



MINNEKHADA REGIONAL PARK

Employment Bridging Assistance Program and
Greater Vancouver Regional District Parks

EXTRA COPY

MINNEKHADA

CENTRAL AREA

July 1983

MINNEKHADA REGIONAL PARK

ECOSYSTEM ASSOCIATIONS PROPOSED TRAIL PLAN BIRD INVENTORY

by

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and

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July 1983

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PREFACE

Minnekhada Regional Nature Park is a 175 hectare park of marshland, lowland forest and upland forested knolls. It is located west of the Pitt River at the base of Burke Mountain in the District of Coquitlam in the Lower Mainland of British Columbia.

In the early 1900's, Minnekhada was the summer home of Harry L. Jenkins. It included farmhouses, stables, fields, marsh and forest. Ownership of the estate changed hands and by 1930 it had been acquired by the late Eric Hamber who was lieutenant-governor of B.C. from 1936 to 1941. Eric Hamber had the hunting lodge constructed on a rocky knoll overlooking the farmland and the Pitt River. The lodge was designed by Palmer and Bow architects and was constructed around 1934.

Hamber later sold the property to Colonel Clarence Wallace who was lieutenant-governor of B.C. from 1950 to 1955. In 1975 Colonel Wallace sold 415 hectares of his estate to the B.C. Government. It was purchased by the government to provide recreation land for the housing development planned nearby on Burke Mountain.

Then, in 1977 the National Second Century Fund purchased the 400 hectare Addington Marsh from Colonel Wallace. Addington Marsh is now managed by the Fish and Wildlife Branch as a sanctuary.

As for the 415 hectares of the Minnekhada estate, this land was eventually leased, because of its agricultural capability, to the Provincial Agricultural Land Commission by the Ministry of Lands, Parks and Housing. The Land Commission in turn has leased 290 hectares to farmers under 20 year term agricultural leases.

The 125 hectare non-farm area which included the hunting lodge, marsh and upland knolls was the subject of discussion of an Advisory Committee established by the Land Commission in 1979. The Advisory Committee's task was to recommend the long term use and management of the 125 hectare non-farm area of Minnekhada. This they did in the 1980 report, "Recommendations of the Minnekhada Advisory Committee to the Provincial Agricultural Land Commission". The report recommended that the land should be managed by the Greater Vancouver Regional District (GVRD) as a Regional Nature Park.

The Land Commission and Provincial Government agreed with this recommendation and in 1981 the Ministry of Lands, Parks and Housing offered the park to the GVRD and asked the GVRD to look after the lodge until transfer of title could be completed. In addition the Minister offered the GVRD the 50 hectares of Crown land situated between Minnekhada and Addington Marsh; this Crown land includes the high knoll.

At the time of writing this report, title to the parkland has not yet been transferred to the GVRD because of technical delays in completing the legal survey of the land and registration of the title. Transfer is expected within the next few months.

GVRD has provided caretaking and maintenance for the lodge since August 1981. GVRD established an Advisory Committee to advise on the long term use of the lodge and on park development and management. The Advisory Committee has met regularly since December 1981.

This report is the outcome of a work project sponsored by the Federation of B.C. Naturalists and the Outdoor Recreation Council. Funding was obtained through the Federal and Provincial Governments' Employment Bridging Assistance Program. From December 1982 through to March 1983 a four person crew constructed a loop walking trail on the west side of the marsh with park entrance and parking lot located off Quarry Road. Two biologists were employed to carry out an ecosystem classification of the park and to conduct bird counts. Their work is the subject of this report. An extension of the Employment Bridging Assistance Program funding through to June 1983 allowed for completion and revisions of this report and for the graphic work to display the findings. The GVRD Parks Department has assisted this project throughout with advise, guidance, materials, and finally the printing of this report.

Bert Ramey

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ACKNOWLEDGEMENTS

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Graphic design and map production for the report are by Violet Fraser. Photos are by Mark Gardiner.

Thanks are also due to the Outdoor Recreation Council and to the Federation of B.C. Naturalists for sponsoring this project and in particular to Bob Dundas and to Dr. Bert Brink for their advice.

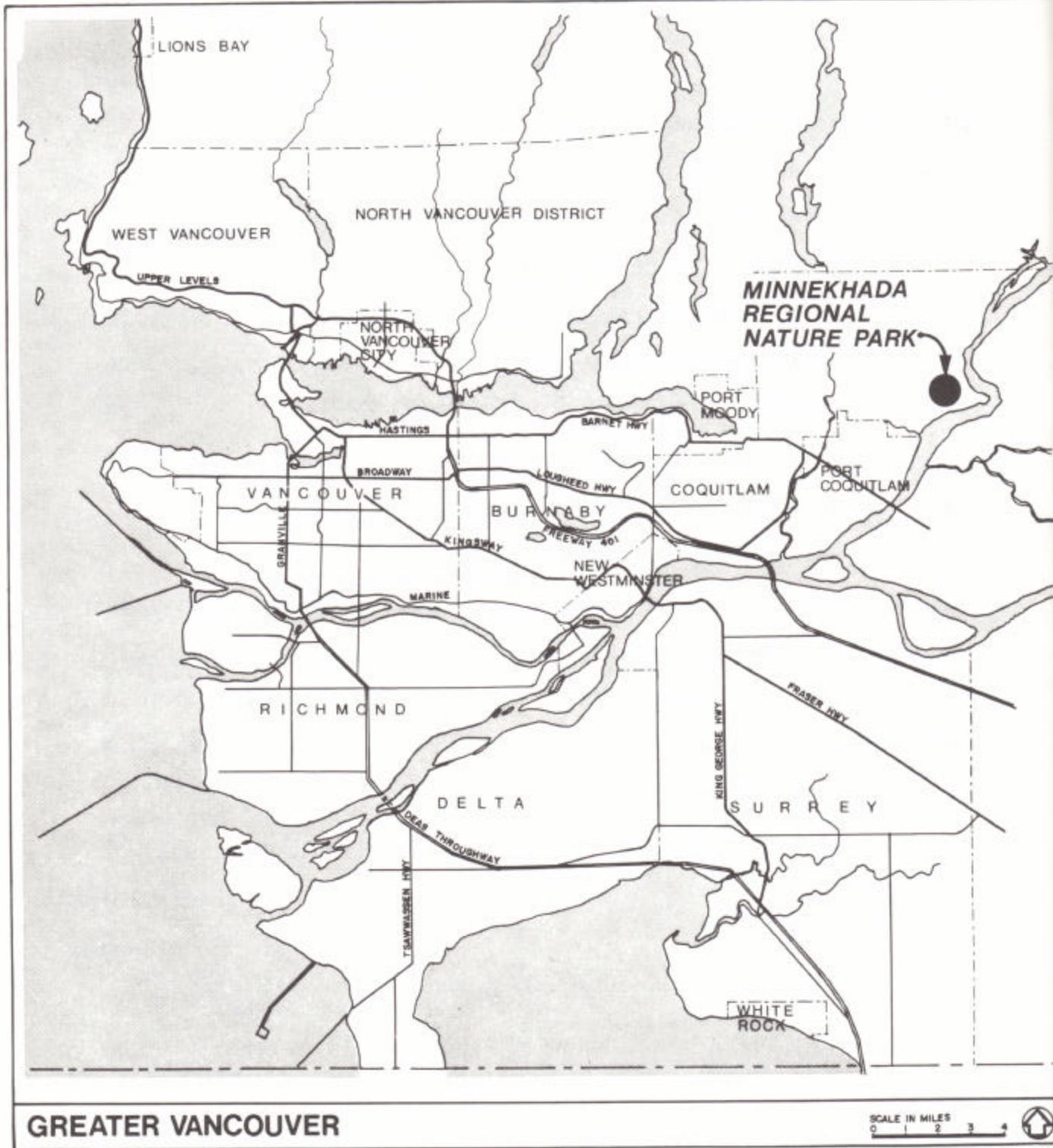
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LOCATION OF MINNEKHADA REGIONAL NATURE PARK



