water hemlock), *Lysichiton americanum* (skunk cabbage) and *Oenanthe sarmentosa* (water parsley).

37) *Alnus* Juvenile Stands

This community is also extensive in the GVRD, representing land which has been cleared and abandoned only relatively recently. Two sub-types occur: a) dry *Alnus* scrub, and b) wet young *Alnus* forest.

a) Dry *Alnus* Scrub

This sub-community characterizes various upland areas which have been used and abandoned relatively recently.

Topography here is generally quite level, slope ranging from 0° to 5°. Drainage is good, soils ranging from sandy loam to gravel. The type is commonly found on old roads and in abandoned gravel pits.

The overstory of this sub-community is composed, almost exclusively, of *Alnus rubra* (red alder) of 15'-25' in height. There may occur a few scattered young or relict *Pseudotsuga menziesii* (Douglas fir) and *Thuja plicata* (western red cedar) as well as some *Salix hookeriana* (Hooker's willow) and *Salix scouleriana* (Scouler's willow). The shrub layer may be absent,

but more commonly there are found some specimens of *Holodiscus discolor* (ocean spray) and sometimes *Rosa gymnocarpa* (dwarf wild rose) and *Vaccinium parvifolium* (red huckleberry). Also present at times are *Cytisus scoparius* (Scotch broom), *Rubus laciniatus* (Himalayan blackberry), *Rubus procerus* (blackberry), *Rubus parviflorus* (thimbleberry) and *Symporicarpos albus* (snowberry). Occurring extensively in the understory is *Rubus ursinus* (trailing blackberry). Also present in varying but usually large quantities are *Berberis nervosa* (Oregon grape), *Gaultheria shallon* (salal) and *Pteridium aquilinum* (bracken fern). Such weedy species as *Anaphalis margaritacea* (pearly everlasting), *Epilobium angustifolium* (fireweed), *Hieracium albiflorum* (hawkweed), *Hypochaeris radicata* (cats ear) and *Plantago lanceolata* (common plantain) are usually present in more open areas.

b) Wet *Alnus* Young Forest

This sub-community is characterized by moister conditions than reign in the one previously described. It may occur on both upland and lowland areas, but in all cases, moisture conditions are high, drainage being no better than fair. Soil is clay to sandy clay loam. Slope is 0° to 2°. This is a younger version of vegetation unit #36.

The overstory in this stand type is, again, almost exclusively *Alnus rubra* (red alder) of 15'-20' in height, with a few scattered young and old growth *Thuja plicata* (western red cedar), *Tsuga heterophylla* (western hemlock), *Abies grandis*

(grand fir), and occasionally *Picea sitchensis* (Sitka spruce).

The shrub layer may be very sparse or non-existent, but is more often very dense indeed. Most common species in the shrub layer is *Rubus spectabilis* (salmonberry), although in slightly more open areas, *Spiraea douglasii* (hardhack) may be very common. Other shrubby species sometimes found are *Cornus stolonifera* (red osier dogwood), *Osmaronia cerasiformis* (Indian plum), and *Sambucus racemosa* (elderberry). The herb layer is often rather sparse, and, in drier areas, most often consists of *Polystichum munitum* (sword fern) in moderate quantities. In wetter areas are found *Athyrium filix-femina* (lady fern), *Equisetum* sp. (horsetail), *Lysichiton americanum* (skunk cabbage), and in some areas *Streptopus amplexifolius* (twisted stalk).

38) Talus Slopes

This unit, which is characterized generally by very sparse or non-existent vegetation, is restricted within the GVRD to the mountains of the north shore. The unit is characterized by steep slopes, normally at or near the angle of repose. Substrate is composed totally of rock fragments, varying in size with position on slope, with small fragments at the top and larger fragments at the bottom. These slopes are continuously replenished by rockfall from the overhanging cliffs. Drainage over most of the slope is extremely good, and except at the top and bottom growth conditions are very dry. Slope bottoms are often characterized by seepage. These slopes are usually very unstable.

Vegetation on the talus slopes themselves is very sparse, and also varies with elevation and aspect. Characteristically, cover consists only of scattered plants growing in pockets of soil trapped in angles between rock fragments. Most common species in this situation are *Arabis* sp. (rock cress), *Carex deweyana* (short scale sedge), *Dryopteris austriaca* (wood fern), *Lycopodium* sp. (club moss), and *Rubus leucodermis* (black cap). In the seepage areas at the foot of these slopes there often exists a tangled mat of shrubby species including *Alnus sinuata* (Sitka alder), *Acer glabrum* (vine maple), and *Salix* spp. (willow), generally with a mixed understory of relatively moisture loving species.

39) Sparsely Vegetated Rock Walls

This unit is also restricted to the mountains of Bowen Island and the north shore, where it is very extensive in some places. It is characterized by extremely steep slopes, often close to vertical. Substrate is rock except in pockets where windborne and weathered debris may gather. These pockets are often extremely shallow and are generally dry throughout most of the growing season.

Vegetation of these rock faces varies with aspect, altitude, and type of rock. In some areas, soil pockets are large enough to support tree growth. In such a case, species commonly found include *Arbutus menziesii* (arbutus), *Juniperus communis* (spreading juniper), *Pinus contorta* (lodgepole pine), and *Pseudotsuga menziesii* (Douglas fir) at lower elevations and *Chamaecyparis nootkatensis* (yellow cedar), *Abies lasiocarpa* (sub-alpine fir), and *Tsuga mertensiana* (mountain hemlock) in subalpine areas.

Such soil pockets, if large enough, may be characterized by certain shrubby species in place of or in addition to the tree species. At low elevations these include *Amelanchier alnifolia* (serviceberry), *Berberis aquifolium* (Oregon grape), *Gaultheria shallon* (salal), *Holodiscus discolor* (ocean spray), and *Pachistima myrsinites* (false box), with *Cladothamnus pyrolaeeflorus* (copper bush), *Menziesia ferruginea* (false azalea), and *Rhododendron albiflorum* (white rhododendron) prevalent at higher elevations.

Most soil pockets are much too small and thin to bear any more than mosses and lichens, as well as ephemeral species such as *Aira* sp. (hairgrass), *Collinsia parviflora* (blue eyed Mary), *Danthonia spicata* (wild oat grass) and *Trifolium wormskjoldii* (spring bank clover).

Rock walls themselves maintain little vegetation other than mosses and lichens. Exceptions to this occur at lower elevations on the north shore, where many outcrops are dominated by *Polypodium vulgare* (licorice fern) and *Sedum spathulifolium* (stone crop).

39) Rhacomitrium Rock Outcrops

Rhacomitrium rock outcrops are common at low to moderate elevations with the northern portion of the GVRD, especially on Bowen Island and near Horseshoe Bay, but also further east near Ioco and Pitt Lake. Slopes within this unit are generally moderate, varying from 0°-25°. Aspect is usually south, east or west. The unit is characterized by a relatively thin layer of rocky residual soil and extensive mats of moss, especially *Rhacomitrium canescens*. In places, bedrock, usually lichen covered, shows through the moss

layer. Moisture conditions are variable with aspect, slope, soil depth, and micro-relief. The unit usually forms a mosaic with units #41 and 42 and occasionally with unit #6.

There is no overstory within this unit, although these outcrops are usually surrounded and overshadowed by dry forest types. Dominant in the shrub layer, which is discontinuous and present only in pockets of deeper soil, is *Gaultheria shallon* (salal). Other shrubby species present in smaller quantities include *Arctostaphylos uva-ursi* (kinnickinnick), *Berberis aquifolium* (Oregon grape), *Holodiscus discolor* (Ocean spray), *Rosa* sp. (wild rose), and *Rubus ursinus* (trailing blackberry). In drier areas, these species are partially replaced by *Amelanchier alnifolia* (service berry).

The herb layer contains a large number of species, the exact species complement of any given location varying with soil moisture and soil depth. These species include *Achillea millefolium* (yarrow), *Allium cernuum* (wild onion), *Aira* sp. (hair grass), *Antennaria* sp. (pussytoes), *Cerastium arvensis* (field chickweed), *Collinsia parviflora* (blue eyed Mary), *Cryptogramma crispa* (parsley fern), *Danthonia spicata* (wild oat grass), *Delphinium* sp. (larkspur), *Heuchera micrantha* (alum root), *Hieracium albiflorum* (white flowered hawkweed), *Lomatium* sp. (biscuit root), *Lupinus* sp. (lupine), *Luzula campestris* (wood rush), *Montia parvifolia* (miner's lettuce), *Plectritis congesta* (sea blush), *Polypodium vulgare* (licorice fern), *Rumex acetosella* (sour grass), *Saxifraga integrifolia*, and *Trifolium wormskjoldii* (spring bank clover), with *Aquilegia formosa*

(columbine), *Mimulus alsinoides* (little monkey flower), *Mimulus guttatus* (monkey flower), and *Montia siberica* (Siberian miner's lettuce) in seepage areas. Other species are also present in smaller quantities, while still others, for the most part ephemeral, had already vanished when this unit was examined in June. Dominant mosses are *Eurhynchium oreganum*, *Polytrichum juniperinum*, and *Rhacomitrium canescens*.

41) *Arbutus - Holodiscus* Dry Rocky Slopes

This vegetation unit is restricted in its occurrence to Bowen Island and the cliffs above Horseshoe Bay on the North Shore. Here it occurs fairly extensively on rocky south and west slopes, interspersed with rock outcrops characterized by vegetation unit #40. Often it marks areas which have been wholly or partially cleared in relatively recent times. Slopes are variable but generally steep, ranging from 5° to 40°. Soils are thin and discontinuous and generally colluvium based with an admixture of angular rock fragments. Drainage is very good, and conditions are dry.

A sparse and scattered overstory is often present. Dominant within this layer is *Arbutus menziesii* (western madrona) with some *Pinus contorta* (lodgepole pine) and *Pseudotsuga menziesii* (Douglas fir). These are generally rooted in deep pockets and crevices.

Various shrub species are found within this unit. These include *Amelanchier alnifolia* (serviceberry), *Arctostaphylos columbiana* (manzanita), *Arctostaphylos uva-ursi* (bearberry),

*Berberis aquifolium* (Oregon grape), *Holodiscus discolor* (ocean spray), *Juniperus communis* (spreading juniper), *Pachistima myrsinoides* (false box), and *Rosa gymnocarpa* (dwarf wild rose).

The herb layer within this unit is generally very sparse, with relatively few species occurring in any quantity. Among species present are *Achillea millefolium* (yarrow), *Cryptogramma crispa* (parsley fern), *Fragaria glauca* (blue leaf strawberry), *Hieracium albiflorum* (white flowered hawkweed), *Lomatium* sp. (biscuit root), *Lonicera hispidula* (hairy honeysuckle), and *Rubus ursinus* (trailing huckleberry).

42) *Pseudotsuga - Arbutus* Dry Forest

*Pseudotsuga - Arbutus* dry slopes are restricted in occurrence to Bowen Island and the western portion of the north shore. They generally occur below and contiguous to vegetation units #39, 40, and 41, with which they may form mosaics. Slopes vary in steepness between 0 and 25°. Soils are generally thin over bedrock, but somewhat thicker than in the unit described above. Large and small angular fragments are common. Drainage is very good, and growth conditions quite dry. There are two sub-units

a) *Pinus* Uplands, and b) *Berberis* Slopes.

a) *Pinus* Uplands

These stands are restricted to upland areas near the tops of hills on south and west facing slopes and are generally more developed or mature versions of unit #41. Conditions in these stands are very dry.

Dominant in a moderately open overstory is *Pseudotsuga menziesii* (Douglas fir), with considerable quantities of *Arbutus menziesii* (western madrona) and *Pinus contorta* (lodgepole pine). Also occasionally present are specimens of *Abies grandis* (grand fir), *Taxus brevifolia* (western yew) and *Thuja plicata* (western red cedar) and, at higher altitudes on Bowen Island, a few *Pinus monticola* (western white pine).

The shrub layer within these stands is relatively sparse and is dominated by *Holodiscus discolor* (ocean spray) and *Pachistima myrsinites* (false box) and *Rosa gymnocarpa* (dwarf wild rose). Also present are smaller quantities of *Juniperus communis* (spreading juniper).

