Pacific Rim National Park

A SURVEY OF SOILS AND LANDFORMS ● PHASES I & II

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ABSTRACT

Four terrain systems exist in Pacific Rim National Park. These are Till soils, the Ucluelet, Tofino and Grice Bay systems, which occur on till, glaciofluvial, glaciomarine, and marine deposits respectively. Soil units in the till soils are the most homogenous. In the other terrain systems, each soil unit includes a range of soils, due to microtopographic variation. The soils are predominantly Humo Ferric Podzols or Gleysols. In the Long Beach Section, all four terrain systems are present. In the Broken Islands Section, till soils predominate. Kame, alluvial and organic deposits occur infrequently.

The most important factor affecting soil development and characteristics is drainage. Due to the high rainfall and gentle slopes over most of the area, few soils are better than moderately well drained. Exposure on sites near the shore is another important factor. Vegetation, erodablity, foundation and productivity are all affected by these factors.

The land surface was delineated into units on the basis of topography, slope, soil characteristics and development and landform. These are shown on the maps provided. Interpretations showing the erodability, foundation and productivity of each unit are shown on an overlay, based on the modified guidelines in the report.

ACKNOWLEDGEMENTS

Many people contributed to the successful completion of the project. Special thanks go to Mr. Andrew Harcombe, whose advice on vegetation was invaluable, as was his assistance and companionship during field work on the Broken Islands. The assistance of the following is gratefully acknowledged: Mr. Ted Baker, for his information and comments on the soils of the Long Beach Section; Dr. N. Keser, for his assistance with preparation of the soil monoliths; Dr. Jan Muller, for information with geology; Mr. Brian White for his information on human history; the staff of the Pacific Forest Research Centre who provided advice and assistance.

The co-operation of the National Park Service, particularly of the staff of Pacific Rim National Park is greatly appreciated.

The cover was designed by Mr. John Wiens of the Pacific Forest Research Centre.

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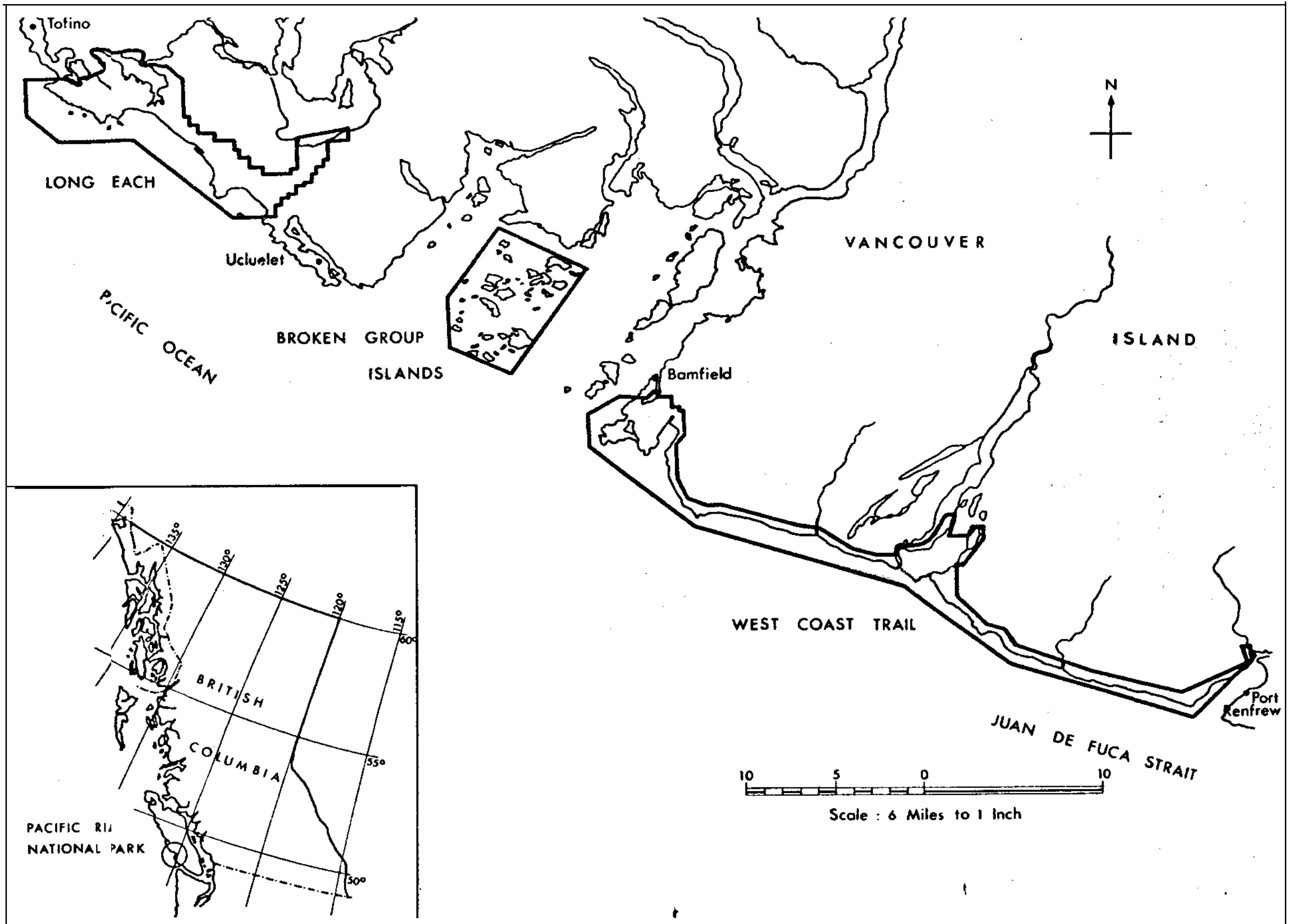
I. INTRODUCTION