INTRODUCTION

Minnekhada Regional Nature Park was, until 1977, part of a large private estate. Except in the vicinity of the Lodge the area was little developed since the turn of the century when it was logged. This project provided an opportunity to conduct vegetation and wildlife studies before park development occurs. Two main field projects were undertaken: mapping and describing ecosystem associations and a study of waterfowl wintering in Minnekhada Marsh. Additional summer and winter waterfowl observations were obtained from the B.C. Fish and Wildlife Branch. Casual observations of all bird species were also compiled.

This report consists primarily of the results of the ecosystem mapping, followed by a proposal for trail development based on information derived from the ecosystem mapping. A short summary of waterfowl of Minnekhada Marsh and a series of Appendices, including lists of plants and animals are also included.



Aerial view from the south of
Minnekhada Regional Nature Park

ECOSYSTEM ASSOCIATIONS

INTRODUCTION

Vegetation undergoes a series of changes until it reaches its stable, self-perpetuating stage or climax. When soil is newly exposed or all the vegetation removed, the first plants which colonize form the pioneer stage. The forest which develops progresses through seral stages until it reaches the climax stage. Seral stages of the ecosystem associations in Minnekhada are usually stands of deciduous trees such as red alder, bigleaf maple and white birch.

A mature climax forest has trees of many ages, if one dies another in a lower canopy will take its place. It is stable in age class and species composition. Individuals may die but the forest as a whole stays much the same.

The ecosystem association classification system used in this report is based on expected climax vegetation. Many factors, particularly soil moisture and nutrient regime influence vegetation development and ultimately the type of climax vegetation. When the vegetation is not climax, as is the situation over much of the park, one must utilize the above mentioned factors, in addition to the existing vegetation, when predicting the expected climax vegetation.

Climax forests covered much of the park prior to the turn of the century when they were selectively logged or in a few areas cleared for farming. Following logging all regeneration occurred naturally. Deciduous trees such as red alder established quickly in cleared areas. These second growth stands are seral forests which will become climax forests in 100 to 200 years.

Minnekhada Regional Nature Park occurs in the dry subzone of the Coastal Western Hemlock Biogeoclimatic Zone. However, suitable conditions for the growth of predominantly climax hemlock forests are rare in the park: the soils are either too wet and rich or too dry. Western red cedar dominates the wet sites while Douglas fir does best on the dry sites. The wet areas occur on fine-textured, lowland soils whereas the dry areas are found in upland regions where the soils are shallow and coarse.

The terrain in the park is extremely variable. The topography changes abruptly from the marsh, at near sea level, to the highest knoll at 170 metres.

This report uses the terms: ecosystem, ecosystem association and variation. These terms are defined in the Ministry of Forests, "Ecosystem Mapping - A Discussion Paper" (Mitchell, Green & Winkler, 1982), as follows:

Ecosystem

An ecosystem occupies a naturally occurring segment of the landscape which is relatively uniform in composition, structure and properties and, in which both the biotic and abiotic factors of the environment interact over-time. It is characterized by a plant community (an area of relatively uniform vegetation) and a soil polypedon (an area of relatively uniform soil). The geographic extent of an ecosystem is variable. Its lateral boundaries may be abrupt, but are more commonly gradual. As a result, an individual ecosystem frequently has some variation in biotic and abiotic characteristics. (p.3)

Ecosystem Association

An ecosystem association may be regarded as a group of related ecosystems and is defined as an area of land capable of producing similar climax plant communities (plant associations) with similar successional development on soils with similar moisture and nutrient regimes. (p.4)

Ecosystem Association Variation

Variations classify successional stages of ecosystems. They are recognized on the basis of stocking, age and species composition of the tree stratum, differential combination of species and properties of the uppermost soil layer. A variation is not yet a formal category within the classification system. (p.4)

METHODS

This ecosystem association survey was conducted from December 1982 through March 1983. The procedures are a simplified version of those being developed by the British Columbia Ministry of Forests (Klinka, 1976; Mitchell et. al, 1982; Inselbert et. al, 1982). The ecosystem associations are based primarily on Klinka's (1976) work in the University of British Columbia Research Forest, Haney, B.C. New ecosystem associations were described where necessary. The procedure for naming ecosystems follows Klinka (1976).

Associations were mapped using a combination of air photo interpretation and field verification. Before the mapping was initiated, the park was explored to get an overall view of the vegetation patterns. A tentative list of ecosystem associations was then completed. Examining the park in small sections, areas of seemingly similar vegetation and physiographic features were delineated using black and white, and colour air photos (scale approximately 1:10,000). The boundaries and identification of these units were then verified in the field; modifications were made where necessary. Factors including existing vegetation, soil moisture regime, soil type, slope position, and types of stumps (from climax forest of prelogging era) were used to determine in which ecosystem association a unit belonged. In addition, for each unit the following information was recorded: landform, age class of the dominant trees, points of interest, and suitability of area for trail construction.