The herb layer is extremely sparse. Species present include *Goodyera oblongifolia* (rattlesnake plantain), *Habenaria unalascensis*, *Hieracium albiflorum* (white flowered hawkweed), *Lonicera hispidula* (hairy honeysuckle), *Luzula campestris* (wood rush), and *Rubus ursinus* (trailing blackberry) as well as several grassy species including *Bromus vulgaris* (brome grass), *Danthonia spicata* (wild oat grass) and *Festuca occidentalis* (western fescue). Lichens are very common within this unit while mosses are generally sparse.

b) *Berberis* Slopes

This sub-unit generally occurs at somewhat lower elevations than the above and is common on the White Rock and Surrey Uplands. Soils are deeper and finer within this sub-

unit and, while conditions are still dry, they are considerably moister than in the unit above. Aspect is not entirely restricted to south and west.

Dominant in the overstory is *Pseudotsuga menziesii* (Douglas fir), with scattered specimens of *Abies grandis* (grand fir), *Pinus contorta* (lodgepole pine), *Thuja plicata* (western red cedar) and very occasionally *Taxus brevifolia* (western yew) also present.

A very sparse shrub layer is present. Dominant is *Rosa gymnocarpa* (dwarf wild rose). Other species present in small quantities include *Berberis aquifolium* and *Berberis nervosa* (Oregon grape), *Gaultheria shallon* (salal), *Holodiscus discolor* (ocean spray), *Symporicarpos albus* (snowberry), and *Vaccinium parvifolium* (red huckleberry).

Equally sparse is the herb layer, with no one species dominant. Species present include *Calypso bulbosa* (lady's slipper), *Chimaphila umbellata* (prince's pine), *Danthonia spicata* (oat grass), *Festuca occidentalis* (western fescue), *Festuca rubra* (red fescue), *Goodyera oblongifolia* (rattlesnake plantain), *Habenaria unalascensis* (rein orchid), *Hieracium albiflorum* (white flowered hawkweed), *Linnaea borealis* (twinflower), *Luzula parviflora* (wood rush), *Pyrola picta* (wintergreen), *Rubus ursinus* (trailing blackberry), and *Trientalis latifolia* (star flower).

Mosses and lichens have a moderately extensive occurrence within these stands. Among moss species occurring

are *Aulacomnium* sp., *Dicranum scoparium*, *Eurhynchium oreganum*, *Pleurozium schreberi*, *Polytrichum juniperinum*, *Rhytidiodelphus loreus*, and *Rhytidiodelphus triquetrus*.

43) Pseudotsuga Slope Forest

*Pseudotsuga* slope forests are common at low and mid elevations throughout the GVRD, especially on the north shore, and the Surrey and White Rock upland areas. Two sub-units occur,

a) *Gaultheria* Upper Slopes and b) *Eurhynchium* Mid Slopes.

a) *Gaultheria* Upper Slopes

This sub-unit is especially common on the thin soiled rocky slopes north of Vancouver, but is also found in many other areas within the GVRD. The unit is characterized by moderate slopes, ranging from 0° to 15°. Soils vary considerably in thickness and may be based on till, colluvium, or outwash. Textures are generally moderately coarse, and drainage is good. Growth conditions vary from moderately dry to mesic. In general these stands are second growth within the GVRD.

The overstory within these stands is moderately to very dense. Dominant is *Pseudotsuga menziesii* (Douglas fir) with a few scattered specimens of *Abies grandis* (grand fir), *Taxus brevifolia* (western yew), and *Thuja plicata* (western red cedar). There is often a sparse second story present. Species included are *Acer circinatum* (vine maple), and *Cornus nuttallii* (flowering dogwood).

The shrub layer is extremely dense and totally dominated by *Gaultheria shallon* (salal). Other species present in much smaller quantities include *Berberis nervosa* (Oregon grape), *Holodiscus discolor* (ocean spray), *Rosa gymnocarpa* (dwarf wild rose), *Rubus parviflorus* (thimbleberry), *Symporicarpos albus* (snowberry), and *Vaccinium parvifolium* (red huckleberry).

The herb layer within this stand type varies in density with soil moisture and overstory density. Under dense mats of salal it is virtually non-existent, while in other areas it may be moderately dense. Species present include *Bromus vulgaris* (brome grass), *Chimaphila umbellata* (prince's pine), *Corallorrhiza maculata* (spotted coral root), *Festuca occidentalis* (western fescue), *Goodyera oblongifolia* (rattlesnake plantain), *Galium aparine* (bedstraw), *Lactuca muralis* (wild lettuce), *Linnaea borealis* (twinflower), *Luzula parviflora* (wood rush), *Pyrola asarifolia* (wintergreen), *Pyrola picta* (wintergreen), *Rubus ursinus* (trailing blackberry), *Trientalis latifolia* (star flower), and *Viola orbiculata* (yellow violet).

Dominant species in the moss layer is *Euryhynchium oreganum*. Other species include *Hylocomium splendens*, *Plagiothecium undulatum*, *Pleurozium schreberi*, *Polytrichum juniperinum*, *Rhytidiodelphus loreus*, *Rhytidiodelphus triquetrus*, and *Rhytidopsis robusta*. Large numbers of saprophytic species are present within this stand type.

b) *Eurhynchiun* Mid Slopes

This sub-unit is, or was, very common within the GVRD, especially on the Surrey and White Rock uplands and on the south slopes of Hollyburn Ridge and near Pitt Lake. Much of it has now been appropriated for housing development. The unit is characterized by gentle, often concave mid slopes. Soils are deep and generally till based with moderately fine texture. Drainage is moderately good and growth conditions vary from mesic to moderately moist.

Dominant in the overstory of this stand type is *Pseudotsuga menziesii* (Douglas fir), with small quantities of *Abies grandis* (grand fir), *Thuja plicata* (western red cedar) and *Tsuga heterophylla* (western hemlock). A sparse second layer containing *Acer circinatum* (vine maple), *Acer glabrum* (Douglas maple), *Cornus nuttallii* (flowering dogwood), *Osmaronia cerasiformis* (Indian plum) and *Salix lasiandra* (Pacific willow) is usually present.

The shrub layer within this stand type is usually very sparse, and contains scattered specimens of such species as *Berberis nervosa* (Oregon grape), *Gaultheria shallon* (salal), *Rosa gymnocarpa* (dwarf wild rose), *Symporicarpus albus* (snowberry), and *Vaccinium parvifolium* (red huckleberry).

Equally sparse is the herb layer which generally contains only a few, widely scattered plants. Among species present are *Blechnum spicant* (deer fern), *Calypso bulbosa* (lady's slipper), *Corallorrhiza maculata* (spotted coral root),

*Dicentra formosa* (bleeding heart), *Dryopteris austriaca* (wood fern), *Festuca occidentalis* (western fescue), *Galium triflorum* (bedstraw), *Gymnocarpium dryopteris* (oak fern), *Luzula parviflora* (wood rush), *Polystichum munitum* (sword fern), *Montia sibirica* (Siberian miner's lettuce), *Pyrola asarifolia* (wintergreen), *Tiarella trifoliata* (foamflower), *Trientalis latifolia* (star flower), and *Trillium ovatum* (trillium).

The moss layer varies from sparse to extensive, the forest floor often being dominated by bare litter and humus. Species present include *Eurhynchium oreganum*, *Hylocomium splendens*, *Leucolepis menziesii*, *Plagiothecium undulatum*, *Rhytidadelphus triquetrus*, and *Rhytidopsis robusta*.

44) *Polystichum* Lower Slopes

*Polystichum* lower slopes are found at various points within the GVRD, both south and north of Burrard Inlet. Two subdivisions exist within this vegetation unit.

a) *Thuja - Gaultheria* Moist Forest

This sub-unit is characteristic of lower slopes north of Burrard Inlet, of some portions of Stanley Park and Point Grey, and, in fragments, of the Surrey and White Rock uplands. Slopes within this sub-unit are gentle and concave with deep extensively podzolized, till based soils. Drainage is generally fair and growth conditions are moist.

Dominant in a very dense overstory is *Tsuga heterophylla* (western hemlock), with some *Pseudotsuga menziesii*

(Douglas fir), and *Thuja plicata* (western red cedar). Also fairly abundant as a second story are *Acer circinatum* (vine maple), *Alnus rubra* (red alder), *Cornus nuttallii* (flowering dogwood), and occasional *Acer macrophyllum* (broad leaf maple).

The shrub layer is always substantial, varying in density from moderate to extreme. Among species present, by far the most common are *Gaultheria shallon* (salal) in drier areas and *Vaccinium parvifolium* (red huckleberry) in slightly wetter areas. Other species present in at least some areas include *Aruncus sylvester* (goat's beard), *Berberis nervosa* (Oregon grape), *Menziesia ferruginea* (false azalea), *Rhamnus purshiana* (cascara), *Ribes* sp. (wild currant), *Rubus parviflorus* (thimbleberry), *Rubus spectabilis* (salmonberry), *Sambucus racemosa* (elderberry), and *Viburnum edule* (squashberry).

Generally, the understory is fairly sparse. Dominant species is *Polystichum munitum* (sword fern). Other species present in at least some areas include *Achlys triphylla* (vanilla leaf), *Adenocaulon bicolor* (silver green), *Athyrium filix-femina* (lady fern), *Bromus vulgaris* (brome grass), *Circaea alpina* (enchanter's nightshade), *Dicentra formosa* (bleeding heart), *Galium triflorum* (cleavers), *Geum macrophyllum* (large leafed avens), *Gymnocarpium dryopteris* (oak fern), *Lactuca muralis* (wild lettuce), *Listera cordata* (twayblade), *Luzula parviflora* (wood rush), *Maianthemum dilatatum* (false lily of the valley), *Mitella pentandra* (mitrewort), *Montia siberica* (Siberian miner's lettuce), *Streptopus amplexifolius*

(twisted stalk), *Tiarella trifoliata* (foam flower), *Trillium ovatum* (trillium), and *Viola glabella* (yellow violet). Dominant mosses are *Eurhynchium stokesii*, *Leucolepis menziesii*, *Mnium insigne*, and *Mnium punctatum*.

b) *Tsuga - Acer* Forest

*Tsuga - Acer* forests are characteristic of bottomland and seepage areas throughout the GVRD, but especially at lower elevations in areas characterized by high rainfall. Slopes within this community are gentle. Soils are fine and deep, usually alluvium based and extensively gleyed. Drainage is fair to poor and moisture conditions range from very moist to wet. Seepage areas and pools of standing water are quite frequent.

Dominant within this overstory is *Tsuga heterophylla* (western hemlock) with some *Thuja plicata* (western red cedar). Also plentiful is *Acer macrophyllum* (broad leafed maple), while also occasionally present are specimens of *Picea sitchensis* (Sitka spruce). A very dense second story containing large quantities of *Acer circinatum* (vine maple) and *Alnus rubra* (red alder) with smaller quantities of *Salix* sp. (willow) is often present.

The shrub layer varies in density with overstory and soil moisture. Under normal circumstances it is quite dense. Dominant species is usually *Rubus spectabilis* (salmonberry). Other species present include *Cornus stolonifera* (red osier)

dogwood), *Lonicera involucrata* (black twinberry), *Oplopanax horridum* (Devil's club), *Ribes* sp. (wild currant), *Sambucus racemosa* (elderberry), *Vaccinium alaskaense* (Alaska blueberry), *Vaccinium ovalifolium* (oval leafed blueberry) and *Vaccinium parvifolium* (red huckleberry).

The herb layer is very sparse. No one species is dominant. Species present include *Athyrium filix-femina* (lady fern), *Blechnum spicant* (deer fern), *Dryopteris austriaca* (wood fern), *Equisetum arvense* (horsetail), *Lysichiton americanum* (skunk cabbage), *Streptopus amplexifolius* (twisted stalk), and *Tiarella trifoliata* (foam flower). Dominant mosses include *Eurhynchium stokesii*, *Mnium insigne*, *Mnium punctatum*, and *Plagiothecium undulatum*.

45) *Thuja - Acer* Banks

The *Thuja - Acer* bank unit occurs extensively in most low elevation portions of the GVRD, being especially common on both banks of the north arm of the Fraser and on most north facing slopes in the southern GVRD. It is characteristic of moderate to steep slopes, especially with north and east aspects. Soils are deep and moderately fine textured. Growth conditions are generally moist, and there may be some seepage.

Dominant in the overstory are *Acer macrophyllum* (broad-leaved maple) and *Thuja plicata* (western red cedar), with smaller quantities of *Abies grandis* (grand fir), *Alnus rubra* (red alder), *Pseudotsuga menziesii* (Douglas fir), and *Tsuga heterophylla* (western hemlock). A scant second story of *Acer circinatum* (vine

maple), *Cornus nuttallii* (flowering dogwood), *Osmaronia cerasiformis* (Indian plum), and *Rhamnus purshiana* (cascara) is present.