Pacific Rim National Park was established on April 28, 1970, by agreement between the Province of British Columbia and the Government of Canada. The three separate phases stretch for approximately 60 miles along the west coast of Vancouver Island. Phase I, the Long Beach Section, covers approximately 23,000 acres of land area between the villages of Tofino and Ucluelet; Phase II, the Broken Islands Group, includes more than 50 islands and numerous inlets in the mouth of Barkely Sound and Phase III, the West Coast Trail, includes Cape Beale and the historical lifesaving trail between Bamfield and Port Renfrew. The boundaries of the latter part have not been announced.

Most of the park lies within the physiographic region called the Estevan Coastal plain, which stretches from Brooks Peninsula to Cullite Cove, 8 miles southeast of Caxmanah Point. Holland (1964) describes the plain as a flat area, usually no higher than 150 feet above sea level. The entire area was glaciated, and much of the park area was at one time depressed below sea level . Marine sediment was deposited over much of the area. Glaciofluvial and glaciomarine materials were deposited over the marine drift. The higher areas are part of the Vancouver Island Ranges, all ice sculptured mountains covered with till.

The long Beach section has the greatest variability in parent materials. Till and bedrock on the hills, marine sands, glacio marine clays, and glaciofluvial gravels and sands on the plain. The Broken Islands Group is predominantly till and bedrock, with marine deposits on the edges of many islands. In Phase III, till occurs at the north and south ends, and glacioflwial deposits are found along the trail.

Figure 1. Pacific Rim National Park : Phase I (Long Beach), Phase II (Broken Group Islands) and Phase III (West Coast Trail).



The bedrock geology of the Long Beach Section was remapped by Muller in 1972. He describes the bedrock of most of the area as part of the "Pacific Rim Belt", "unmetamorphosed but intensely deformed, sheared, brecciated and faulted rocks". 1/

Sections of Long Beach in which geology is important are:

a) Indian Island and hills along the northeast boundary; where there are Paleozoic quartz diorites, diorites, gabbro gneissic, limestone, and some Lower Jurassic buff breccia, feldspatic lava and argilite.

b) the D. O.T. Hills, which are primarily Lower Cretaceous and Upper Jurassic greywacke and conglomerates, occasionally ribbon chert, some Lower Cretaceous or Upper Jurassic siltstone argilite.

c) on the Ucluth Peninsula and between Wickaninnish Inn and Florencia (Wreck) Bay, where Lower Jurassic buff breccias, feldspatic lava, argilite, lower Cretaceous (possibly Upper Jurassic) siltstone, argilits, greywacke and conglomerate occurs.

d) the east shore of Kennedy Lake, which is upper Triassic amygdeloidal and pillow lavas, limestones, possibly occasional volcanics of Jurassic or Paleozoic ages, or Lower Tertiary grancdiorites and quartz diorites.

1/ Muller, J.E. 1972 Personal communication, and a draft of The Geology of Pacific Rim National Park, Project 720074

2/ Ibid.

Photo 1 Wiebe Island - showing geological formation of the south side of the island.