Often a unit would contain a mixture of two ecosystem associations that were too small to be mapped separately. If the inclusions of the second ecosystem association occupied less than 20 percent of the total area the unit was named according to the dominant association. Where inclusions occupied more than 20 percent of a map unit the unit was considered to be a complex and was assigned both ecosystem association names with the dominant one occurring first.

Ecosystem association names are based on expected climax vegetation. Each ecosystem name usually contains the common names of 2 or 3 characteristic plant species. Typically the first plant named is a herb, the second a shrub or a tree, and the last is the dominant tree species. Common names used in the ecosystem association names were often abbreviated due to space constraints. Common names were used throughout the text to assist the layperson. Most mosses have no common name so scientific names were used. A complete list of the scientific and common names of vascular plants, following Taylor and MacBryde (1977), is in Appendix 3.

SUGGESTED FURTHER STUDIES

The time limit (four months) and time of year (winter) imposed limits on the methods used and information gathered on the project. Further studies would add to the information collected, for example:

- a survey of spring and summer herbaceous vegetation.
- detailed vegetation sample plots in the ecosystem associations to obtain more quantitative information on plant composition.
- soil analysis for more information on soil characteristics and nutrient regime.
- marsh inventory including plants, animals, soil, water nutrients and water levels.

RESULTS

Nine ecosystem associations, excluding the marsh, were identified. Eight associations were based on Klinka's (1976) work in the University of British Columbia Research Forest, located directly across the Pitt River Valley to the east. The two areas are geologically and topographically similar and share many of the same plant associations. One ecosystem association, the Hylocomium-Cedar ecosystem identified in Minnekhada, is not present in the UBC Research Forest.

For this report the ecosystem association descriptions are ordered according to soil moisture conditions, from driest to wettest. Few areas of intermediate (mesic) moisture conditions exist (refer to Appendix 1 for definitions of soil moisture conditions).

Each ecosystem association description contains information on expected climax vegetation, existing seral and pioneer stages, soil type and parent material, and associated land-forms. A summary of visual attractions and notes on the area's suitability for trail construction is also included. Each generalized description is followed by a description of individual ecosystem map units. These descriptions are accompanied by a black and white air photo (scale 1:8,000) showing where the ecosystem association occurs. The smallest map unit is 0.5 x 0.5 centimetres, equivalent to 0.16 hectares on the ground. Appendix 5 provides a summary description of all map units.

A composite map of all ecosystem association units follows on the next page. The ecosystem associations are indicated by letter on the map, the legend is below. In some instances the same letter appears in adjacent map units. The units have been indicated separately because they are in a different successional stage (variation). These variations are described on subsequent pages under the individual map units.

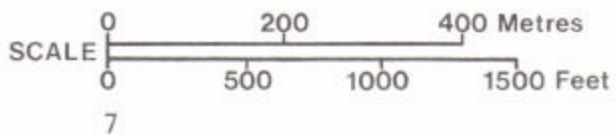
Legend for Composite Map of Ecosystem Associations (refer to map on opposite page)

- A. Lichen-Salal-Douglas Fir
- B. Salal-Hemlock-Douglas Fir
- C. Oregon Grape-Cedar-Douglas Fir
- D. Licorice Fern-Salal-Douglas Fir-Cedar
- E. Sword Fern-Douglas Fir-Cedar
- F. Sword Fern-Foamflower-Cedar
- G. Salmonberry-Sword Fern-Cedar
- H. Skunk Cabbage-Cedar
- I. Hylocomium-Cedar

Composite Map of Ecosystem Associations



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A. LICHEN-SALAL-DOUGLAS FIR ECOSYSTEM ASSOCIATION

This ecosystem association is restricted to rocky knolls and ridge crests where the bedrock is very near the surface. Forested and non-forested areas are interspersed as influenced by soil depth. Where pockets of deeper soil occur, this association often forms a complex with the Salal-Hemlock-Douglas Fir association.

The non-forested portion occurs on rock outcrops supporting only mosses, lichens, and a few herb species. As soil develops trees will eventually become established.

For mapping purposes the forested and non-forested variations are treated as one because individual units of each are too small to delineate on the airphoto base. They are described separately as suitability for trail construction and sensitivity to disturbance is very different for each variation.

a) Non-forested Outcrops

Climax Vegetation Description:

Outcrop vegetation consists mostly of mosses and lichens with herbaceous plants and shrubs restricted to sites of greater soil development. Common mosses are Pleurozium schreberi, Rhacomitrium canescens, and Rhacomitrium lanuginosum.

Herbaceous species composition and abundance varies among the outcrops. Those species most commonly found include Wallace's selaginella, parsley fern, saxifrage, foxglove, Siberian lettuce, sheep sorel and yarrow. Salal, kinnikinnik and ocean spray are the usual shrub species.

The above-mentioned plant species occur in a variety of combinations depending on microsite conditions.

Moisture Regime:

Very xeric to xeric; precipitation is the only source of moisture and drainage is very rapid.

Soil Type/Parent Material:

Thin organic soil layer overlying granodiorite bedrock. The very thin soils derived from granodiorite are coarse and nutrient poor.

Landform:

Ridge crests and knolls.

Trail Construction Suitability:

The topography of the outcrops is generally flat, gently sloping, or consists of a series of large steps. At least one side abuts the forested portion of this ecosystem while some or all of the other sides include cliffs. The rock is generally smooth and trail construction would frequently require stairs or steps. Also, stairs, and/or steps would hopefully confine pedestrian traffic to the trails, reducing destruction of the fragile vegetation. Mosses and lichen adhere loosely to the rock and are easily peeled off. Some consideration should be given to public safety as cliffs are common.

Points of Interest:

Many of the non-forested outcrops offer excellent views of the surrounding landscape. Much of the park can be seen from the many outcrops although only a small portion is generally visible from any one outcrop. The park's highest knoll affords a view of Burke Mountain, the southern portion of Addington Marsh, the southern half of the park and much of the Lower Mainland west of the Pitt River.

Such open and sunny sites will likely be popular with park visitors and receive much attention. As mentioned previously, these sites are very fragile and will suffer from public use.

The mosses and herbaceous plants are interesting and often restricted to this habitat.

b) Forested Areas

Climax Vegetation Description:

Douglas fir is the dominant climax tree species for this ecosystem. Very few other tree species do well on the shallow, nutrient poor soils. Shore pine often colonizes areas with a southern exposure, but is eventually replaced by Douglas fir. Salal dominates the species poor shrub layer. Herbaceous plants are rare and the few mosses are confined to rocks.