A shrub layer is not always present. When it exists, it consists, in drier areas, of *Rubus parviflorus* (thimbleberry), *Symporicarpos albus* (snowberry), and *Vaccinium parvifolium* (red huckleberry). In wetter areas, these are partially or completely replaced by such species as *Aruncus sylvester* (goat's beard), *Rubus spectabilis* (salmonberry), and *Sambucus racemosa* (elderberry).

The understory is generally quite sparse. Dominant in most areas is *Polystichum munitum* (sword fern), with extensive *Athyrium filix-femina* (lady fern), in wetter areas. Among other species commonly found within this unit are *Petasites frigidus* (colts foot), *Ranunculus repens* (spreading buttercup), *Stachys cooleyae* (hedge nettle), *Tolmiea menziesii* (youth-on-age) and, *Viola glabella* (yellow violet).

#### 46) *Tsuga - Gaultheria* Upland Forest

*Tsuga - Gaultheria* upland forests are very common in the northern portion of the GVRD, especially on the slopes above Burrard Inlet and Pitt Lake between ca. 1000' and 2000'. Slopes are moderate and convex, ranging from 2° to 25°. Soils are thin to moderate in depth, generally till based, fairly coarse textured, and extensively podzolized. Drainage is good and growth conditions are somewhat dry.

The overstory is generally moderately open. Dominant is *Tsuga heterophylla* (western hemlock), with small amounts of *Pseudotsuga menziesii* (Douglas fir) and some *Thuja plicata* (western

red cedar).

The shrub layer is low and fairly dense. Dominant species here is *Gaultheria shallon* (salal) with occasional specimens of *Rosa gymnocarpa* (dwarf wild rose) and *Vaccinium parvifolium* (red huckleberry).

There is essentially no herb layer. Mosses within this unit include *Eurhynchium oreganum*, *Hylocomium splendens*, *Plagiothecium undulatum*, *Pleurozium schreberi*, and *Rhytidiodelphus loreus*.

47) Abies - Tsuga Midslopes

This vegetation unit is also extremely common in the mountainous areas of the northern portion of the GVRD. Here it occupies midslopes, generally of moderate slope, at elevations between 1200' and 3000' feet where it gradually merges with sub-alpine forest types. Slopes are generally moderate. Soils are deep, moderately fine textured, podzolized and generally till based. Drainage is fairly good and sites range from mesic to moist.

Dominant in a dense, good quality overstory is *Tsuga heterophylla* (western hemlock). Also present are considerable quantities of *Abies amabilis* (Pacific silver fir), and small quantities of *Thuja plicata* (western red cedar). No second story other than abundant hemlock regeneration is present.

The shrub layer is relatively dense in some places, sparse in others. Dominant species are *Vaccinium alaskaense* (Alaska blueberry) and *Vaccinium ovalifolium* (oval leaf blueberry), with some *Menziesia ferruginea* (false azalea) and *Rhododendron albiflorum*.

(white rhododendron) and very occasional specimens of *Gaultheria shallon* (salal).

Somewhat more sparse is the herb layer. Species generally present include *Blechnum spicant* (deer fern), *Carex* sp. (sedge), *Clintonia uniflora* (Queen's cup), *Dryopteris austriaca* (wood fern), *Listera caurina* (twayblade), *Streptopus amplexifolius* (twisted stalk) and *Tiarella trifoliata* (foam flower). Also occasionally present in large quantities are *Cornus canadensis* (bunchberry), *Pyrola asarifolia* (wintergreen), *Streptopus roseus* (rosy twisted stalk), and *Veratrum veride* (Indian hellebore). There is essentially no moss layer.

48) *Blechnum - Tsuga* Seepage Slopes

This unit is generally contiguous with the one described above, with which it may form mosaics. It generally occupies moderate concave slopes at mid elevations. Soils are deep and vary in texture from coarse to fine. Generally they are till or colluvium based and highly podzolized with well developed gleization. Drainage is fair and conditions moist to wet. Some seepage areas are present.

Dominant in a thick, well developed overstory is *Tsuga heterophylla* (western hemlock), with a few specimens of *Abies amabilis* (Pacific silver fir) and *Thuja plicata* (western red cedar).

The shrub layer is very dense, especially in moist pockets. Especially abundant are such species as *Oplopanax horridum* (Devil's club), *Menziesia ferruginea* (false azalea), *Rubus spectabilis* (salmonberry), *Sambucus racemosa* (elderberry),

*Vaccinium alaskaense* (Alaska blueberry), and *Vaccinium ovalifolium* (oval leaf blueberry).

The herb layer is sparse. Among species occurring here are *Blechnum spicant* (deer fern), *Cornus canadensis* (bunchberry), *Rubus pedatus* (bramble), *Streptopus amplexifolius* (twisted stalk), *Streptopus roseus* (rosy twisted stalk), *Streptopus streptopoides* (dwarf twisted stalk), and *Veratrum viride* (Indian hellebore). Dominant mosses are *Eurhynchium stokesii*, *Mnium insigne*, and *Mnium punctatum*.

49) *Thuja - Oplopanax* Stream Banks

This unit is common within the northern portion of the GVRD at mid and low elevations. It is generally transitional with the unit described above. Slopes here are moderate to steep. Soils are deep and fine textured with a large organic component. Drainage is fair to poor and growth conditions are generally wet.

Dominant in a dense overstory is *Thuja plicata* (western red cedar) with some *Tsuga heterophylla* (western hemlock). A second story of scattered *Acer circinatum* (vine maple) may also be present.

The shrub layer is extremely dense, and dominated by *Oplopanax horridum* (Devil's club). Also present are *Menziesia ferruginea* (false azalea), *Rubus spectabilis* (salmonberry), *Sambucus racemosa* (elderberry) and *Vaccinium alaskaense* (Alaska blueberry).

Herb layer is relatively sparse. Among species present are *Adiantum pedatum* (maidenhair fern), usually on ravine walls,

*Athyrium filix-femina* (lady fern), *Blechnum spicant* (deer fern), *Carex* sp. (sedge), *Circaeа alpina* (enchanter's nightshade), *Gymnocarpium dryopteris* (oak fern), *Lysichitum americanum* (skunk cabbage), *Tiarella trifoliata* (foam flower), *Trautvetteria grandis* (false bugbane) and *Viola glabella* (yellow violet). Mosses present include *Eurhynchium stokesii*, *Mnium punctatum*, and, in pockets, *Sphagnum squarrosum*. Within some of these peat pockets may be found specimens of *Drosera rotundifolia* (sundew), *Empetrum nigrum* (crowberry), and *Ledum groenlandicum* (labrador tea).

50) *Tsuga - Abies - Vaccinium* Upper Slopes

This vegetation unit bears considerable resemblance to vegetation unit #47 with which it is often transitional, but is characteristic of upper slopes above ca. 2500'. Slopes are gentle and soils are deep, till based, moderately coarse in texture, and highly podzolized. Drainage is good, and growth conditions mesic to moist.

Dominant in the overstory are *Abies amabilis* (Pacific silver fir) and *Tsuga mertensiana* (mountain hemlock) with some *Chamaecyparis nootkatensis* (yellow cedar), *Thuja plicata* (red cedar), and *Tsuga heterophylla* (western hemlock). Generally this overstory is very dense except over very thin topsoil.

The shrub layer varies somewhat in density with soil moisture conditions. Dominant are *Vaccinium membranaceum* (thin leafed blueberry) and *Vaccinium ovalifolium* (oval leafed blueberry). Also present are *Menziesia ferruginea* (false azalea), *Ribes bracteosum* (stink currant), *Ribes lacustre* (swamp gooseberry),

*Rubus spectabilis* (salmonberry), and *Vaccinium alaskaense* (Alaska blueberry).

The herb layer is extremely sparse and consists essentially of scattered specimens of *Blechnum spicant* (deer fern), *Clintonia uniflora* (Queen's cup), *Rubus pedatus* (bramble), *Streptopus streptopoides* (dwarf twisted stalk), and *Viola glabella* (yellow violet). Mosses are also very sparse. Species present include *Dicranum fuscescens*, *Dicranum scoparium*, *Rhytidiodelphus loreus*, and *Rhytidopsis robusta*.

51) *Abies - Streptopus* Mid Slopes

This vegetation unit characterizes mid and lower slopes at higher elevations within the mountains of the northern GVRD. It is the subalpine equivalent of unit #47. Slopes within this unit are generally moderate varying from ca. 2° to ca. 30°. Soils are deep, till based, and highly podzolized, with a thick layer of raw humus. Drainage is moderately good and growth conditions moist. Seepage areas are plentiful.

Dominant within the overstory are *Abies amabilis* (Pacific silver fir) and *Tsuga mertensiana* (mountain hemlock). Also present in small quantities are *Chamaecyparis nootkatensis* (yellow cedar) and *Tsuga heterophylla* (western hemlock).

The shrub layer is usually moderately dense, although this is variable. Especially common are *Cladothamnus pyrolaefolius* (copper bush) and *Menziesia ferruginea* (false azalea). Other species present include *Oplopanax horridum* (Devil's club), *Rhododendron albiflorum* (white rhododendron), *Ribes bracteosum*

(stink currant), *Ribes lacustre* (swamp gooseberry), *Rubus spectabilis* (salmonberry), and *Vaccinium alaskaense* (Alaska blueberry).

The herb layer within this stand type is somewhat sparse, although considerably less so than in the previous unit. Dominant species is *Cornus canadensis* (bunchberry). Other species present include *Blechnum spicant* (deer fern), *Clintonia uniflora* (Queen's cup), *Gymnocarpium dryopteris* (oak fern), *Osmorrhiza purpurea* (sweet cicely), *Rubus pedatus* (bramble), *Streptopus roseus* (pink twisted stalk), *Streptopus streptopoides* (dwarf twisted stalk), *Tiarella unifoliata* (foam flower), and *Veratrum viride* (false hellebore). Common mosses include *Dicranum scoparium*, *Hypnum circinale*, *Mnium nudum*, *Plagiothecium denticulatum*, *Rhytidiodelphus loreus*, and *Rhytidopsis robusta*.

52) *Thuja - Oplopanax* Lower Slopes

This vegetation unit occurs very commonly within the mountains of the north shore, although its occurrence is limited in any given area. It characterizes lower slopes and streambanks and is similar to the lower elevation unit #49. Slopes within this unit are gentle, usually < 5°. Soils are deep and fine textured with an extensively gleyed B layer. Drainage is poor, and conditions wet. There is abundant permanent seepage.

Dominant in a somewhat open overstory are *Abies amabilis* (Pacific silver fir), *Thuja plicata* (western red cedar), and *Tsuga heterophylla* (western hemlock). Also occasionally present are specimens of *Chamaecyparis nootkatensis* (yellow cedar).

A dense shrub layer is present. Species present include *Lonicera utahensis* (red twinberry), *Menziesia ferruginea* (false azalea), *Oplopanax horridum* (Devil's club), *Ribes bracteosum* (stink currant), *Ribes lacustre* (swamp gooseberry), *Rubus spectabilis* (salmonberry), *Vaccinium alaskaense* (Alaska blueberry), *Vaccinium membranaceum* (thin leaved blueberry), and *Vaccinium ovalifolium* (oval leafed blueberry).

The herb layer varies considerably in density, generally with soil moisture. Species composition varies within this unit with soil moisture and aspect. Species present in at least some portion of the unit include *Athyrium filix-femina* (lady fern), *Blechnum spicant* (deer fern), *Carex laeviculmis* (smooth stemmed sedge), *Clintonia uniflora* (Queen's cup), *Cornus canadensis* (bunchberry), *Coptis asplenifolia* (gold thread), *Gymnocarpium dryopteris* (oak fern), *Habenaria saccata* (rein orchid), *Listera cordata* (twayblade), *Lycopodium clavatum* (club moss), *Lysichiton americanum* (skunk cabbage), *Nephrophilidium crista-galli* (deer cabbage), *Streptopus amplexifolius* (twisted stalk), *Streptopus roseus* (rosy twisted stalk), *Streptopus streptopoides* (dwarf twisted stalk), *Tiarella unifoliata* (foam flower), *Veratrum viride* (false hellebore), and *Viola glabella* (yellow violet). Common mosses include *Bryum* sp., *Dicranum scoparium*, *Dicranum fuscescens*, *Eurhynchium stokesii*, *Hookeria lucens*, *Hypnum circinale*, *Hypnum dieckii*, *Mnium nudum*, *Plagiothecium denticulatum*, *Plagiothecium undulatum*, *Rhytidadelphus loreus*, *Rhytidopsis robusta*, and in very moist areas, *Sphagnum girgensohnii* and *Sphagnum squarrosum*.