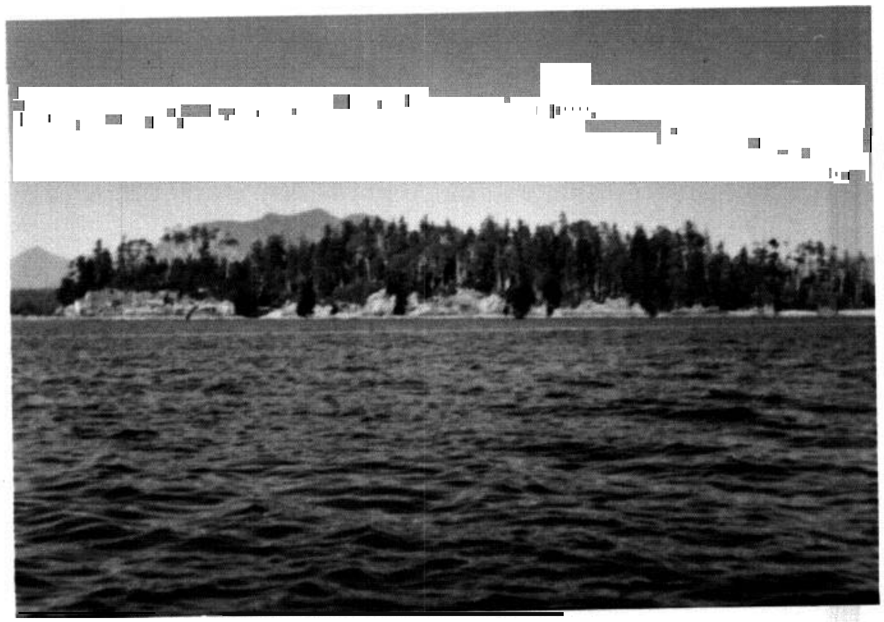


Photo 2 Wiebe Island - aerial view of south side.

Photo 3

Austin Island - Showing the exposed outer edge of The Broken Group. The slope is ablation till (Ta); The vegetation is Thuja plicata - Vaccinium ovatum forest type (T2). e is the VanLene. Pnoto taken on Jan. 18, 1973.

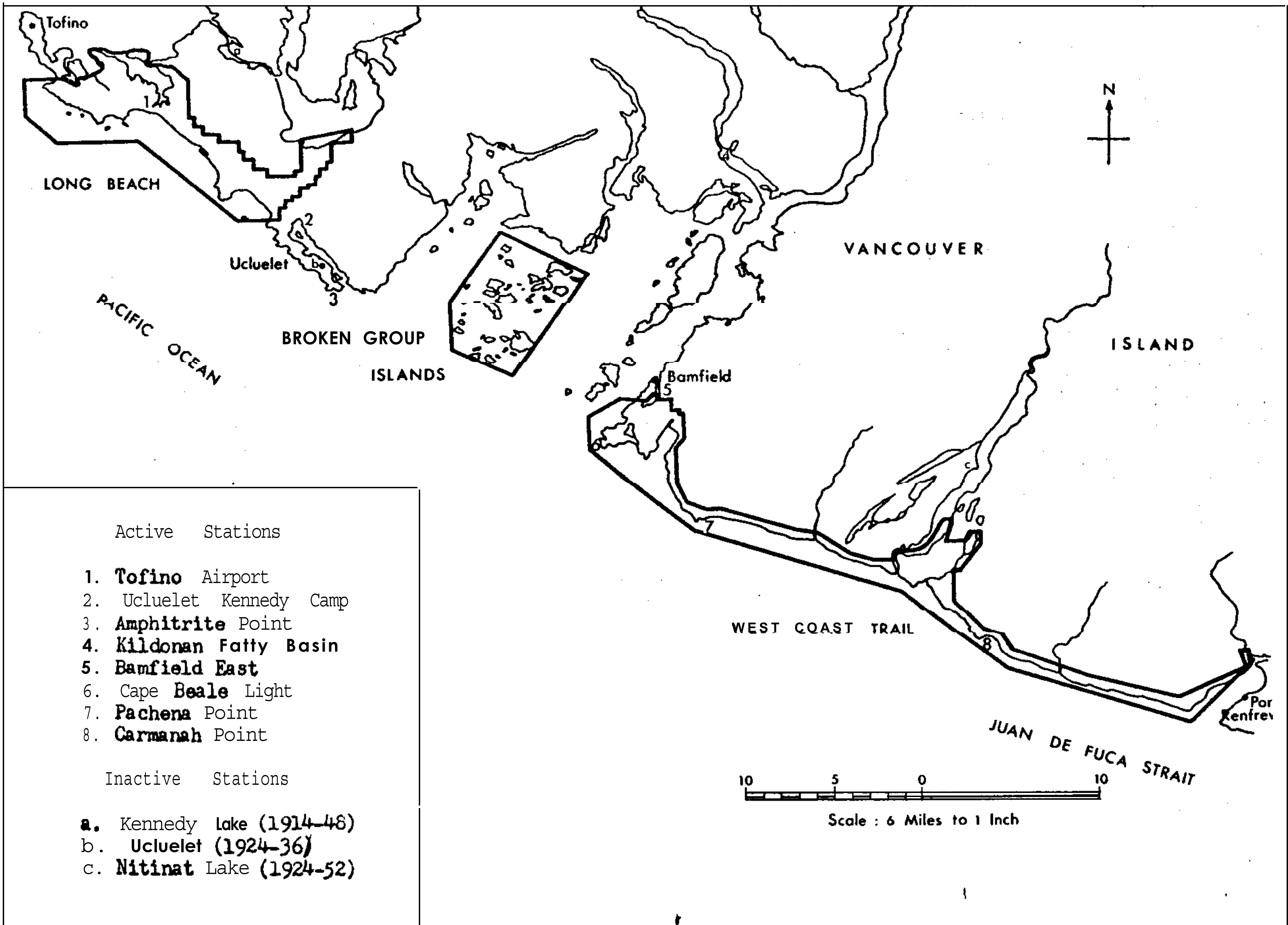
The geology of the other sections of the park is to be remapped in 1972-73. The Broken Group is presently mapped as the West Coast Complex, a unit that includes gneasic diorite,quartz diorite, gabbro and amphibolite. This is a reconnaissance unit, and will be separated into more specific types in future work (Muller, personal conummication).