Moisture Regime:

Xeric.

Soil Type/Parent Material:

The parent material is either granodiorite bedrock, or shallow morainal or glaciomarine deposits less than 50 centimetres thick. The soil is coarse textured and rapidly drained. Nutrient poor parent materials and loss of soil nutrients through leaching result in nutrient poor soils.

Landform:

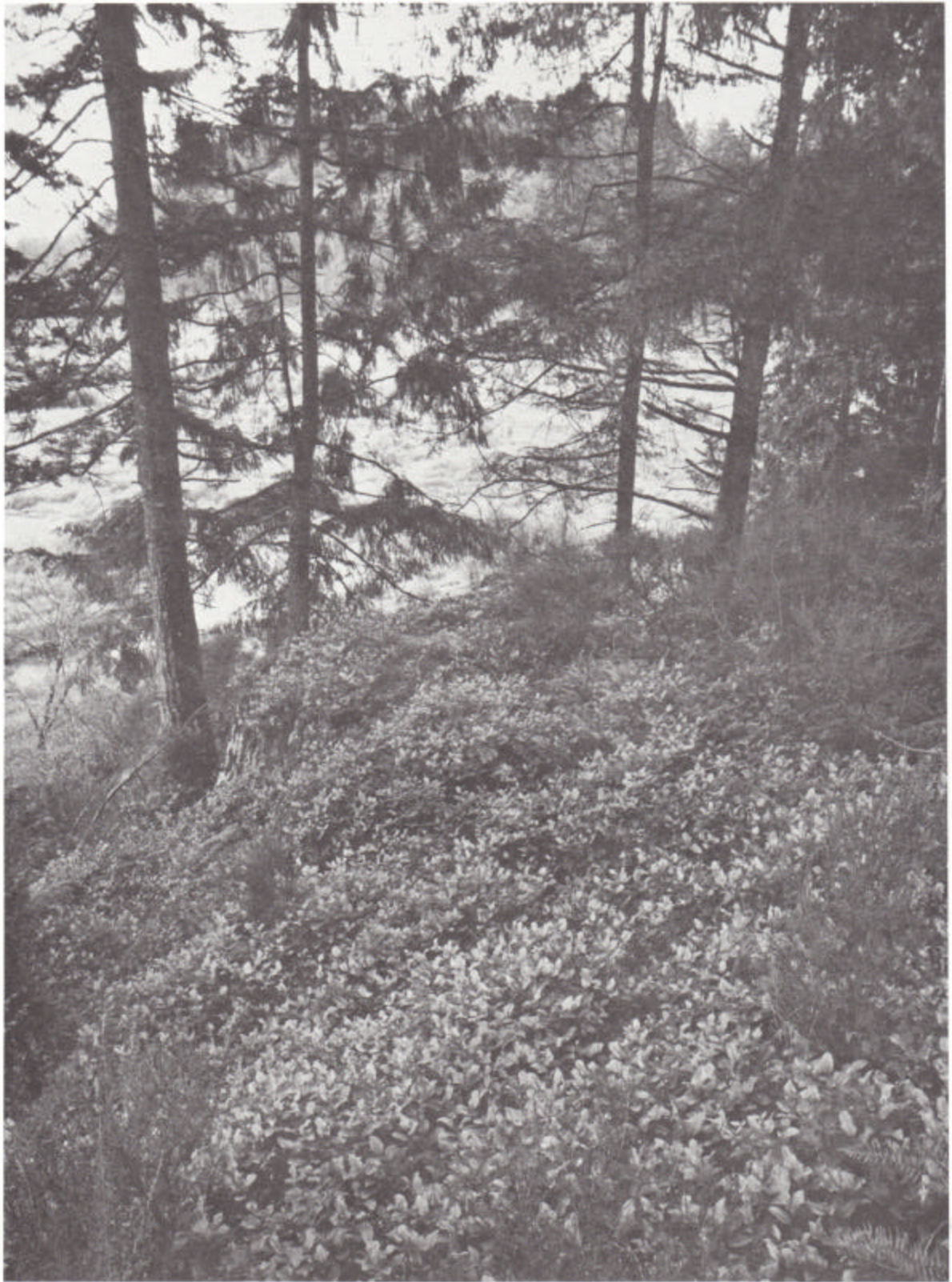
Crests and knolls; areas that have a convex outline, such as ridges.

Trail Construction Suitability:

Variable. Soils are coarse and well drained, but typically shallow, making erosion a potential problem on steep slopes. Occasional sections of exposed bedrock would require stairs or rock work. Limited areas of deeper soil are more suited for trails. Frequent windthrow may present a maintenance problem.

Points of Interest:

Large, mature and overmature Douglas fir occur on some sites. Windthrow is common in exposed areas where large shallow rooted trees are unprotected from strong winds.

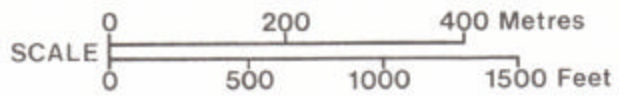


Lichen-Salal-Douglas Fir Ecosystem Association

A. Lichen - Salal - Douglas Fir



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LICHEN-SALAL-DOUGLAS FIR MAP UNITS