53) Tsuga - Abies Subalpine Forest

This unit is extremely common within the mountains of the north shore, especially at altitudes above 3500'. Slopes here are moderate, ranging from 0° to ca. 40°. Soils are of moderate to shallow depth and coarse texture. Drainage is good, and growth conditions are fairly dry. Duration of snow cover is about 7 months.

Dominant species in a somewhat open overstory is *Tsuga mertensiana* (mountain hemlock). Other species present in considerably smaller quantities are *Abies amabilis* (Pacific silver fir), and *Chamaecyparis nootkatensis* (yellow cedar) and at higher elevations, *Abies lasiocarpa* (subalpine fir).

A fairly extensive shrub layer is usually also present. This is dominated by various species of *Vaccinium*, including *V. alaskaense* (Alaska blueberry), *V. deliciosum* (Cascade blueberry), *V. membranaceum* (thin leafed blueberry), and *V. ovalifolium* (oval leafed blueberry). Also present in most areas are *Cladothamnus pyrolaeeflorus* (copper bush), *Menziesia ferruginea* (false azalea), and sometimes *Rhododendron albiflorum* (white flowered rhododendron). Common lower shrubs are *Gaultheria humifusa* (western wintergreen), and *Rubus pedatus* (bramble), with moderately large quantities of *Cassiope mertensiana* (white heather) and *Phyllodoce empetriformis* (pink heather) at upper elevations.

The herb layer is very sparse within this unit. Species present in quantity include *Carex nigricans* (black sedge), *Deschampsia atropurpurea* (mountain hair grass), *Luetkea pectinata*,

and *Lycopodium sitchense* (Alaska club moss). Mosses are rather extensive as are lichens. Common moss species include *Dicranum fuscescens*, *Dicranum scoparium*, *Lescuraea baileyi*, *Pleurozium schreberi*, *Rhytidadelphus loreus*, and *Rhytidopsis robusta*.

54) Tsuga - Cassiope Sub-Alpine Shrubland

This unit characterizes high elevation slopes within the northern portion of the GVRD. Altitudes are generally above 4000'. Slopes are relatively gentle, generally less than 25°. Soils are till based, of varying depth, and generally coarse. While drainage is good, snow duration is > 8 months, and conditions vary between mesic and moist.

There is no overstory, the only tree species present, *Tsuga mertensiana* (mountain hemlock), assuming a shrub form within this unit. Forming a dense mat surrounding the open stand of stunted hemlock are very extensive *Cassiope mertensiana* (white heather) and *Phyllodoce empetriformis* (pink heather) along with some *Vaccinium deliciosum* (Cascade huckleberry).

The herb layer is relatively sparse. Major species include *Carex nigricans* (black sedge), *Hippuris montana* (mare's tail), *Luetkea pectinata*, *Lycopodium sitchense* (Alaska club moss), *Rubus pedatus* (bramble), and *Veratrum viride* (false hellebore). Considerable numbers of moss, liverwort, and lichen species are present.

55) Cassiope - Phyllodoce Sub-Alpine Slopes

*Cassiope - Phyllodoce* subalpine slopes occur extensively in large and small portions within the north shore mountains at

elevations above 4000'. They occupy all positions on slope and are characterized by shallow to deep till based soil. Slopes are usually moderate. Conditions are generally mesic. Snow duration is 8-9 months.

No overstory is present within this vegetation unit. There is, however, a very dense layer of low shrub species. This is composed of *Cassiope mertensiana* (white heather), *Phyllodoce empetriformis* (pink heather), *Phyllodoce glanduliflora* (yellow mountain heather), and *Vaccinium deliciosum* (Cascade blueberry). Other species present within this unit include *Luetkea pectinata* and *Lycopodium sitchense* (Alaska club moss), as well as various moss, lichen, and liverwort species.

#### 56) Alpine Communities

Various alpine communities exist at high elevations within the north shore mountains. These include high moors, fell fields, talus slopes and rock walls. Because of limitations, both of time and in available literature, these are not described. Sources of information for these areas are listed in the appended bibliography.

#### Lands Currently Under Active Management

##### A) Parks and Other Areas of Maintained Turf

Included within this unit are all parks which are regularly maintained and/or cultivated, the greens and fairways of golf courses and extensive areas of lawn such as occur within the vicinity of Vancouver International Airport. Vegetation within

these areas consists of introduced and/or cultivated species and all grassy areas are frequently mowed. Tree species may be introduced but are often relicts of past forest types.

B) Industrial Land

This unit is characterized by factories, mills, warehouses, and other such buildings as well as such operations as gravel pits and dryland sorts. Vegetation in these areas is generally very sparse, although patches of the various wasteland communities may be present. This unit, when it occurs contiguous to urban areas, is not denoted separately.

C) Agricultural Land

This classification includes all land, outside designated agricultural reserves, which is presently being utilized for agricultural pursuits, whether crop raising or pasturing. Included in this section are semi-urban areas where there is even the smallest degree of agricultural endeavour. Vegetation here is generally composed of introduced, cultivated, or weedy species, except in hedgerows, which are generally similar to wasteland communities.

D) Schools and Other Public Buildings

This unit contains little vegetation, what there is usually being cultivated. Where contiguous with urban areas, this unit is not presented separately.

E) Urban Areas

This map unit represents areas which are entirely or predominantly residential or commercial/industrial in nature. Often these areas contain small patches of the wasteland communities described earlier. Generally, these patches are small, normally the size of a city lot. Where larger patches occur, they are so indicated. In rural areas, this map unit and that denoting agricultural land are often intermingled. Such a situation is indicated by the use of both map unit code numbers.

## SECTION II

### LAND USE INTERPRETATION

In this section, each vegetation unit is considered separately in tabular form. Each table includes a brief description of site characteristics including soil type, drainage, slope, and moisture conditions; an estimation of the successional status of that vegetation unit; some indication of the uses to which areas characterized by that unit might be put, and, for each type of land use, aspects of land management which may have to be considered. It is to be stressed that recommendations for land use and management considerations contained in this section are in many cases estimates only, based on knowledge of only some aspects of the entire problem. A thorough compilation of land use decisions and management considerations can only come from a joint discussion of workers in all aspects of land description.

- 1) ZOSTERA MUD - located in Mud and Boundary Bays, off the western edge of the Fraser Delta, and in Burrard Inlet

Site Description	Successional Status	Use	Management Considerations
- submerged except at extremely low tide	- climax	RESIDENTIAL - N.A.	- extensively used for recreational crabbing at present
- mud flats	- will be altered by draining or dredging	RECREATION - crabbing and fishing	- area fronts recreational beaches (White Rock, Crescent Beach)
	- under natural circumstances will be displaced outward by growth of delta		- sewage disposal or other source of water contamination, i.e. by fecal matter, chemicals, oil, etc. - will render area unsuitable for human recreational use
		WILDLIFE - extensive use by wildfowl and marine life	- contamination or development will drastically reduce wildlife capacity
			- because of significance for wildfowl and marine life, much effort should be expended to preserve and protect as much of this area as it is possible
			- highly significant area for breeding or some part of life cycle of many important species, including various species of salmon
			AGRICULTURE - N.A.
			FORESTRY - N.A.

2) SALICORNIA - ATRIPLEX MUD FLATS - located on Mud and Boundary Bays and in Burrard Inlet

Site Description	Successional Status	Use	Management Considerations
- flat	- climax	RESIDENTIAL - N.A.	
- mud and shell substrate	- will gradually be displaced outward as delta grows	RECREATION - hunting of wildfowl	- disturbance of wildfowl - littering with debris (i.e. shotgun shells, skeets, packages, etc.)
- partly submerged at high tide		- possible beach area	- involves extensive trampling of vegetation
		WILDLIFE - shelter and food for aquatic and shore wildfowl	- some areas should be preserved for this purpose
		AGRICULTURE - N.A.	
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL	- would involve extensive filling - also possibility of release of sewage and/or petroleum products into water or marina - could disturb wildfowl and would be destructive to vegetation - should be avoided

3) CAREX - SCIRPUS TIDAL MARSH - Fraser delta foreshore - Boundary Bay - limited occurrence near head of Burrard Inlet

Site Description	Successional Status	Use	Management Considerations
- flat	- will be displaced outward as delta extends seaward	RESIDENTIAL - N.A.	
- sandy muck substrate		RECREATION	- visibility poor - hunting might be dangerous - wildfowl hunting and observation
- partly submerged at high tide	- process may be altered by additional dyking or filling	WILDLIFE	- valuable nesting area - should be guarded against hunting - (as G. Reifel Reserve) - extensive use by wildfowl for nesting and food
		AGRICULTURE - N.A.	
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL	- high cost of filling and landscape
			- possible use for marina or other oceanside development with extensive filling
			- development could pose threat to wildfowl nesting - considerable danger of sewage or petroleum product contamination of water

4) ELYMUS BEACH - White Rock Highlands, Crescent Beach, Boundary Bay, Point Roberts, portions of Howe Sound and Burrard Inlet

Site Description	Successional Status	Use	Management Considerations
- level to 2° slope	- generally stable	RESIDENTIAL	<ul style="list-style-type: none"> <li>- may be some problem for sewage disposal with attendant danger of water contamination</li> <li>- some beach front cottages might be built</li> </ul>
- sand/gravel substrate	- parts may be eroded away - others built up into back beach comm.	RECREATION	<ul style="list-style-type: none"> <li>- upper beach vegetation mats quite fragile</li> <li>- easily replaced by introduced species</li> <li>- extensive damage to existing beach vegetation is inevitable with this type of use</li> </ul>
- no horizons	- many species may be introduced	WILDLIFE	<ul style="list-style-type: none"> <li>- valuable beach area</li> </ul>
- well drained			<ul style="list-style-type: none"> <li>- provides food for some shore birds i.e. sandpipers, etc.</li> </ul>
			<u>AGRICULTURE - N.A.</u>
			<u>FORESTRY - N.A.</u>
			<u>COMMERCIAL/INDUSTRIAL</u> - possibility of extensive littering and destruction of beach vegetation
			<ul style="list-style-type: none"> <li>- amusement parks and beach development</li> <li>- new species may be introduced</li> <li>- possibility of water contamination as a result of improper sewage disposal or gasoline/oil leakage</li> </ul>

5) POTENTILLA - ASTER BACK BEACH - restricted in occurrence. Boundary Bay and some islands in the Fraser mouth; Campbell River mouth

Site Description	Successional Status	Use	Management Considerations
- sandy soil, some shell	- has developed from stabilized beach	RESIDENTIAL	- sewage disposal difficult - danger of extensive contamination
- little horizon development	- will eventually develop forest cover, first deciduous, later coniferous	- suitable with some filling	- filling would eradicate community type
- open			- high tide and storm might cause serious flooding
- well drained except for some depressions			- vegetation easily replaced by introduced weeds
		RECREATION	- avoid wholesale trampling of vegetation
		- outdoor education and nature study	- some introduction of new species unavoidable
		- hiking	
		WILDLIFE	- should avoid excessive development for other purposes
		- extensive use by wildfowl	
		AGRICULTURE	- grazing potential limited - best for sheep
		- some grazing potential	- any such activity would seriously limit utilization for other purposes
			- would result in replacement of vegetation
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL	- see problems for residential development
		- possible with extensive filling	

6) ATRA ROCKY HEADLANDS - restricted to rocky headland areas near Horseshoe Bay, on Howe Sound, and on Bowen Island

Site Description	Successional Status	Use	Management Considerations
- flat to steeply sloping	- climax except over geologic times	RESIDENTIAL - limited use	- vegetation very fragile - sewage disposal facilities limited
- drainage excellent except in pockets	- soils present only in pockets	- possible use for prestige view housing	- pollution potential very high
-	-	RECREATION - high potential - scuba diving, fishing, nature study	- dangerous terrain at times - vegetation and shore life fragile
-	-	WILDLIFE - when present residual with some shell and salt near the ocean	- very susceptible to pollution from terrestrial and marine sources, especially adhesive pollutants, i.e. oil, tar, etc.
-	-	- some wildfowl	AGRICULTURE - N.A.
-	-	FORESTRY - N.A.	COMMERCIAL/INDUSTRIAL - N.A.

7) NUPHAR LAKES - almost all of Burnaby Lake and portions of most other lowland lakes within the area

Site Description	Successional Status	Use	Management Considerations
- water community	- sub climax	RESIDENTIAL - N.A.	- only possible with houseboats
- deep muck soil at lake bottom	- lake will gradually fill in, especially in areas of high siltation and/or nutrient enrichment	RECREATION	- contamination potential high - danger of sewage and industrial pollution from surrounding areas very high in Burnaby and Deer Lakes, less in others
- rooted 2'-6' deep	- excessive enrichment by sewage disposal will hasten process	fishing, wildfowl hunting, swimming	- weeds and importance of wildfowl should prohibit powerboating - hunting dangerous in proximity of settled areas
		WILDLIFE	- seepage from surrounding or nearby population centres might result in increased BOD in water with resulting change in fish population and alteration of wildfowl population
		AGRICULTURE - N.A.	
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL	- N.A.