The climate of Long Beach Section is classified as Cfb, after Köppen. Average precipitation ranges from 100inches at Ucluelet to 121 inches at the Tofino Airport. Most of this falls during the winter, though less than 10 inches of snow is expected. Temperatures are generally mild, providing a long growing season. Figure 2 shows locations of meterological stations in the park area. Table 1 gives the average conditions recorded at some of them. Annual moisture deficits are less than 1 inch, while the annual moisture surplus, 79.5 inches at Ucluelt and 96.8 inches at Tofino Airport, is "the most important single feature of the climate to be reckoned with when the inter-relationship of climate, soil, vegetation growth are considered." 3/

Summer climate is generally mild. The prevailing winds from the northwest during the summer force the warm surface water of the Pacific offshore (Pincock and Turner, 1956). Upwelling of the cold bottom water creates conditions favorable to the occurrence of fog. In late summer, the probability of fog is 25%.

3/ Valentine, K.W.G., 1971 Soils of the Tofino-Ucluelet Lowland of British Columbia Report no. 11, British Columbia Soil Survey

Figure 2. Meteorological Station Locations



Active Stations

1. Tofino Airport
2. Ucluelet Kennedy Camp
3. Amphitrite Point
4. Kildonan Fatty Basin
5. Bamfield East
6. Cape Beale Light
7. Pachena Point
8. Carmanah Point

Inactive Stations

a. Kennedy Lake (1914-48)
b. Ucluelet (1924-36)
c. Nitinat Lake (1924-52)

Table 1 - Average Temperature and Precipitation Recorded near Pacific Rim National Park

Element and Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	NOV	Dec	Year
Tofino A	Latitude 49 05 N Longitude 125 46 W elevation 80 Ft. Asl												
Mean daily temperature (DEG F)	40.8	40.0	41.7	45.4	50.8	54.7	57.9	58.4	55.8	51.1	44.0	41.4	48.5
Mean Daily Maximum Temp.	45.9	45.8	47.6	51.5	57.8	61.4	65.3	65.1	63.9	57.1	49.4	46.8	54.7
Mean Daily Minimum Temp.	35.8	34.3	35.8	39.3	43.7	48.0	50.0	51.7	48.7	45.0	38.7	36.5	42.3
Maximum Temperature	58	66	60	69	77	90	91	86	85	75	64	58	91
Minimum Temperature	20	24	26	30	34	38	41	42	37	32	27	17	17
Mean Rainfall (Inches)	17.66	14.72	13.60	11.15	4.13	3.71	3.69	3.52	5.80	IA.00	16.58	16.39	124.95
Mean Snowfall	2.6	1.3	2.1	T	T	0.0	0.0	0.0	0.0	0.0	T	2.5	8.8
Mean Total Precipitation	17.92	14.85	13.81	11.15	41.3	3.71	3.69	3.52	5.80	14.00	16.61	16.63	125.83
Maximum Precipitation in 24 hrs	6.86	5.06	4.39	4.18	2.01	1.55	2.55	2.47	2.91	4.46	5.44	6.55	6.86
Ucluelet	Latitude 48 48 N Longitude 125 32 W Elevation 18 Ft ASL												
Mean Daily Temperature	40.8	40.4	43.2	47.1	51.4	55.8	58.1	59.0	55.3	50.0	44.4	41.3	48.9
Mean Daily Maximum Temp.	46.8	47.8	50.7	55.9	60.9	65.0	67.1	68.0	64.0	58.0	51.2	47.5	56.9
Mean Daily Minimum Temp.	34.7	32.9	35.7	38.3	41.9	46.5	49.1	49.9	46.5	42.0	37.6	35.1	40.9
Maximum Temperature	62	68	70	76	85	87	91	-94'	86	75	65	58	94
Minimum Temperature	7	13	19	23	26	33	35	36	30	18	18	11	7
Mean Rainfall (Inches)	16.49	11.68	12.05	8.86	4.78	4.07	3.53	2.75	5.57	12.22	14.30	16.63	113.03
Mean Snowfall	4.7	1.5	0.5	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.9	7.6
Mean Total Precipitation	16.96	11.83	12.10	8.86	4.78	4.07	3.36	2.75	5.57	12.22	14.30	16.72	113.7[illegible]
Maximum Precipitation in 24 hrs	4.65	4.45	4.75	4.91	3.90	3.93	3.25	2.80	3.55	4.55	4.74	4.92	4.92
Kildonan	Latitude 49 02 N Longitude 125 01 W Elevation 20 Ft Asl												
Mean Rainfall	15.53	13.60	11.83	9.44	5.97	3.94	3.45	3.03	6.42	16.70	18.10	20.06	328.07
Mean Snowfall	8.6	2.2	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.7	15.4
Mean Total Precipitation	16.96	13.82	12.04	9.44	5.97	3.94	3.45'	3.03	42	16.70	18.13	20.33	129.66
No. Of Days with Measurable Rain	18	17	18	16	14	13	9	10	11 1	17	20	20	183
No. of Days with Measurable Snow	2	.	1	1	*								5