- A1 Several non-forested outcrops are interspersed with forested areas. Shore pine grows around the outcrops and foxglove is common. Some of the moss and lichen cover on rock has already peeled off from light pedestrian use.
- A2 There is quite an abrupt drop on the southern portion of this unit. The outcrops overlook the farmland to the south.
- A3 Approaches to this unit are steep and it is therefore not recommended for trails. It provides a narrow corridor view of the southeastern section of Minnehada Marsh.
- A4 This unit is a small low outcrop. There are limited views of the marsh, partially obscured by trees. Approaches to this outcrop are steep and not suitable for trails.
- A5 There are several non-forested outcrops in this unit. Each outcrop provides a slightly different view of the valley and marsh below. The western outcrop has the best view of Minnehada Marsh, but is very susceptible to damage by pedestrian traffic.
- At the narrowest section of the unit a tiny creek flows over the bluff. In winter when rainfall is heavy this is quite pretty. It is rather inaccessible however, and difficult to see. This is a probable site for various lily species.
- A6 This unit is a well developed climax stage of the Lichen-Salal-Douglas Fir association. Salal is extensive and the trees range in age from young to mature. Scotch broom and Saskatoon berry are found here. A trail is possible through this area though some rock work will be necessary. Some of the lichen and moss cover will be damaged but restricting people to a carefully routed trail should prevent excessive disturbance.
- A7 This unit has a few small areas of rock outcrop; most of the area is forested. There is quite a lot of windfall.
- A8 This unit includes bluffs on the west and south boundaries that intersect at right angles, creating an interesting formation. There are many open outcrops; some are on steep slopes and not accessible. This is a likely site for lily species.
- A9 Non-forested outcrops offer limited views of the north marsh. Access by trail can come only from the east. Sitka mountain alder grows in the unit.
- A10 This unit is a complex of the Lichen-Salal-Douglas Fir and the Salal-Hemlock-Douglas Fir associations. Most of the non-forested outcrops are in the centre of the unit with forested areas surrounding them.
- A11 This unit occurs on a steep slope. Most of the views look over forested areas. The area is not suited for trails.
- A12 The unit is steep and not easily accessible except from the north, outside the park. The view encompasses part of the north and west marsh.
- A13 This small unit is a complex of the Lichen-Salal-Douglas Fir and the Salal-Hemlock-Douglas Fir associations. It occurs on a small rock outcrop.
- A14 This unit contains a small rock knoll, mostly non-forested.
- A15 A complex of the Lichen-Salal-Douglas Fir and Salal-Hemlock-Douglas Fir associations. Much of the area is forested.
- A16 This is a complex of the Lichen-Salal-Douglas Fir and Salal-Hemlock-Douglas Fir associations. Most of the unit is open with many non-forested outcrops. Many of the outcrops are interspersed with steep slopes. The outcrops on the eastern boundary provide views of the southern region of the marsh and the outlet dam.

B. SALAL-HEMLOCK-DOUGLAS FIR ECOSYSTEM ASSOCIATION

Climax Vegetation Description:

The climax canopy consists mostly of Douglas fir with a small amount of western hemlock. White birch occurs in the climax forest but is more abundant in the younger seral stages. Salal and red huckleberry are the most common shrubs. Pacific menziesia is sometimes present. Generally, stunted western sword fern is the only species present in the poorly developed herb layer. Mosses, such as Plagiothecium undulatum, Hylocomium splendens, and Rhytidiadelphus loreus, are present on rock surfaces.

Seral Variations:

A common seral stage found in this type consists of dense stands of young western red cedar. Some western hemlock and Douglas fir may also occur. White birch is the only regularly occurring deciduous tree in seral stages. Ground cover is severely limited. Stunted salal grows under breaks in the canopy. Elsewhere, insufficient light penetrates the canopy to support understory species.

Moisture Regime:

Subxeric to xeric.

Soil Type/Parent Material:

Soils are deeper than in the Lichen-Salal-Douglas Fir ecosystem. They are coarse textured and well drained loamy sands to sandy loams. Large stones on the soil surface are common. Parent material is morainal or coarse glaciomarine, occasionally with a colluvial veneer from steep slopes. Small areas of exposed bedrock frequently occur.

Landforms:

This ecosystem occurs on upper slopes, ridges, and knolls where at least 50 centimetres of soil has accumulated. The described variation typically occurs on knolls where 1.5 - 3 metre high rock faces alternate with level areas to form large steps.

Trail Construction Suitability:

Trail construction and maintenance should not be a problem. This does not imply that trails can be placed anywhere within the type but that reasonable routes usually exist. Stairs may be necessary to overcome small rock faces. Erosion could be a problem where thin soils occur on steep slopes.

Points of Interest:

Very large Douglas fir trees are common on some sites. Seral forests of densely spaced cedar trees occur in this ecosystem.

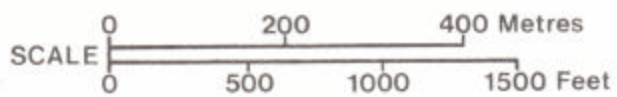


Salal-Hemlock-Douglas Fir Ecosystem Association

B. Salal - Hemlock - Douglas Fir



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SALAL-HEMLOCK-DOUGLAS FIR MAP UNITS

- B1 This unit has a cover of Douglas fir with some western red cedar. Numerous owl pellets were found just west of the garage. This is possibly a roost for a great horned owl or a barn owl.
- B2 This unit has some steep slopes. Most of the trees are small Douglas fir or small western red cedar.
- B3 A seral stage with immature trees; there is a mixture of Douglas fir and the immature western red cedar variation. There are several small rock faces in the unit. Trails through this unit are possible if carefully routed.
- B4 This is the largest unit of this association and contains mature and overmature Douglas fir. Much of the southern boundary has steep bluffs of the Licorice Fern-Salal-Douglas Fir-Cedar association. An old logging road runs through this unit. Trail construction on the ridge should be straight forward; however trails on the southern slope, except where the road is located, will be difficult.
- B5 This is a complex of the Salal-Hemlock-Douglas Fir and Sword Fern-Foamflower-Cedar association. The unit occurs on the top of the ridge and is relatively flat. The area was logged at the turn of the century. An old logging road is situated along the ridge top. Inclusions of Salmonberry-Sword Fern-Cedar are found in the swale.
- B6 This is a good example of the climax forest of this association. There are several overmature residual Douglas fir. The soil is fairly well drained and flat; trail construction through this unit should be relatively easy.
- B7 This unit is largely a seral stage of immature western red cedar. There are some inclusions of the Lichen-Salal-Douglas Fir association. Shore pine is growing on one outcrop with a southern exposure.
- B8 A narrow strip of the coniferous seral stage in a flat area between a rock knoll and a bluff.
- B9 Most of this unit consists of flat areas combined with rock faces which form large step-like formations. Perched water tables are common. The flat areas would be suitable for trails but stairs or steps would be needed on the rock faces.
- B10 A narrow band of the immature western red cedar growing on steplike formations.
- B11 Similar to B3.
- B12 Several areas have rock faces or large boulders. A small section of road runs through this unit. Trails are possible if carefully located.
- B13 Much of the forest is on steep colluvial slopes not suitable for trails.
- B14 A small unit of coniferous forest on a ridge; area is suitable for trails.
- B15 An immature climax forest. Unit is fairly flat with some rocks present. It is suitable for trails.
- B16 Similar to B15 except more rocky.
- B17 Climax forest; includes steep slopes with some inclusions of the Lichen-Salal-Douglas Fir association.
- B18 Similar to B3.
- B19 A complex of the Salal-Hemlock-Douglas Fir and Lichen-Salal-Douglas Fir. Bracken fern grows in some of the open areas. There are some steep bluffs on the southwestern boundary.
- B20 A complex of the Salal-Hemlock-Douglas Fir and Lichen-Salal-Douglas Fir associations. This unit is difficult to reach because of steep slopes and rock bluffs.
- B21 A ridge area with an old logging road near the park's northern boundary.
- B22 A complex of the Salal-Hemlock-Douglas Fir and Lichen-Salal-Douglas Fir associations. Most of the knoll is forested but there are a few outcrops. Depressions contain some inclusions of the Salmonberry-Sword Fern-Cedar association.
- The 1983 Salmonberry Flats Loop Trail runs through this unit. There are a few areas along the trail which offer partial views of the marsh.
- B23 Similar to B3.