8) *LEMNA DITCHES* - common in lowland areas within GVRD

Site Description	Successional Status	Use	Management Considerations
- standing water at all times	- usually maintained for irrigation or drainage purposes	RESIDENTIAL - N.A.	- dangerous to cattle and children
- bottom is mud	- if left	RECREATION - N.A.	
	- unintended will silt and fill in	WILDLIFE	- limited use by small animals
		AGRICULTURE - N.A.	
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL	
			- N.A.
			- entire area would revert to marsh or wetland type

9) *TYPHA - SCIRPUS WATER MARGINS* - found bordering bodies of water, both fresh and brackish, in all parts of lowland GVRD, especially on the delta

Site Description	Successional Status	Use	Management Considerations
- mud or silt substrate	- will become less wet and eventually	RESIDENTIAL - N.A.	
- flat terrain	progress to wetland forest	RECREATION - N.A.	
- wet	- drainage will accelerate process if not accompanied by agriculture or submerged housing	<p>WILDLIFE</p> <p>- affords some habitat for small mammals and wildfowl</p>	<p>- subject to damage as a result of pollution</p>
		AGRICULTURE - N.A.	
		FORESTRY - N.A.	

10) *ELEOCHARIS* GRAVEL LAKE MARGINS - sparsely present bordering some upland lakes in the northern portion of the GVRD

Site Description	Successional Status	Use	Management Considerations	
- gravel substrate	- will eventually progress through wetland thicket units to cedar-hemlock forest	RESIDENTIAL	- N.A.	- very small area
- flat with little or no gradient		RECREATION	- N.A.	- small contiguous patches
- wet		WILDLIFE		
- possibly some standing water			- some use by small mammals and birds	
- exposure open		AGRICULTURE	- N.A.	
		FORESTRY	- N.A.	
		COMMERCIAL/INDUSTRIAL	- N.A.	

- 11) SPIRAEA - SALIX SWAMPLAND - occurs extensively in lowland areas of the GVRD, especially in near Burnaby Lake and Pitt and Fraser Rivers - often found near peatland areas

Site Description	Successional Status	Use	Management Considerations
- generally flat terrain	- may be relatively permanent transition between wet- land forests	RESIDENTIAL	<ul style="list-style-type: none"> <li>- not suitable except with extensive draining and filling</li> <li>- poor drainage and sewage disposal</li> <li>- subject to frequent flooding</li> <li>- poor foundation material</li> <li>- may require extensive filling</li> </ul>
- drainage poor		RECREATION	<ul style="list-style-type: none"> <li>- very soft terrain</li> </ul>
- silt or mud soils	- will gradually progress to wetland forest		<ul style="list-style-type: none"> <li>- possibly some wildfowl hunting</li> <li>- often impassible</li> </ul>
- wet conditions		WILDLIFE	<ul style="list-style-type: none"> <li>- subject to intensive trampling</li> </ul>
- possibly some standing water	- drainage will accelerate process		<ul style="list-style-type: none"> <li>- some areas should be preserved</li> </ul>
		AGRICULTURE	<ul style="list-style-type: none"> <li>- nesting and feeding area for birds and small mammals</li> <li>- possibly some deer cover</li> <li>- very soft</li> </ul>
			<ul style="list-style-type: none"> <li>- grazing will cause soil trampling and compaction</li> </ul>
			<ul style="list-style-type: none"> <li>- mechanical equipment may bog down</li> </ul>
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL	<ul style="list-style-type: none"> <li>- similar disadvantages as for residential</li> </ul>
		- possible with extensive draining and filling	<ul style="list-style-type: none"> <li>- is currently being extensively carried out</li> </ul>

## 12) CAREX UPLAND SWAMPS - common at mid elevations in the northern portion of the GVRD

Site Description	Successional Status	Use	Management Considerations
- flat	- will gradually fill in,	RESIDENTIAL - N.A.	- small contiguous area
- characterizes rock basins and seepage pockets	- becoming wetland forest	RECREATION - N.A.	
- moist to wet		WILDLIFE	
		- some wildlife use	
		AGRICULTURE - N.A.	
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL	
		- N.A.	
		- organic muck soil, some peat	
		- drainage poor	

13) CAREX ALPINE BASINS - covers moderately large areas at alpine elevations

Site Description	Successional Status	Use	Management Considerations
- convex basins	- development slow as a result of high altitude, cold, wet conditions	RESIDENTIAL - N.A.	- high elevations, difficult terrain, long duration of snow preclude present utilization
- slope 0-25°		RECREATION - N.A.	
- wet conditions		WILDLIFE - N.A.	
- deep organic soil		AGRICULTURE - N.A.	
- extensive peat		FORESTRY - N.A.	
- drainage poor		COMMERCIAL/INDUSTRIAL - N.A.	

14) *THUJA - ALNUS SWAMP FOREST* - present in small areas in both northern and southern portions of district

Site Description	Successional Status	Use	Management Considerations
- slope 0-5°	- will progress towards more mesic conditions and eventually to edaphic climax characteristic of particular area	RESIDENTIAL - N.A.	- unit occupies only small contiguous areas - poor drainage and foundation material
- in concave seepage basins, along streams		RECREATION - N.A.	- poor footing - susceptible to trampling
- wet conditions		WILDLIFE	- some cover for deer and smaller species
- drainage fair to poor		AGRICULTURE - N.A.	
- fine alluvial soil		FORESTRY	- difficulty of harvesting
			- some potential for cedar harvesting
			- susceptible to soil compaction and excessive destruction of undergrowth
			- small continuous areas increase expense of harvesting
		COMMERCIAL/INDUSTRIAL	- if location is suitable cost of filling and draining may be acceptable - limited

15) *POPULUS* - *SALIX* BARS - occurs extensively on sand bars and small islands above the mouth of the Fraser river and in the Pitt and Coquitlam Rivers

Site Description	Successional Status	Use	Management Considerations
- flat terrain - wet to moist	- if stabilized will develop gradually into wetland forest	RESIDENTIAL - not satisfactory	- low lying - poor drainage, poor sewage disposal, poor foundation material - usually poor access
- in places are wet depressions	- process accelerated by dyking	RECREATION - possible for nature study	- frequent flooding - some parts have dense undergrowth and standing water - poor access
- subject to flooding 1-5 days per year	- under normal conditions very dependent on riverbed changes	WILDLIFE - some limited use by small mammals, deer	
- considerable seepage			
- sand and river silt			
		AGRICULTURE - N.A.	
		- except on largest islands where pastureage is possible	
		FORESTRY - very limited	- cottonwoods may be harvested for firewood or pulping
		COMMERCIAL/INDUSTRIAL - satisfactory	- high expense of preparing area mitigated by easy access to shipping (i.e. Anacis Is.) - some problems with effluent disposal

16) *POPULUS* - ACER FLOODPLAIN FOREST - occurs extensively on alluvial terraces and river bottoms with GVRD

Site Description	Successional Status	Use	Management Considerations
- silt or clay	- will gradually develop into cedar-hemlock forest over very long period of time	RESIDENTIAL - possible but expensive	- poor drainage - periodic flooding - potential sewage problems - poor foundation material - fill expensive
- alluvial deposits	- moist to wet	RECREATION - outdoor education	- dense undergrowth - soft ground - sometimes standing water
- subject to periodic flooding	- change involves soil alteration	EDUCATION - limited browse - good deer cover	- trails need careful planning - conflict with other uses
- 0-2° gradient		WILDLIFE	
		AGRICULTURE	- severe soil compaction problems
		- pastureland with clearing	- mechanization difficult because of soft soil
		- with drainage	- soil possibly too wet for some crops
			- might be good for field crops
		FORESTRY	- no large contiguous patches of timber
		- possibly useful for harvesting firewood and pulpwood	- soft ground limits mechanization
		COMMERCIAL/INDUSTRIAL	- expensive - requires extensive filling
		- see residential above	- is near river, ease of access to shipping may be overriding factor
			- conversion is being carried out extensively at present

17) *PICEA* ALLUVIAL PLAIN FOREST - very limited occurrence within lowland portions of GVRD - formerly had much wider occurrence

Site Description	Successional Status	Use	Management Considerations
- flat to gently sloping	- over long periods of time will progress	RESIDENTIAL	- poor drainage - mediocre foundation material
- 0-2° gradient	- towards cedar-swordfern bottomland forest	RECREATION	- may be subject to flooding - understorey and soil very susceptible to trampling - nature study - should be preserved
- substrate silt some-times with peat or other organic matter		WILDLIFE	- limited use by deer and smaller mammals
- drainage fair to poor		AGRICULTURE	- expensive process of site preparation - with dyking and draining area provides excellent source of crop production
- conditions moist to wet		FORESTRY	- little now left undisturbed - excellent source of timber, especially spruce, cedar and hemlock
- subject to periodic inundation		COMMERCIAL/INDUSTRIAL	- preparation for these purposes expensive but probably good investment - some strategic positions on Fraser river occupied by this unit - rarity of unit at present should be factor here

18) *BETULA* - *SALIX* WET FOREST - occurs extensively near the Fraser and Pitt rivers and on the large islands at the margins of peat bogs

Site Description	Successional Status	Use	Management Considerations
- flat terrain	- intimately tied with peat bog succession	RESIDENTIAL - N.A.	- very wet area - poor drainage - poor foundations
- subject to flooding	- over very long period of time will eventually develop into <i>Populus</i> wetland forest	RECREATION	- very easily compacted soil - nature study - often dense undergrowth - herb layer susceptible to trampling
- drainage poor		WILDLIFE	- provides browse, cover, for deer, small animals
- wet conditions		AGRICULTURE	- periodic flooding - soils easily compacted
- often standing water			- viable if extensively dyked and drained
- substrate river silt lensed with peat		FORESTRY	- poor conditions for mechanization - soil fertility when treated is high
			- possible pulpwood - firewood harvesting
			- limited potential - very low trafficability - mechanized traffic will cause extensive damage
		COMMERCIAL/INDUSTRIAL	- filling and drainage very expensive
			- needs drainage and filling - position near river may be mitigating factor in decision making for some portions of this unit

19) *BETULA* - SPIRAEA PEATLAND - occurs extensively at periphery of peat bogs

Site Description	Successional Status	Use	Management Considerations
- flat terrain	- will gradually become part of wetland forest	RESIDENTIAL - N.A.	- poor foundation material - high water table
- deep peat soil often lensed with river silt	- as peat bogs fill up	RECREATION	- fragile vegetation - hiking and nature study
- low soil nutrient level	- drainage fair	WILDLIFE	- very thick undergrowth in some places - sometimes impassable or even dangerous - some portions of this zone should be preserved - relatively little forage for mammals - limited use by mammals
		AGRICULTURE	- fertilization sometimes necessary - extensive draining and clearing - excellent for commercial blueberry production necessary
		FORESTRY	- produces valuable farmland - birch may be harvested for pulp or firewood - limited possibilities
		COMMERCIAL/INDUSTRIAL	- if location is good, expense of draining and possibly some peat harvesting - may be drained and filled if location is especially suitable

20) *BETULA PINUS BOG MARGIN* - found on margins of all bog areas within GVRD

Site Description	Successional Status	Use	Management Considerations
- flat to gently sloping terrain	- as bog matures will pass through <i>Betula</i> forest to <i>Populus</i> wetland forest	RESIDENTIAL - N.A.	- similar factors as are present in unit #19 - only small area within district
- drainage poor	-	RECREATION	- extensive and dense undergrowth - hiking and nature study - difficult conditions for access and passage - fragile understory
- peat substrate	-	WILDLIFE	- limited provision of forage - limited use - excellent cover
- low nutrient content	-	AGRICULTURE	- could be cleared for blueberry production - limited - small area within district renders this impractical
- wet conditions	-	FORESTRY - N.A.	- pine trees stunted and unmerchantable
		COMMERCIAL/INDUSTRIAL	- destructive to bog forest - possibly some peat harvesting - at least some bog forest area within GVRD should be preserved

21) *PINUS - GAULTHERIA BOG FOREST* - extensive occurrence in all bogs of the area