NO. of Days with **Meas** Precipitation	20	17	19	16	14	9	10	13	11	207		21	187
Maximum Precipitation in 24 **Hrs.**	8.60	5.92	5.41	3.38	6.44	3.38	4.58	4.68	5.45	7.18	7.78	6.38	8.60

Bamfield Latitude 48 50 N Longitude 125 06 W Elevation 70 Ft Asl

Mean Rainfall (Inches)	14.23	12.20	11.10	7.76	4.12	3.28	2.63	2.03	5.18	11.73	15.39	16.33	106.07
Mean Snowfall	5.5	1.5	1.5	T	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.6	10.3
Mean Total Precipitation	14.78	12.35	11.34	7.76	4.12	3.28	2.63	2.03	5.18	11.73	15.41	16.49	107.[illegible]
No. of Days with Measurable **Rain**	17	15	17	15	10	9	7	8	9	15	18	19	159
No of Days with Measurable snow	3	1	1								*	1	6
No of Days with **Meas.** Precipitation	18	15	17	15	10	9	7	8	9	15	18	19	16[illegible]
Maximum Precipitation **in 24 hrs**	4.82	4.86	4.75	4.42	3.50	3.05	4.64	1.7[illegible]	3.23	4.83	4.80	5.05	5.05

Pachena Point Latitude 48 43 N Longitude 125 06 W Elevation 150 ft Asl

Mean Daily Temperature	39.6	40.3	41.9	45.3	5[illegible].0	53.4	55.6	56.1	54.1	49.6	44.5	41.7	47.7
Mean Daily Maximum Temperature	44.2	45.9	47.9	51.9	56.7	59.5	61.6	62.2	60.6	55.5	49.6	46.5	53.5
Mean Daily Minimum Temperature	35.0	34.6	35.8	38.7	43.2	47.2	49.6	50.0	47.6	43.6	39.5	36.8	41.8
Maximum temperature	58	61	68	73	77	89	89	83	81	71	61	59	8[illegible]
Minimum Temperature	4	14	20	26	29	35	39	40	30	23	15	14	[illegible]
Mean Rainfall (Inches)	15.39	13.00	11.29	7.69	4.16	3.76	3.17	2.99	'5.48	12.72	15.93	16.94	112.[illegible]
Mean Snowfall	5.6	1.8	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.6	11.[illegible]
Mean total Precipitation	15.95	13.18	11.52	7.69	4.16	3.76	3.17	2.99	5.48	12.72	15.97	17.10	114.0[illegible]
No of Days with **Measurable** Rain	21	18	20	17	13	13	10	11	11	17	21	23	19[illegible]
No. of Days with Measurable Snow	3	2	1								*	1	[illegible]
No. of Days with **Meas.** Precipitation	22	18	20	17	13	13	10	11	11	17	21	24	19[illegible]
Maximum Precipitation	5.65	5.50	4.33	3.83	3.25	4.55	5.24	4.75	3.49	4.74	5.86	'4.88	5.8[illegible]

Table 1 continued

Element and Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Year
Nitinat Lake	Latitude 48 45 N Longitude 124 45 W Elevation 25 Ft Asl												
Mean Rainfall (Inches)	14.37	12.57	11.98	-8.50	4.87	3.63	2.97	2.57	5.59	12.78	15.20	16.73	11.76
Mean Snowfall	6.9	3.3	1.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3	3.2	15.[illegible]
Mean Total Precipitation	15.06	12.90	12.16	8.51	4.87	3.63	2.97	2.57	5.59	12.78	15.23	17.05	113 .2
No. of Days with Measurable Rain	14	16	18	15	12	9	8	9	9	16	19	19	16[illegible]
No. of Days with Measurable Snow	3	1	1	*							*	2	7
No. of Days with **Meas. Precipitation**	17	17	19	15	12	9	8	9	9	16	20	29	171
Maximum F-recipitation in 24 hrs	5.00	5.91	5.00	4.33	2.40	3.63	3.90	1.81	3.80	5.00	4.27	4.90	5.91
River Jordan	Latitude 48 25 N Longitude 124 03 W Elevation 10 Ft Asl												
Mean Daily Temperature	39.0	39.3	43.7	48.1	52.1	55.4	59.0	59.1	55.7	50.0	43.4	41.5	48.7
Mean Daily **Maximum** Temperature	44.5	45.1	50.2	55.6	60.1	63.2	67.7	67.1	63.5	56.6	49.5	46.1	55.7
Mean Daily **Minimum**	33.7	33.5	37.2	40.6	44.1	47.7	50.5	51.1	48.0	43.5	13.3	36.0	41.[illegible]
Maximum temperature	57	66	61	69	80	82	88	81	81	70	60	61	88
Minimum Temperature	4	14	15	30	31	39	40	39	36	29	12	9	4
Mean Rainfall (Inches)	10.58	8.77	7.41	4.86	2.65	2.31	1.41	1.58	3.47	8.50	10.60	13.10	75.2[illegible]
Mean Snowfall	3.2	1.8	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.9	7.[illegible]
Mean Total Precipitation	10.90	8.95	7.56	4.86	2.65	2.31	1.41	1.58	3.47	8.50	106.	13.19	75.90
No. of Days with Measurable rain	19	17	19	17	13	10	6	8	lo	17	20	21	17[illegible]
No. of Days With Measurable Snow	2		11	*							*	1	5
No. of **Days with Meas. Precipitation**	21	18	19	17	13	10	6	8	10	17	20	22	18[illegible]
Maximum Precipitation in 24 hrs	4.75	7.44	2.81	4.26	1.81	2.25	1.70	1.74	2.31	5.36	3.91	5.60	7.44