C. OREGON GRAPE-CEDAR-DOUGLAS FIR ECOSYSTEM ASSOCIATION

Climax Vegetation Description:

Douglas fir and western red cedar are the typical climax species but western hemlock usually forms part of the canopy. Lack of light under the canopy restricts plant growth, resulting in a fairly open understory. Vine maple and salal are present but not abundant. Oregon grape occurs in clumps. Western sword fern and spiny shield fern are quite abundant but are not as large or luxuriant as on Sword Fern-Douglas Fir-Cedar sites.

The Oregon Grape-Cedar-Douglas Fir ecosystem occurs in small areas adjacent to Salal-Hemlock-Douglas Fir and Sword Fern-Douglas Fir-Cedar types. It is uncommon in the park occurring on only four small sites.

Seral Variations:

Some red alder may occur in immature stands.

Moisture Regime:

Mesic to subhygric.

Soil Type/Parent Material:

The soils are typically well drained, sand to sandy loams. Parent material is either coarse textured glaciomarine deposits or deep medium textured colluvium.

Landform:

This type occurs on upper slopes or flat ridge crests.

Trail Construction Suitability:

Deep, well drained soils on flat or gentle slopes make this ecosystem good for trail construction.

Points of Interest:

The sites in the park where this type occurs are the closest to the mesic situation. That is, these sites are similar to that required for a western hemlock climax forest. Large cedar and fir stumps are common and easily visible in the open understory.

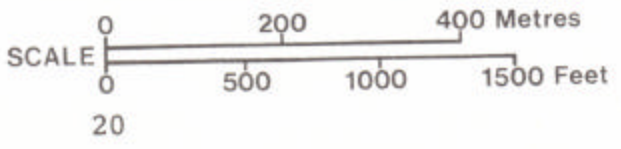


Oregon Grape-Cedar-Douglas Fir Ecosystem Association

C. Oregon Grape - Cedar - Douglas Fir



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OREGON GRAPE-CEDAR-DOUGLAS FIR MAP UNITS

- C1 A young coniferous forest with a mixture of western hemlock, western red cedar and Douglas fir. Many of the hemlocks here have been worked by sapsuckers. The sandy soil is good for trails. Generally a very attractive site.
- C2 This unit is located in a saddle between two knolls. A few over mature western red cedar are located here. The site is open and very attractive. Western white trillium can be found in the unit. Soil is sandy and good for trails. A trail from the valley to the ridge should pass through this unit to provide some variety in scenery.
- C3 This unit is also attractive. It contains some older trees and good soil for a trail.
- C4 This unit is located on a slope containing large colluvial fragments. An old logging road runs through the southern tip of this unit. The old road is the best place for a trail.

D. LICORICE FERN-SALAL-DOUGLAS FIR-CEDAR ECOSYSTEM ASSOCIATION

Climax Vegetation Description:

This ecosystem contains species representative of both wet and dry habitats. Small regions of permanent seepage create wet habitat in an otherwise xeric association.

Douglas fir and western red cedar occur sporadically. Salal, red huckleberry and Pacific menziesia are present in the shrub layer. Licorice fern grows on the moist rock faces. Maidenhair spleenwort and northern maidenhair fern are restricted to areas of permanent seepage. Western sword fern is found where soil has accumulated in cracks and crevices. On rock faces mosses and liverworts are abundant. Mosses include Hylocomium splendens and Dicranum sp. Scapania americana, a liverwort, is also present.

Only one unit of the Licorice Fern-Salal-Douglas Fir-Cedar has been mapped. However, many inclusions of this ecosystem occur within other associations, but they are too small to delineate on the map.

Seral Variations:

None present.

Moisture Regime:

Typically xeric to subxeric, with isolated areas of permanent seepage.

Soil Type/Parent Material:

The shallow soil is composed of organic matter, material weathered from rock, and material derived from upslope through erosion. Parent material is colluvium and bedrock.

Landform:

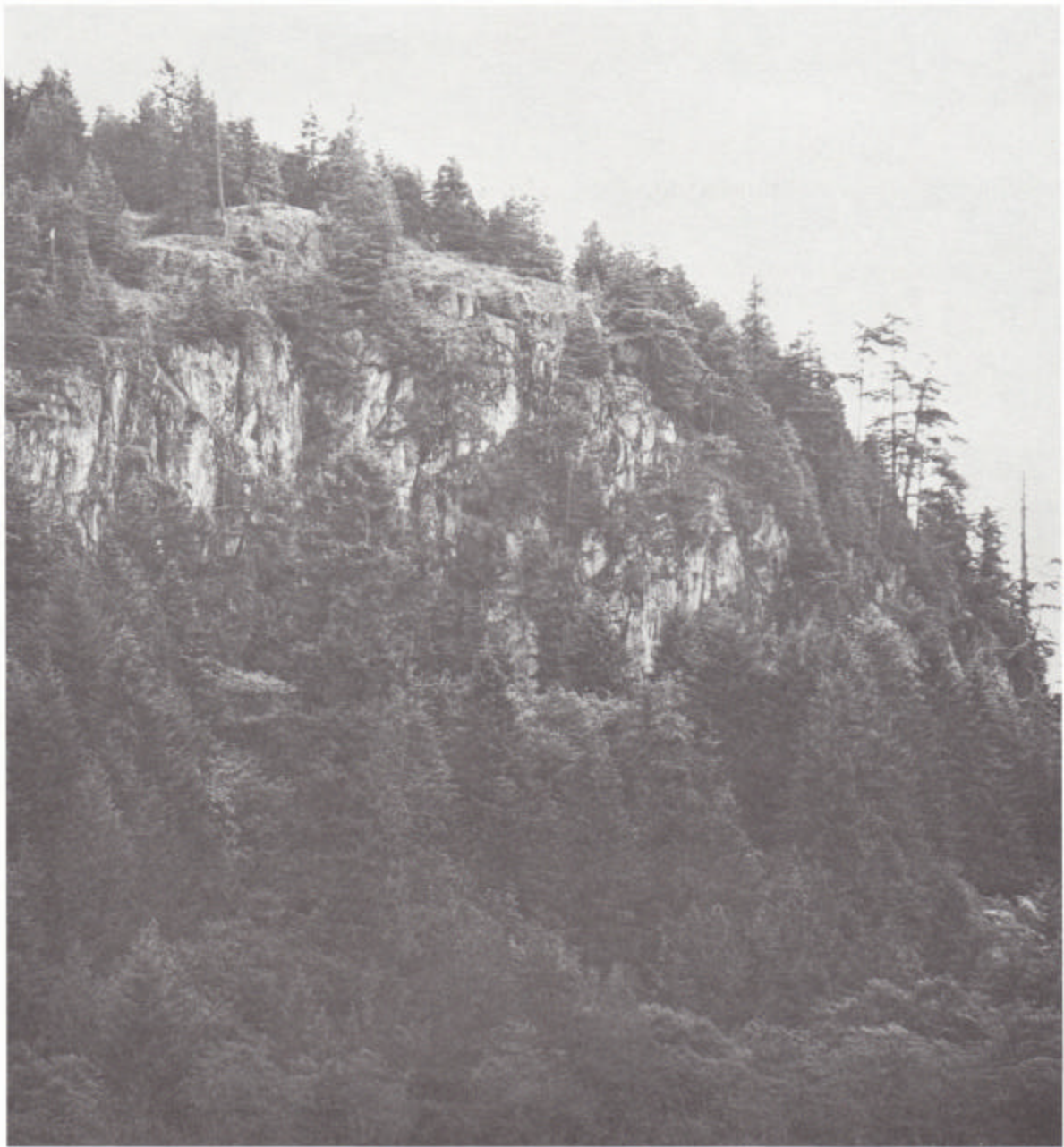
Found on bluffs with exposed rock faces, discontinuous ledges and crevices. Slope is greater than 100 percent, often near vertical.

Trail Construction Suitability:

These sites are too steep and rocky for trail construction. Also, the potential for rock slides is great.

Points of Interest:

The rock faces are visually dramatic and support unique and interesting flora. Since these areas were difficult to log at the turn of the century, some of the park's oldest trees occur in this ecosystem association.



Licorice Fern-Salal-Douglas Fir-Cedar Ecosystem Association complex with Lichen-Salal-Douglas Fir Ecosystem Association

D. Licorice Fern – Salal – Douglas Fir – Cedar



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SCALE 0 200 400 Metres
0 500 1000 1500 Feet



LICORICE FERN-SALAL-DOUGLAS FIR-CEDAR MAP UNITS

- D1 This unit occurs on the bluffs of the high knoll. It forms a mosaic with the Lichen-Salal-Douglas Fir association so the two are treated as a complex.

The Licorice Fern-Salal-Douglas Fir-Cedar association on the bluffs is in its climax stage. Most of the Lichen-Salal-Douglas Fir association is climax, however there is a seral stand of shore pine around the rock outcrop in the southeastern portion of the unit. A small wet depression containing sphagnum moss occurs on the knoll.

The open outcrops offer excellent views over Addington Marsh, the Pitt River, the southern Minnehaha Marsh and Burke Mountain. This knoll, at 170 metres, is the highest point in the park.

Any trail to the knoll must approach from the north outside of this unit; the bluffs are too steep for trails.

E. SWORD FERN-DOUGLAS FIR-CEDAR ECOSYSTEM ASSOCIATION

Climax Vegetation Description:

Both western red cedar and Douglas fir do well in this ecosystem but cedar is more abundant and dominates the climax canopy. Western hemlock is less vigorous in these rich soils; most are infected with American dwarf mistletoe. Bigleaf maple is often present.

Principal components of the well developed shrub layer are vine maple, salmonberry and American red elderberry. Cascara is often present.

Mosses do not occur extensively on soil or humus but small patches of Plagiomnium insigne and Leucolepis menziesii indicate a nutrient rich site. Epiphytic mosses and liverworts are abundant on the trees and shrubs. Licorice fern, western sword fern, and mosses such as Hylocomium splendens and Rhytidiadelphus loreus populate the numerous small cliffs.

This association frequently occurs in narrow strips along the base of bluffs and knolls. Often these units are too small to delineate on the map and are combined with larger adjacent units.

Seral Variations:

Most of the Sword Fern-Douglas Fir-Cedar ecosystem was logged at the turn of the century. Much of the second growth forest is deciduous with red alder and bigleaf maple forming the canopy. Paper birch may also be present. This is a seral stage that will eventually be replaced by cedar and fir as the deciduous canopy matures and dies.

Moisture Regime:

Subhygric to hygric.

Soil Type/Parent Material:

Typically the soil is a sandy loam to loam with numerous boulder sized colluvial fragments. Soil is derived from colluvium or glaciomarine material overlaid with colluvial material.

Landform:

This ecosystem is found on moderate to steep slopes. Small vegetated rock faces, characteristic of the unit, are formed by large rock fragments and occasionally by exposed bedrock. A strip of this ecosystem always occurs along the base of knolls and bluffs.

Trail Construction Suitability:

Steep unstable slopes make trail construction difficult. The coarse colluvium will need extensive reworking and filling. Downward creep and slumping of the surficial materials will require additional maintenance.

Points of Interest:

The largest bigleaf maple and western hemlock in the park occur in this ecosystem. Extensive broom formations, caused by American dwarf mistletoe, colonize the mature western hemlock. Epiphytic mosses and liverworts are very abundant on the deciduous trees and shrubs. Licorice fern grows profusely on bigleaf maples and on the numerous small rock faces.

Huge western red cedar and Douglas fir stumps assist one in visualizing the enormous trees that formed the climax forest during the pre-logging era.