Site Description	Successional Status	Use	Management Considerations
- flat to gently sloping terrain.	- will age with peat bog	RESIDENTIAL - N.A.	- boggy ground - difficult access
- peat and litter substrate	- peat cutting will radically alter this process, as will other activities such as dyking, draining, and waste disposal	RECREATION WILDLIFE AGRICULTURE	- nature study - fragile vegetation - very limited use - can be cleared for blueberry and cranberry cultivation
- poor drainage		FORESTRY - N.A.	- pine trees not merchantable
- wet			- generally no more than 8' in height
- low nutrient level			COMMERCIAL/INDUSTRIAL
- sterile and highly acidic growth conditions			- peat cutting - much peat for commercial sales of peat moss - will radically influence water relations of bog area and consequently change successional patterns

22, 23, 24, 25) PEAT BOG COMMUNITIES - form a mosaic in all peat bog areas within the GVRD. Should be dealt with as one unit

Site Description	Successional Status	Use	Management Considerations
- flat terrain with many depressions	- will be gradually filled and overgrown providing water levels	RESIDENTIAL - N.A. RECREATION - study area	- site completely unsuited in every way - very fragile ecosystem - susceptible to trampling
- wet soils peat except in depressions where organic muck dominates	- do not rise - peat cutting will impede this process, while dyking and draining will hasten successional processes	WILDLIFE - extensive use by wildlife	- some possibility for areas characterized by units #22 and 23
- standing water in depressions	-	AGRICULTURE - will require extensive ditching and draining with corresponding destruction of bog area	- will require extensive ditching and draining with corresponding destruction of bog area
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL - peat cutting	- carried out in some areas - is disruptive to bog ecosystems
			- has considerable influence on water levels in bog
			- water levels in bog also profoundly influenced by draining and ditching of inter-river areas

26) *EMPETRUM* - *HABENARIA* UPLAND BOG - unit is moderately common within upland areas in the north half of the GVRD

Site Description	Successional Status	Use	Management Considerations
- flat surface	- process of succession will involve gradual filling of rock basin ultimately resulting in wetland forest	RESIDENTIAL - N.A.	- small areas and poor drainage render unit poorly suited for this purpose
- characterizes rocky basins and seepage pockets		RECREATION - N.A.	
- wet conditions		WILDLIFE	- very limited use
		AGRICULTURE - N.A.	
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL	- N.A.
- substrate peat and organic muck			
- poor drainage			

27) *ERIOPHORUM* - *SPAGNUM UPLAND MOOR* - found in moderately extensive quantities in alpine areas or the northern portion of the GVRD

28) *SOLIDAGO* ROADSIDES - occur on all roadside areas in the lowland portion of the GVRD, and on much of the upland area. Also characterizes other recently disturbed gravel waste sites

Site Description	Successional Status	Use	Management Considerations
- 0-30° slope - sandy gravelly soil - good drainage - mesic to dry conditions - all sites recently disturbed	- generally artificially maintained - if neglected will progress to alder scrub and ultimately to forest type climax for specific environmental parameters characterizing area	RESIDENTIAL - roadsides N.A. - waste areas usually very suitable	- portions contiguous to travel routes well suited to this purpose
		RECREATION - possibly bicycle trails in lowland portions of GVRD	- possibly bicycle trails in lowland portions of GVRD
		WILDLIFE - limited use of waste areas	
		AGRICULTURE - N.A.	
		FORESTRY - N.A.	
		COMMERCIAL/ INDUSTRIAL - N.A.	

29) RUBUS - ALNUS WASTELAND - occurs extensively in upland and drier lowland areas in the southern GVRD where land has recently been abandoned. Less extensively present in the northern portion

Site Description	Successional Status	Use	Management Considerations
- flat to moderate slope	- will gradually progress through <i>Alnus</i> young forest	RESIDENTIAL - suitable	- good foundation material - good drainage - usually convenient location - perhaps needs fill for lawns and gardens
- dry to mesic conditions	- mixed forest to coniferous forest which is climax for that area. Re-cutting <u>WILDLIFE</u> will delay the process	RECREATION - N.A. without extensive conversion	- wasteland - may be converted for other uses - provides only limited forage
- sandy loam to gravel substrate	- drainage good	WILDLIFE - limited use by birds and small mammals	- position often poorly located
		AGRICULTURE	- rapid drainage - coarse soil - can be used for garden plots if soil is sufficiently fertile
		FORESTRY - N.A.	- may need fertilization or extensive soil treatment - usually exists in small plots only
		COMMERCIAL/INDUSTRIAL	- usually convenient location - seldom large contiguous areas - may not be enough space for large installations

30) *RUBUS* - *SPIRAEA* WET WASTE - occurs extensively in lowlands and in upland wet areas where cleared land has recently been abandoned. More extensive occurrence in southern portion of GVRD

Site Description	Successional Status	Use	Management Considerations
- flat terrain - moist to wet conditions - silt or clay soil - drainage fair to poor - usually open	- will progress through medium of young <i>Alnus</i> forest to <i>Populus</i> wetland forest type	RESIDENTIAL - limited suitability	- high water table - poor drainage and waste disposal potential - chance of repeated water damage - may provide poor foundation material
		RECREATION - N.A.	
		WILDLIFE - drainage may retard this or lead to establishment of coniferous forest	- supports some small mammals - possible deer cover
		AGRICULTURE - limited suitability	- extensive draining necessary - usually exists in small plots
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL - acceptable	- needs filling - locations near river are very convenient, especially for heavy industry - some industrial uses will demand filling or drainage
			- presently many areas of this unit are contiguous to currently used locations
			- in general unit characterizes relatively small areas

31) *JUNCUS* OLD FIELDS - occurs extensively in all parts of the GVRD especially lowland areas which have been or are currently under pasture

Site Description	Successional Status	Use	Management Considerations
- flat or gently sloping terrain	- will progress through alder lowland forest to <i>Populus</i> - <i>Alnus</i> wetland forest	RESIDENTIAL - possible with extensive drainage and filling	- poor drainage and sewage disposal facility - poor foundation material - subject to periodic flooding during winter
- moist to wet conditions	- on uplands probably to Cedar - hemlock forest	RECREATION - possibly hunting or nature study	- soft ground - often standing water - not easily traversed
- silt or silt loam substrate	- drainage fair	WILDLIFE - provides some browse for deer	- may be competition with some uses
- often marshy during winter		AGRICULTURE - pasturing	- heavy soil texture - may be flooded late in season
			- could be drained for production of field crops
			- difficult to work with mechanized equipment
			- provides moderately good pasture
			- <i>Juncus effusus</i> , a non-palatable species, should be controlled if possible
			FORESTRY - N.A.
		COMMERCIAL/INDUSTRIAL	- expensive (see Residential use)
		- possible with extensive filling and drainage	- is presently being carried out in some areas, especially near the Fraser and Pitt rivers

32) *EPILOBIUM - HYPOCHAERIS CUTOVERS* - moderately extensive occurrence within areas previously logged.  
 Majority of occurrence is in northern portion of GVRD.

Site Description	Successional Status	Use	Management Considerations
- slope gentle to steep (2-50°)	- succession will progress in southern GVRD, through alder regeneration	RESIDENTIAL - suitable in some lowland areas	- soil generally coarse, stony and highly podzolized
- moisture conditions highly variable	- forest to local edaphic climax - in northern GVRD, hemlock regeneration	RECREATION - excellent hunting potential	- generally good deer habitat - conflict between two uses
- soils fine to coarse	- drainage variable	WILDLIFE - excellent deer and wildfowl habitat	- good for berry picking
- occurs in many different conditions within the northern GVRD		AGRICULTURE - generally unsuitable	- coarse acid soil - usually steep or uneven terrain
		FORESTRY - N.A.	- planting or other artificial regeneration methods often necessary
		COMMERCIAL/INDUSTRIAL	- N.A.

## 33) ALNUS - SYMPHORICARPOS DRY BANKS - very limited in extent - Point Grey, White Rock, Point Roberts

Site Description	Successional Status	Use	Management Considerations
- slope 20-60°	- slopes unstable	RESIDENTIAL - N.A.	
- southwest aspect	- rapid and extensive erosion	RECREATION	- need reinforcing to reduce erosion from recreational use
- coarse till based soil	- probably constant vegetation on slopes of this kind	point areas	- guard rails necessary to reduce danger of falling
- drainage good		WILDLIFE - N.A.	
	- ultimately Douglas fir - cedar forest when and if slopes stabilize	AGRICULTURE - N.A.	
		FORESTRY - N.A.	
		COMMERCIAL/INDUSTRIAL	- N.A.

34) *ALNUS POLYSTICHUM* WET BANKS - occur extensively through the whole of the GVRD. Limited in extent in southern portion, extensive in regenerated areas of the northern section

Site Description	Successional Status	Use	Management Considerations
- slope 10-40°	- considerable slumping	RESIDENTIAL	- poor foundation material - demands support
- drainage fair - often some seepage	- this will continue	- may be used if slopes are gentle	- drainage must be carefully laid out
- fine to moderate textured soil	- climax will be <i>Thuja</i> - <i>Acer</i> banks	RECREATION	- erosion studies necessary
- some slumping may be evident		WILDLIFE	- dangerously steep slopes
			- possibly some viewing
			- erosion hazard increased by human use
			- very limited use
		AGRICULTURE - N.A.	- steep slopes
		FORESTRY - N.A.	- steep slopes
		INDUSTRIAL/COMMERCIAL	- small and commercially useless trees
			- see limitations for residential use
			- N.A.

35) ALNUS - ACER UPLAND REGENERATION FOREST - occurs very extensively in all the upland areas within the southern GVRD and less extensively at low and medium elevations in the northern section

Site Description	Successional Status	Use	Management Considerations
- 0-10° slope - drainage fair to good - moist to mesic - silt loam to sandy loam, sometimes coarser soil	- succession given no further disturbance to <i>Pseudotsuga</i> - <i>Thuja</i> forest in most areas	RESIDENTIAL - good potential where terrain and location are suitable	- possibly some drainage problems in certain areas - good foundation material - good access
		RECREATION - hunting - hiking	- some portions of unit currently being developed - trails may be muddy in wet weather - undergrowth an impediment at times
		WILDLIFE - moderate use by deer	- generally both good forage and good cover
		AGRICULTURE	- in some areas, drainage necessary
			- some potential for field crops and orchards after clearing
		FORESTRY	- harvesting for firewood before clearing for other purposes
			- harvesting for firewood
			- potential for commercial growth of cedar and Douglas fir in future
		COMMERCIAL/INDUSTRIAL	- see residential
			- good potential - some of this area is being developed at this time

36) ALNUS WETLAND REGENERATION FOREST - extensive occurrence on flood plains and in seepage areas at low elevations in both north and south GVRD

Site Description	Successional Status	Use	Management Considerations
- slope 0-5° - drainage generally fair	- succession to cedar swordfern or cottonwood bottomland  - moist to wet conditions  - soils fine silt	RESIDENTIAL  - low potential	- poor foundation material  - poor drainage  - subject to periodic floods
		RECREATION  - very low potential	- muddy ground and heavy undergrowth
		WILDLIFE  - moderate use by deer	
		AGRICULTURE  - low potential except with expensive treatment	- when cleared may provide pastureland  - dyking and draining may render area very suitable for crop raising
		FORESTRY  - low potential in present form	- may be useful for firewood  - soil compaction potential very high  - artificial regeneration will hasten process of forest regrowth
		COMMERCIAL/INDUSTRIAL  - N.A.	

37) *ALNUS JUVENILE FOREST* - occur scattered on the upland areas. Especially common in the vicinity of White Rock, Burnaby Mountain and Bowen Island. Areas generally small.

Site Description	Successional Status	Use	Management Considerations
- slight to moderate slope 0-20°	- will eventually progress to <i>Abies</i> or <i>Pseudotsuga</i> forest	RESIDENTIAL - good potential RECREATION - very limited -	- may be some localized drainage problems - uniform vegetation - often dense undergrowth
- fair to good drainage	- early stage in succession after clearing	HIKING AND VIEWING	- hiking and viewing
- soils generally fine to medium texture		WILDLIFE - some use by deer and wildfowl	- dense undergrowth provides good cover and some forage
- mesic conditions		AGRICULTURE - could be cleared for pasture or orchard	- small areas and often coarse soils mitigate against these uses
		FORESTRY	- requires long term planning
			- sites show potential for silviculture of cedar and Douglas fir
			- clearing and growth will occupy ca. 100 years
		COMMERCIAL/INDUSTRIAL	- N.A.