Canada Dept. of Transport, Meteorological Branch 1967, Temperatures and Precipitation Tables for British Columbia, Toronto.

The soils on the West Coast have received little attention in the past, as they have low potential for agriculture. Both Salisbury (1935) and Wainwright (1942) refer to soils of the west coast, but provide little specific information. Bhoojedur (1968) provides an analysis of the development of placic horizons, and hypothesizes the sequence of soil development present. The most useful published document is the soil survey by Valentine (1971). The intent of the survey was to map the area and collect data which might help to explain poor forest growth. It was one of the first soil surveys of non-agricultural land published in B.C. The work has been criticized on several accounts, partly because it attempts to present results more detailed than possible at the scale of mapping used. Most of the soil classifications have been revised by Baker (unpublished report and personal communication). Baker's thesis on Soils of the Long Beach area will be available in the near future, and will provide more detailed information.

The information of the geology of Long Beach Section of the park was obtained from personal communication with J.E. Muller of the Geological Surveys of Canada, and from an unpublished draft of his report on this section. He will be completing his survey of the other section in 1973/74.

Information on vegetation comas from Bell (1972) and Bell and Harcombe (1973) and from personal communication with the authors.

Advance prints of Canada land Inventory maps were obtained from the British Columbia Land Inventory for the outdoor recreation, wildlife and 'present land use sectors. Capability for Forestry and Agriculture maps are to be prepared in the near future (field work in 1973-74). As these maps are not published, the information should be treated as confidential.

II STANDARDS AND PROCEDURES

Because of the minimal lead time available, and the necessity of taking advantage of good weather, only a cursory check was made of the air photos before going into the field. The preliminary classificiation of the islands was carried out in the field. Available information on the Long Beach Section was collected and map boundaries were transferred to maps and air photos for field checking and revision.

In the Broken Group, a number of typical sites were selected to cover the range of soils. At accessible sites, soil samples were collected for analysis and a detailed profile description was prepared. A number of transects were made across the islands. Observations were made from exposed profiles, under wind-thrown trees and along creek banks, and small test pits were used to confirm boundaries and classification. A shoreline survey was used to check results. Access was obtained by using a small inflatable boat, which could be landed at most areas.

In the Long Beach Section, four profiles were sampled in conjunction with the preparation of monolith samples. Field checking was curtailed by time and weather, and the map of the Long Beach Section relies heavily on existing reports, refined through air photo interpretation.

Chemical and physical analyses of the soils sampled were carried out by the Pacific Forest Research Centre staff. The results of these have been used to check the field classifications.

To deliniate the units for mapping, air photos of various scales were used. Photo coverage at 1:31,680 was obtained from the Long Beach Section, and at 1:50,000 scale for the Broken Group.

High level photography flown as part of a Canadian Centre for Remote Sensing project also became available. These were flown on July 6 and on August 19, 1972. Photographs at a scale of approximately 1:105,000 were produced, in 9X9 color end 70 mm prints. The 70 mm photography covers only a strip in the centre of the flight line, but provides black and white, black and white infrared and color infrared photographs. The use of the different photographic coverage provided more distinct imagery in some cases, and often enhanced small differences.

It was originally intended to use five acres as the minimum size of unit to be delineated. This guideline has been generally followed in the Long Beach Section, except in some cases where a small, distinct unit could be delineated. For the Broken Islands Section, no minimum size was practical. The most important part of the islands for any management consideration is the shoreline units. It is more valuable to have these delineated accurately than to attempt to complex units to reach a minimum size.