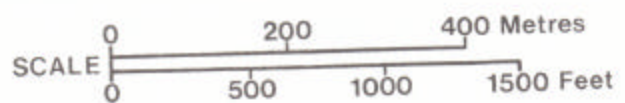


Sword Fern-Douglas Fir-Cedar Ecosystem Association

E. Sword Fern - Douglas Fir - Cedar



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SWORD FERN-DOUGLAS FIR-CEDAR MAP UNITS

- E1 A complex of the Sword Fern-Douglas Fir-Cedar and the Salal-Hemlock-Douglas Fir associations. The two associations tend to merge into one another throughout the unit. Paper birch is the major tree.
- E2 This unit has patches of conifers interspersed with a main canopy of big-leaf maple and red alder. This unit is close to the Lodge and contains some escaped domestic plants such as ivy and periwinkle.
- E3 This older seral forest has some domestic ivy and periwinkle.
- E4 The unit contains many large rocks from the rock knoll above. A trail could be located through here if routed around the rocky areas.
- E5 This seral stage is situated on a steep slope of large, unstable rocks. It may be possible to route a trail along the least steep slopes.
- E6 This is an immature deciduous forest. A trail through this unit is more feasible than in E5 since slope is gentler and fewer rocks are present.
- E7 This unit slopes gently north and east down to the valley. The westward facing slope is steep and one portion has an abrupt drop-off.
- E8 The unit follows the base of a steep bluff. Its large loose rocks are covered by moss and ferns with shrubs and trees growing in crevices. The unit is susceptible to slides and is not suitable for trails.
- E9 A young climax forest dominated by Douglas fir and some western red cedar. Large loose rocks are present.
- E10 The unit is situated below the highest knoll. Similar to unit E8, although a trail may be routed across the southern portion of the unit.
- E11 Primarily deciduous with much vine maple in the understory. Suitable for trail construction.
- E12 This unit contains some inclusions of the Sword Fern-Foamflower-Cedar association on the more level areas. Some of the largest bigleaf maples and western hemlock in the park are found here. The western hemlock are heavily broomed from mistletoe infections. Part of this unit forms a valley with a stream. Many of the slopes have large colluvial rocks. An old road is located in the eastern portion of the unit.
- E13 The northern half of the unit is a steep slope. The remainder is situated at the base of a rock bluff.
- E14 This unit has a stream near its northern boundary. There are some inclusions of the Salmonberry-Sword Fern-Cedar association in the south-eastern area.
- E15 This unit is the best location for a trail to the top of the high knoll. Except for the rock faces most of the unit is suitable for a trail. An old logging road is located within the unit.
- E16 This is a complex of the Sword Fern-Douglas Fir-Cedar association on the slopes and the Salal-Hemlock-Douglas Fir association on the flatter areas. Much of this area is not suited for trails although the trail to the high knoll must be routed through this unit.
- E17 This u-shaped unit consists of two narrow valleys situated between bluffs and rock knolls. The northern arm has vertical rock faces on either side. Trees grow between large colluvial rocks which are covered with moss and ferns. This valley is attractive but not suitable for trails because of the rocks. The southern arm has an old logging road. Devil's club occurs in this unit.
- E18 A young climax forest. This unit can support trails.
- E19 This is a complex of the Sword Fern-Douglas Fir-Cedar and the Sword Fern-Foamflower-Cedar associations. There is an old logging road through most of the unit which would make a good base for a trail.
- E20 This unit is situated on a north facing slope. Douglas fir and western hemlock are the common trees. The steep slope of colluvium and exposed bedrock is not suitable for trails.
- E21 A complex of the Sword Fern-Douglas Fir-Cedar and Salal-Hemlock-Douglas Fir associations.
- E22 A seral forest with some conifers. There are inclusions of Sword Fern-Foamflower-Cedar and Salmonberry-Sword Fern-Cedar in the broader parts of the valley.
- E23 A young climax forest on a northwest facing slope.
- E24 A small unit with some windfall. A trail could go across, but not down the slope.
- E25 The forest is very mixed in both species composition and age. Much of the slope is steep with large stones. In most areas a trail up the slope is not feasible; however, an old logging road, which would make a good trail, traverses the slope.

F. SWORD FERN-FOAMFLOWER-CEDAR ECOSYSTEM ASSOCIATION

Climax Vegetation Description:

Western red cedar dominates the climax canopy. Western hemlock, and less frequently bigleaf maple and paper birch, also contribute to the climax forest.

The principal shrubs of this ecosystem are vine maple, salmonberry and red elderberry. Red huckleberry and Pacific menziesia also occur in the mature climax forest. Cascara is often present.

Western sword fern and spiny shield fern are the most abundant species of the luxuriant herb layer. Deer fern and three-leaved foamflower are usually present, as are two-leaved false Solomon's seal and Siberian lettuce. Youth-on-age grows on the wettest sites.

Epiphytic mosses and liverworts are abundant on deciduous trees and shrubs. As in the Sword Fern-Douglas Fir-Cedar ecosystem small patches of Plagiomnium insigne and Leucolepis menziesii indicate a nutrient rich site.

Seral Variations:

Most of this unit was logged at the turn of the century. The naturally regenerating second growth stands are primarily deciduous, dominated by bigleaf maple and red alder. Paper birch is usually present while black cottonwood often occurs in the vicinity of streams. As the forest matures, western red cedar and some western hemlock, now present in small numbers, will gradually replace the deciduous canopy until the climax forest is attained.

Moisture Regime:

Subhygric to hygric.

Soil Type/Parent Material:

The soils are typically sandy loams with isolated inclusions of clay loams. Parent materials are fine to medium textured glaciomarine deposits occasionally mixed with glacial outwash material.

Landform:

This unit is restricted to level or gentle slopes. It typically occurs down slope of the Sword Fern-Douglas Fir-Cedar ecosystem and in broad gently sloping valleys.

Trail Construction Suitability:

Trail routes should be confined to sandy soil. Poor drainage on the fine textured soils is a major problem. Near streams and where this ecosystem borders the Salmonberry-Sword Fern-Cedar association, the water table can be very near the surface. Unsurfaced trails would be very soft and muddy. Surfacing of trails or boardwalks would be necessary in many areas.

Points of Interest:

This ecosystem is visually attractive throughout the year. Ferns and other herbs carpet the forest floor yet do not obscure the overall view as does salmonberry in the Salmonberry-Sword Fern-Cedar ecosystem. Epiphytic mosses and licorice fern, abundant on the maples, create the appearance of a rain forest. This is most pronounced on wet misty days.

The park's largest western red cedar stumps are found in this ecosystem.



Sword Fern-Foamflower-Cedar Ecosystem Association

F. Sword Fern – Foamflower – Cedar



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