38) TALUS SLOPES - relatively common on mountain slopes within the northern section of the GVRD

Site Description	Successional Status	Use	Management Considerations
<ul style="list-style-type: none"> <li>- steep slopes, angle depending on specific angle of repose</li> <li>- drainage varies with position on slope</li> <li>- very dry to moist conditions</li> <li>- substrate fine to coarse angular rock fragments</li> </ul>	<ul style="list-style-type: none"> <li>- very slow process will ultimately result in forms of coniferous forest compatible with elevation and aspect on slope</li> </ul>	<ul style="list-style-type: none"> <li>RESIDENTIAL - N.A.</li> <li>RECREATION - N.A.</li> <li>WILDLIFE - N.A.</li> <li>AGRICULTURE - N.A.</li> <li>FORESTRY - N.A.</li> <li>COMMERCIAL/ INDUSTRIAL - N.A.</li> </ul>	

39) SPARSELY VEGETATED ROCK WALLS - common within mountainous areas of the northern portion of the GVRD at both high and low elevations

Site Description	Successional Status	Use	Management Considerations
- steep, sometimes vertical slopes	- very long process will eventually lead to coniferous forest type	RESIDENTIAL - N.A. RECREATION - rock climbing	
- little or no soil except in crevices and pockets	- eagles and other bird species	WILDLIFE AGRICULTURE - N.A.	
- all aspects and elevations		FORESTRY - N.A. COMMERCIAL/INDUSTRIAL - N.A.	

40) RHACOMITRUM ROCK BLUFFS - extensive occurrence in small areas at low elevations within the northern portion of the GVRD

Site Description	Successional Status	Use	Management Considerations
- moderate to vertical slopes	- slow development through outcrop	RESIDENTIAL	- high expense of site preparation - limited potential except for prestige housing
- drainage good except in concave pockets	vegetation types to dry coniferous forest	RECREATION	- high damage potential to moss cover - hiking, rock climbing
- dry to mesic conditions under normal circumstances		WILDLIFE	- moderate use
		AGRICULTURE - N.A.	
		FORESTRY - N.A.	
		COMMERCIAL/ INDUSTRIAL	- N.A.
			- generally concave terrain

41) *ARBUUS - HOLODISCUS DRY ROCK SLOPES* - limited occurrence above West Vancouver and in the vicinity of Horseshoe Bay in the northern GVRD

Site Description	Successional Status	Use	Management Considerations	
- moderate to steep slopes	- towards dry coniferous forest	RESIDENTIAL	- difficult access	
- convex terrain		- very suitable for prestige view housing	- expensive preparation	
- drainage excellent			- poor sewage disposal facilities	
- conditions generally dry		RECREATION	- some portions of this unit should be retained for these purposes	
- soil shallow in most areas		- hiking, viewing and nature study		
		WILDLIFE		
		- moderate use		
		AGRICULTURE - N.A.		
		FORESTRY	- expensive and difficult access	
		- very limited	- limited timber resources	
		COMMERCIAL/ INDUSTRIAL		
		- N.A.		

42) *PSEUDOTSUGA* - *ARbutus* DRY FOREST - limited occurrence in the northern portion of the GVRD above West Vancouver, Horsehoe Bay, and Howe Sound and on Bowen Island

Site Description	Successional Status	Use	Management Considerations
- moderate to steeply sloping terrain	- climax within this set of environmental parameters	RESIDENTIAL - excellent potential	- some areas of thin soil might provide problems for drainage and expensive foundation
- south and west aspect		RECREATION - hiking and nature study	- relatively low interest level - good for campsites if level terrain
- dry conditions		CAMPING	- camping
- drainage excellent		WILDLIFE - moderate use	- relatively little forage
- shallow stony soil over bedrock		AGRICULTURE - N.A.	- thin soil with low nutrient level
- low to mid elevations		FORESTRY - moderately good	- relatively small trees - possibly difficult terrain - will conflict with other uses
- convex terrain		COMMERCIAL/INDUSTRIAL - N.A.	

- 43) *PSEUDOTSUGA* SLOPE FOREST - extensive on uplands and south and northwest slopes at low elevations. Predominantly occurs in the southern portion of the GVRD. In the north, limited to Bowen Island and the Horseshoe Bay area

Site Description	Successional Status	Use	Management Considerations
- flat to moderate sloping terrain	- climax for dry to mesic site type	RESIDENTIAL - good for suburban development	- good foundation material - good drainage - excellent for large lot subdivisions, especially in outwash plain areas
- southwest or west aspect		RECREATION - hiking and trail riding	- excellent for all these purposes - may be dry in summer
- mesic to dry conditions		- nature study	- open campfires should be avoided during summer
- drainage good		- camping	
- deep sandy gravelly loam usually till or outwash based		WILDLIFE - extensive use by deer	- good forage availability
		AGRICULTURE - N.A.	- drainage usually excessive - soil lacking in nutrients
		FORESTRY	- gentle slopes - well drained soil - potential for commercial Douglas fir production - at present too young to be merchantable - tree growth rate relatively slow
		COMMERCIAL/INDUSTRIAL	- N.A. - too far from transport lanes in most cases

44) *POLYSTICHUM LOWER SLOPES* - in fairly limited areas on north facing slopes in all parts of southern portion of GVRD, more extensive in northern portion. Was very extensively distributed before clearing in 19th C.

Site Description	Successional Status	Use	Management Considerations
- gentle to moderate sloping terrain	- climax for this combination of site parameters	RESIDENTIAL - suitable	- drainage a problem in some areas - preparation expensive where drainage is restricted - should be preserved, at least in part
- drainage fair to good	- probably climax in most upland portions of the southern GVRD	RECREATION - hiking and nature study - hunting	- no extensive understorey - some of herb layer fragile - should have carefully constructed trails - might be conflict between hunting and other uses
- some seepage in places		WILDLIFE - extensive use by deer	- part of area might be preserved
- generally silt loam to sandy loam		AGRICULTURE - N.A.	- not well suited to crop raising
- moist conditions		FORESTRY	- clearing will produce good pastureland - only small contiguous areas left
			- excellent for Douglas fir, cedar production - should be preserved rather than harvested - many portions of GVRD suited to artificial regeneration
		COMMERCIAL/INDUSTRIAL	- not convenient to shipping transport - not really suitable - only relatively small areas remain

- 45) *THUJA* - ACER BANKS - occurs extensively within the GVRD on all low elevation slopes except those facing southwest

Site Description	Successional Status	Use	Management Considerations
- gentle to steep slopes	- climax for this area	RESIDENTIAL - expensive but possible	- sometimes steep terrain - access problems - erosion problems - severe drainage problems at slope bases
- drainage fair (some seepage)		RECREATION - hiking and viewing	- may present foundation and drainage problems - some areas of extensive undergrowth - problems of erosion on steep slopes
- moist to wet conditions		WILDLIFE - berry picking	- provides excellent cover and forage
- deep till and colluvium		WILDLIFE - extensive use by deer	- slopes often too steep
- concave terrain		AGRICULTURE - N.A.	- no large contiguous areas
		FORESTRY	- some possibilities for harvesting cedar and hemlock
			- problems of erosion - soil moisture and texture will cause problems for mechanized logging
		COMMERCIAL/ INDUSTRIAL	- N.A.

46) TSUGA - GAULTHERIA UPLAND FOREST - very extensive at low to mid elevations in the northern portion of the GVRD

Site Description	Successional Status	Use	Management Considerations
- terrain flat to steeply sloping	- climax for this set of environmental parameters	RESIDENTIAL	- thin soil and high rainfall cause erosion - good potential within limitations - expensive foundation construction - heavy snowfall in winter
- drainage good		RECREATION	- sometimes steep and dangerous terrain
- conditions dry to mesic			- hiking and hunting
- soil coarse and generally thin over bedrock		WILDLIFE	- limited browse
- south to west exposure			- moderate potential
		AGRICULTURE - N.A.	- steep terrain - thin, acid soils
		FORESTRY	- probably uneconomic - limited potential
		COMMERCIAL/ INDUSTRIAL	- N.A.

47) *ABIES - TSUGA MIDSLOPES* - very extensive occurrence on mid elevation (1500-3000') slopes within the northern portion of the GVRD

Site Description	Successional Status	Use	Management Considerations
- gentle to steep slopes	- climax within this set of environmental parameters	RESIDENTIAL - low potential	- high rain and snowfall - access often difficult - remote from services
- drainage moderately good	- site conditions moist to mesic	RECREATION	- may conflict with logging
- soils moderately deep till based	-	- hiking, cross country skiing, berry picking, nature study	- skiing and snow-mobiling damaging to understory
		WILDLIFE - moderately extensive use	
		AGRICULTURE - N.A.	
		FORESTRY	- high quality timber - excellent potential
			- sometimes difficult access - some conflict with recreation
		COMMERCIAL/INDUSTRIAL	- N.A.

BLECHNUM - TSUGA SEEPAGE SLOPES - extensive occurrence in relatively small contiguous areas within the northern portion of the GYRD - moderate elevations

Site Description	Successional Status	Use	Management Considerations
- flat to moderately sloping terrain	- will develop towards <i>Abies</i> slope forest type	RESIDENTIAL - N.A.	- poor drainage and foundation provisions - very difficult access
- concave slopes		RECREATION - N.A.	- heavy undergrowth - generally unpleasant conditions
- drainage fair to poor		WILDLIFE	
	- moderate use		
		AGRICULTURE - N.A.	
		FORESTRY	- site index for cedar and hemlock high - limited - very difficult access and limited areas may render harvest uneconomic - erosion problems high
		COMMERCIAL/INDUSTRIAL	- N.A.

49) *THUJA - OPLOPAX STREAM BANKS* - common in small portions bordering upland streams within the northern portion of the GVRD

Site Description	Successional Status	Use	Management Considerations	
- flat to moderately sloping	- climax for site type	RESIDENTIAL - N.A.	- frequent flooding	- swampy conditions
- concave lower slopes	- as erosion continues will develop towards mid-slope type	RECREATION - N.A.	- difficult access	- very heavy understory
- drainage poor			- swampy conditions	- difficult access
		WILDLIFE		
		- limited use		
		AGRICULTURE - N.A.		
		FORESTRY	- good site index for cedar and possibly cypress	
		- not recommended	- difficult access	- extreme danger of bank erosion and siltation of streams
		COMMERCIAL/ INDUSTRIAL		
		- N.A.		
			- soils very deep	

- 50) *TsUGA - ABIES - VACCINIUM* Upper Slopes - very extensive occurrence on upper elevation (2500-3500') slopes within the northern portion of the GVRD - upper elevation analogue to unit #47 (units #47 and #50 mapped together)

Site Description	Successional Status	Use	Management Considerations
- gentle to steep slopes	- climax	RESIDENTIAL - low potential	- high rain and snowfall - access difficult - remote location
- drainage good		RECREATION - hiking, skiing, berry picking, nature study	- may conflict with logging - skiing and snow-mobiling damaging to understory - snow-mobiling disruptive to wildlife
- site conditions moist		WILDLIFE - moderate use	
- soils deep, till and colluvium based		AGRICULTURE - N.A.	
- highly podzolized		FORESTRY - excellent potential	- high quality timber - often difficult access - harvesting potential source of heavy soil disturbance - regeneration very slow - some conflict with recreation
			COMMERCIAL/INDUSTRIAL - N.A.

51) *ABIES* - *STREPTOPUS* Mid Slopes - extensive occurrence within northern portion of GVRD, especially east and north slopes at 2500-3500'. Upper elevation analogue to unit #47 on these slopes (units #51 and #47 mapped together)

Site Description	Successional Status	Use	Management Considerations
- moderate to steep slopes	- climax	RESIDENTIAL - low potential	- remote location with difficult access - high precipitation - steep slopes
- drainage moderately good		RECREATION - hiking, skiing, nature study	- may conflict with logging
- conditions moist		WILDLIFE - low to moderate use	
- till and colluvium based soil		AGRICULTURE - N.A.	
- highly podzolized		FORESTRY - excellent potential	- high quality <i>Abies</i> - difficult access - harvesting potential source of severe soil disturbance - regeneration very slow
		COMMERCIAL/INDUSTRIAL - N.A.	

52) *THUJA - OLOPANAX* Lower Slopes - moderately common in seepage areas at mid elevations, especially on northern and eastern slopes. Mapped with unit #48, its lower elevation analogue.

Site Description	Successional Status	Use	Management Considerations
- moderate to steep slopes	- will develop towards <i>Abies</i> slope forest type	RESIDENTIAL - N.A.	- difficult access - poor drainage and foundation provisions
- concave slopes		RECREATION - N.A.	- heavy Devil's Club - wet conditions
- drainage fair to poor			- high insect nuisance
- conditions very moist		WILDLIFE - limited use	
- fine till or colluvium based soil		AGRICULTURE - N.A.	
- often gleyed B horizon		FORESTRY - limited	- high site index for cedar, hemlock - erosion and soil disturbance problems high - high cost of roadbuilding
		COMMERCIAL/INDUSTRIAL - N.A.	