The relationship between soil and vegetation associations was determined through collaboration with Andrew Harcombe of Biocon Services, both in the field and in the preparation of the report. All vegetation Communities and Types referred to in this report are those described in reports to the National Parks Service Bell, 1972; Bell and Harcombe, 1973)

On each soil parent material in the park, the same soil subgroups occur in similar topographic positions. Because time available for sampling was short, it was impossible to prepare soil monoliths from every land type in the park. Soil monolith samples were prepared to illustrate soil profiles on four sites, on different parent materials. These show:

a) an Orthic Humo Ferric Podzol on moderately well drained basal till,

b) an Orthic Humo Ferric Podzol on well drained glaciofluvial gravels with a sandy loam capping,

c) a Gleyed Humo Ferric Podzol on imperfectly drained glaciomarine silt and clay,

d) a Placic Humic Podzol on imperfectly drained marine sands.

To'illustrate the complete range of soils, a sample of a glsysolic soil from a poorly drained site would be needed. The best examples of this soil type would be located in a bog or seepage area. Due to problems encountered from seepage water, it is almost impossible to obtain this sample, except possibly in a period of severe drought.

The guidelines for map presentation and for overlays showing susceptibility to erosion, soil foundation and soil productivity were modified to provide more meaningful results. Local conditions unique to Pacific Rim National Park, i.e. the heavy rainfall, exposure, had to be incorporated into the classifications. The revised guidelines are discussed in Section III. For the Long Beach Section, an additional interpretation for recreation value was added. It was not practical to assign this type of rating to individual units in the Broken Islands Group, but rather to consider the whole group as one unit.

III CLASSIFICATION SYSTEM

Due to the high rainfall and low relief over much of the area, microtopographic position is the major importance to soil development. Most of the land units delineated on the map will contain a wide range of soil types. This is particularly true in the Ucluelet and Tofino Terrain systems. Soil drainage, the most obvious characteristic, will illustrate this variation. Figure 3 shows the relationship between soil drainage and the microtopographic slope position. On the hummocks, even on the lower (major) slope positions, moderately well drained soils may be found. Imperfectly to poorly drained soils occur in the depressions, even on the upper slopes.

Each unit delineated on the map will therefore include a range of soils. The soils legend is a description of the predominant characteristics. Minor components are shown when they cover a significant portion of the unit.

Three types of complexes are shown on the map. The complex "a" means that they unit is predominantly class "a", but may include less than 10% of other classes. Comples "a(b)" indicates that while the unit is predominantly class "a", 10-24% of the area may be class "b". A complex of "a-b" shows that 25-49% of the area is class "b". No three-way complexes have been used.