53) *TSUGA MERTENSIANA* - *ABIES* SUB-ALPINE FOREST - very extensive occurrence on upper slopes at sub-alpine elevations within the northern portion of the GVRD

Site Description	Successional Status	Use	Management Considerations
- gentle to steep slopes	- climax for this set of environmental parameters	RESIDENTIAL - low potential	- high snowfall - difficult access
- drainage moderately good		RECREATION - high potential for hiking and skiing	- generally remote from services - possible conflict with other activities - potential soil and vegetation damage from skiing - soil and water contamination from ski lodges
- mesic to moist conditions		WILDLIFE - extensive use	
- shallow to moderate soil		AGRICULTURE - N.A.	
- generally till and/or colluvium base		FORESTRY - high potential	- low rate of regeneration - high danger of soil erosion
- coarse texture		COMMERCIAL / INDUSTRIAL - N.A.	- difficult and expensive access

54) *TSUGA* - *CASSIOPE* SUB-ALPINE SHRUBLAND - very extensive occurrence at and above timberline in the mountains of the northern portion of the GYRD

55) CASSIOPE - PHYLODOCE SUB-ALPINE SLOPES - extensive occurrence on upper sub-alpine slopes within the mountains of the northern portion of the GVRD

Site Description	Successional Status	Use	Management Considerations
- gentle to steep slopes	- climax for this set of environmental parameters	RESIDENTIAL - N.A.	
- fair to good drainage		RECREATION	- fragile herb layer - skiing, hiking and climbing - sometimes perilous terrain
- conditions moist to dry		WILDLIFE	- limited use - mostly wildfowl
- seepage pockets common		AGRICULTURE - N.A.	
- thin coarse soil over bedrock		FORESTRY - N.A.	
- long snow cover duration		COMMERCIAL/ INDUSTRIAL	- N.A.

N) ALPINE COMMUNITIES - occur at high elevations within the mountains of the northern portion of the GVRD

Site Description	Successional Status	Use	Management Considerations
- moderate to precipitous slopes	- long term succession over geological time	RESIDENTIAL - N.A.	- dangerous terrain, fragile vegetation
- drainage variable but generally good except in seepage areas and rock pockets		RECREATION - hiking, skiing, climbing	
- conditions dry to moist		WILDLIFE - limited use	- mostly birds
- soils coarse, thin and colluvium based		AGRICULTURE - N.A.	
		FORESTRY - N.A.	
		COMMERCIAL/ INDUSTRIAL - N.A.	

## BIBLIOGRAPHY OF MATERIAL CITED AND/OR UTILIZED

Anon. n.d. The Lower Coast Bulletin Area. British Columbia Lands Service, Area Bull. 3, 59 pp.

Anon. 1970. Land Capability Classification for Forestry. Canada Land Inventory Report 4. 72 pp.

Atmospheric Environment Service. 1971. Temperature and Precipitation: 1941-1970. (British Columbia). Atmospheric Environment Service Publ. 78 pp.

Bell, M. A. M. 1971. Forest Ecology. In: Forestry Handbook, U.B.C. Forest Club, Vancouver, B.C., pp. 200-287.

Brayshaw, T. C. 1976. Catkin bearing plants of British Columbia. B.C. Provincial Museum, Occasional Paper 18, 176 pp.

Brooke, R. C. 1965. The Subalpine Mountain Hemlock Zone. Part II - Ecotypes and Biocoenotic Units. Ecology of Western North America, Vol. 2, pp. 79-101.

Brooke, R. C., E. B. Peterson, and V. J. Krajina. 1970. The Subalpine Mountain Hemlock Zone. Ecology of Western North America 2(2):1-349.

Clark, L. J. 1973. Wild Flowers of British Columbia. Gray's Publishing Company, Sidney, B.C. 591 pp.

Forbes, R. D. 1972. A Floral Description of the Fraser River Estuary and Boundary and Mud Bay, B.C. B.C. Dept. Fish and Wildlife.

Forbes, R. D. 1972. Additional Catalogue to "A Floral Description of the Fraser River Estuary, and Boundary and Mud Bays, B.C." B.C. Fish and Wildlife Branch Rept. 20 pp.

Forbes, R. D. 1972. A Note on Eelgrass (*Zostera* spp.), an Addendum to "A Floral Description of Fraser River Estuary, and Boundary and Mud Bays, B.C." B.C. Fish and Wildlife Branch Rept., 2 pp.

Franklin, J. F. and C. T. Dyrness. 1973. Natural Vegetation of Oregon and Washington. U.S. Dept. Agric., Forest Service, General Technical Rept. PNW-8, 417 pp.

Halliday, W. E. 1937. A Forest Classification of Canada. Canada, Forest Service Bull. 89, 50 pp.

- Hitchcock, C. L. and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, Wash., 730 pp.
- Holland, S. S. 1964. Landforms of British Columbia, a Physiographic Outline. B.C. Dept. of Mines and Petroleum Resources. Bull. 48, 220 pp.
- Hoos, L. M. and G. A. Packman. 1974. The Fraser River Estuary. Status of Environmental Knowledge to 1974. Canada, Dept. Environment, Special Estuary Series No. 1, 518 pp.
- Hosie, R. C. 1973. Native Trees of Canada. Canadian Forestry Service. 380 pp.
- Hubbard, W. A. 1955. The grasses of British Columbia. B.C. Provincial Museum, Handbook 9, 205 pp.
- Johnston, W. A. 1923. Surficial Geology of Fraser River Delta. Geological Survey of Canada, Memoir 135, Map 1965.
- Kelley, C. C. and R. H. Spilsbury. 1939. Soil Survey of the Lower Fraser Valley. Canada, Dept. Agric., Tech. Bull. 20, 67 pp.
- Kendrew, W. C. and D. Kerr. 1955. The Climate of British Columbia and the Yukon Territory. Queen's Printer, Ottawa, 222 pp.
- Krajina, V. J. 1959. Bioclimatic Zones in British Columbia. Univ. Brit. Col., Botanical Series, No. 1, 47 pp.
- Krajina, V. J. 1965. Biogeoclimatic Zones and Classification of British Columbia. Ecology of Western North America, Vol. 1, pp. 1-17.
- Krajina, V. J. 1969. Ecology of Forest Trees in British Columbia. Ecology of Western North America 2:1-146.
- Krajina, V. J. and L. Orloci. 1962. Biogeoclimatic Forest Zones on the Lower Mainland of British Columbia. Ecology of the Forests of the Pacific Northwest. Progress Rept., 1962, pp. 18-24.
- Leach, B. 1974. Wildlife and Agriculture in the Fraser Valley. B.C. Fish and Wildlife Branch, 60 pp.
- Lyons, C. P. 1965. Trees, Shrubs, and Flowers to Know in British Columbia. J. M. Dent and Sons (Canada) Ltd., Vancouver, 194 pp.
- McLaran, K. A. 1972. A Vegetation Study of the Islands and Associated Marshes in the South Arm of the Fraser River, B.C. B.C. Dept. of Fish and Wildlife Rept., 54 pp.

McTaggart Cowan, I. and C. J. Guiget. n.d. The Mammals of British Columbia. B.C. Provincial Museum, Handbook 11, 414 pp.

Orloci, L. 1965. The Coastal Western Hemlock Zone on the South-western British Columbia Mainland. Ecology of Western North America, Vol. 1, pp. 18-41.

Peterson, E. B. 1965. The Subalpine Mountain Hemlock Zone. Part 1: Phytocoenoses. Ecology of Western North America, Vol. 1, pp. 76-101

Robbins, C. S., B. Bruin, and H. S. Zim. 1966. Birds of North America. Golden Press, New York, 340 pp.

Schofield, W. B. 1969. Some Common Mosses of British Columbia. B.C. Provincial Museum, Handbook 28, 262 pp.

Taylor, T. M. C. 1963. The Ferns and Fern Allies of British Columbia. B.C. Provincial Museum Handbook, 172 pp.

Wass, E. F. 1974. Bibliography on Flora and Vegetation Analysis in the Greater Vancouver Regional District. Prepared for: Working Group, Environmental Baseline Inventory for Lower Fraser Valley and Estuary, 6 pp.

MAPPING UNITS IN GVRD



A/ MARINE COMMUNITIES

- 1) *Zostera* Mud
- 2) *Salicornia* Mud Flats
- 3) *Carex - Scirpus* Tidal Marsh
- 4) *Elymus* Beach
- 5) *Potentilla - Aster* Back Beach
- 6) *Aira* Rocky Headlands



B/ FRESH WATER AQUATIC COMMUNITIES

- 7) *Nuphar* Lakes
- 8) *Lemna* Ditches
- 9) *Typha - Scirpus* Water Margins
- 10) *Eleocharis* Gravel Lake Margins



C/ SWAMPLAND COMMUNITIES

- 11) *Spiraea - Salix* Swampland
- 12) *Carex* Upland Swamps
- 13) *Carex* Alpine Basins
- 14) *Thuja - Alnus* Swamp Forest



D/ ALLUVIAL PLAIN COMMUNITIES

- 15) *Populus - Salix* Sandbar
- 16) *Populus - Acer* Floodplain Forest
- 17) *Picea* Alluvial Plain Forest
- 18) *Salix - Betula* Wet Forest

E/ BOG MARGIN COMMUNITIES

- 19) *Betula* - *Spiraea* Peatland
- 20) *Betula* - *Pinus* Bog Margin
- 21) *Pinus* - *Gaultheria* Bog Forest

F/ PEAT BOG COMMUNITIES

- 22) *Gaultheria* - *Ledum* Bog Shrubland
- 23) *Vaccinium* - *Kalmia* Bog
- 24) *Sphagnum* - *Lysichitum* Bog
- 25) *Dulichium* Muck
- 26) *Empetrum* - *Habenaria* Upland Bog
- 27) *Eriophorum* - *Sphagnum* Upland Moor

G/ WASTELAND COMMUNITIES

- 28) *Solidago* Roadsides
- 29) *Rubus* - *Alnus* Wasteland
- 30) *Rubus* - *Spiraea* Wet Waste
- 31) *Juncus* Old Field
- 32) *Epilobium* - *Hypochaeris* Cutovers

H/ ALDER REGENERATION COMMUNITIES

- 33) *Alnus* - *Symporicarpos* Dry Banks
- 34) *Alnus* - *Polystichum* Upland Regeneration Forest
- 35) *Alnus* - *Acer* Upland Regeneration Forest
- 36) *Alnus* Wetland Regeneration Stands
- 37) *Alnus* Juvenile Stands

I/ ROCK COMMUNITIES

- 38) Talus Slopes
- 39) Sparsely Vegetated Rock Walls
- 40) *Rhacomitrium* Rock Bluffs
- 41) *Arbutus* - *Holodiscus* Dry Rock Slopes

J/ DOUGLAS FIR SUBZONE CONIFEROUS FOREST

- 42) *Pseudotsuga* - *Arbutus* Dry Forest
  - a) *Pinus* Uplands
  - b) *Berberis* Slopes
- 43) *Pseudotsuga* Slope Forest
  - a) *Gaultheria* Upper Slopes
  - Euryhynchium* Mid Slopes
- 44) *Polystichum* Lower Slopes
  - a) *Thuja* - *Gaultheria* Moist Forest
  - b) *Tsuga* - *Acer* Forest
- 45) *Thuja* - *Acer* Banks

K/ HEMLOCK ZONE CONIFEROUS FOREST

- 46) *Tsuga* - *Gaultheria* Upland Forest
- 47) *Abies* - *Tsuga* Mid Slopes
- 48) *Blechnum* - *Tsuga* Seepage Slopes
  - a) *Blechnum* Lower Slopes
  - Streptopus* Upland Slopes
- 49) *Thuja* - *Oplopanax* Stream Banks

L/ SUB-ALPINE COMMUNITIES

- 50) *Tsuga Mertensiana* - *Abies* Sub-Alpine Forest

51) *Tsuga - Cassiope* Sub-Alpine Shrubland

52) *Cassiope - Phyllodoce* Sub-Alpine Slopes

 53) ALPINE COMMUNITIES

 N/ LANDS CURRENTLY UNDER ACTIVE MANAGEMENT

- A) Parks and Other Areas of Maintained Turf
- B) Industrial Land
- C) Agricultural Land
- D) Schools and Public Buildings
- E) Urban Areas
- F) Miscellaneous