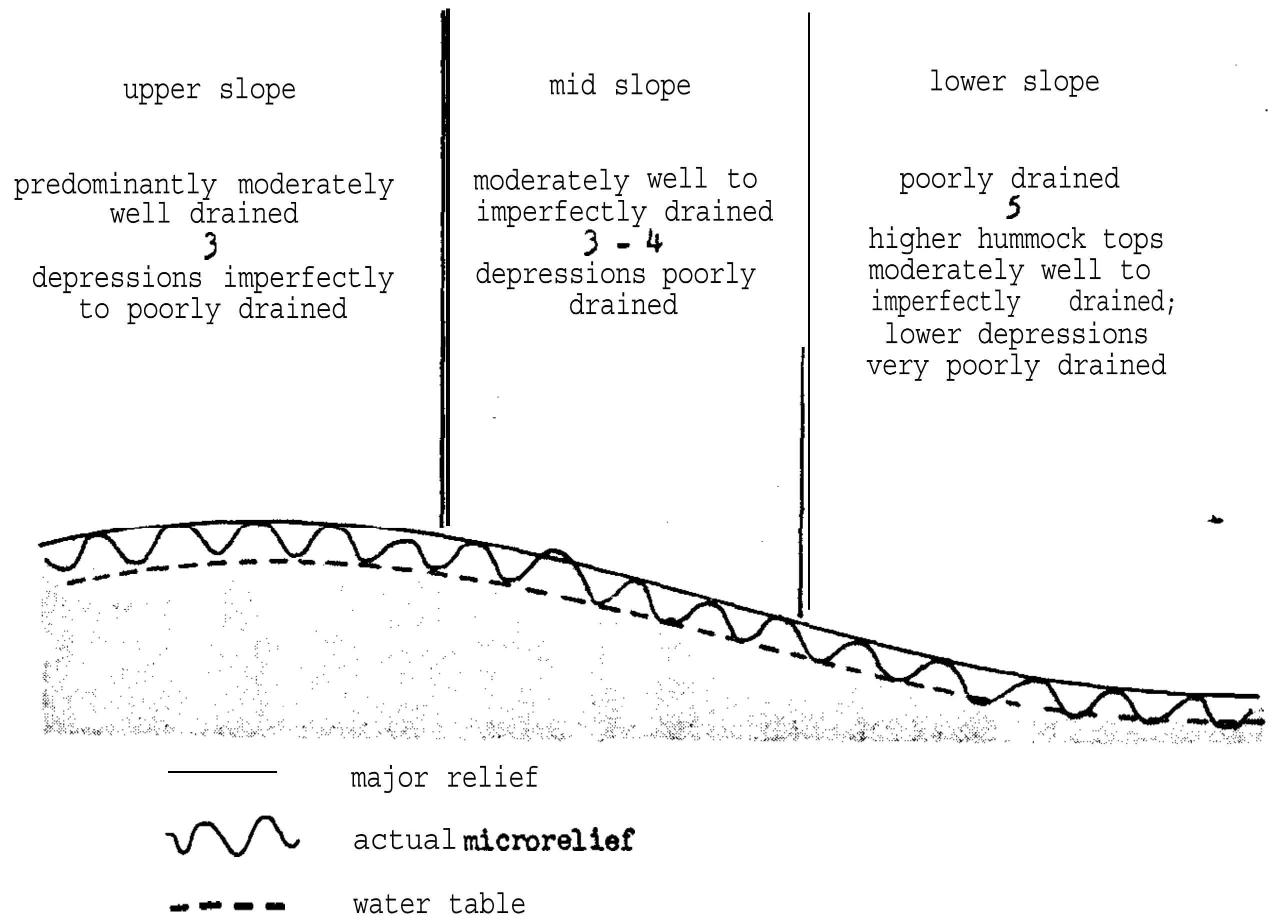


Figure 3. Relationship between soil drainage and topography on gently undulating terrain

Map Legend

a) Unit Boundaries

—— unit boundary (definite).

— — unit boundary (uncertain). In some areas, particularly between different terrain systems, the materials intergrade and the location of the boundary is arbitrary.

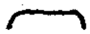
---- sub-unit boundary. This indicates a unit that is sufficiently distinct so that it can be located, although the boundary may not be clear. However, it is not sufficiently different from the major unit to classify separately, either because the difference is not important or the classification system is not fine enough.

b) Unit Number

Each unit has been assigned a number, unique to that unit, in each section of the park. Numbers that have been deleted indicate revision of the map. In the Broken Islands Group, every tenth number has been skipped to allow for revision. The units are normally numbered along the flight lines of the air photos.

c) Local Topography and Relief:

While keeping generally to the guidelines provided, each symbol used must be recognized as being a literal expression of the topography. An attempt thas been made to include important features that may be near the boundary, such as cliffs or faults. This is particularly the case in the Broken Islands Group. Beach units are frequently narrow bands along the shore, backed by a cliff. The symbol used for this would be  . In the case where the shoreline is a cliff with a level area above, it would be shown as  . Rift valleys are shown as  , and slopes broken by cliffs as  .

Symbol	Description
	knob
	hill
	knoll
	plateau
	slope
	complex slope
	flat
	valley or trough
	depression, or wide valley
	depressed flat
	scarp
	rolling, mostly uplands
	rolling mostly lowlands
	rough, broken

d) Slope:

The major or modal slope of the unit is shown by arrows. On the Long Beach Section maps, these have been incorporated into the legend. Further information concerning aspect and complexity of the slopes can be obtained from the topographic map. In the Broken Islands Group, the direction of the slope arrows indicates the major aspect. Many units, however, will have more than one aspect, particularly if they are either broken terrain or hilltops.

In the case of more than one arrow, the slope of the unit is complex. The first arrow is predominant. Arrows that cross each other are indicative of a slope broken by channels, usually faults.

Symbol	Slope Gradient
	0 - 15%
	16 - 30%
	31 - 60%
	61 - 100%
	101+

e) Soil Drainage:

With an annual rainfall of over 100 inches , most of the soils are imperfectly to poorly drained for part of the year. Drainage classes are assigned on the basis of topographic position, vegetation types, soil texture and drainage characteristics. In the marine sands and the glaciofluvial materials, placic horizons occur intermittently throughout most of the area. These will modify the drainage considerably, and must be considered in any planning.

Class	Symbol
Rapidly drained	1
Well drained	2
Moderately well drained	3
Imperfectly drained	4
Poorly drained	5
Very Poorly drained	6

Evapotranspiration from forest cover will remove 5 to 15 (area) inches of water from the soil annually; removal of the forest cover can be expected to increase water to the streams by roughly the same amount (Hewlett and Hibbert, 1961, cited in Meehan, et al., 1969). In low lying areas, where the drainage system cannot remove this increase, the water table may be raised above the surface; areas of the park that have been logged over show the result. The area at the south end of the Long Beach Section (unit 233) is an example. Prior to logging, it sustained an Amabilis fir community (Bell, 1972). Removal of forest cover has resulted in changing the site from moderately well drained to very poorly drained. Regeneration of forest cover will be difficult on these areas.

f) Soil Texture

Soil texture has been classified into seven classes as described below:

Class	Contents	Symbol
Very Coarse Textured		vc
	- Gravel and Coarse Sand	
Coarse Textured		c
	-Sand Coarse Sand Sand Fine Sand Very Fine Sand	
	-Loamy Sands Loamy Coarse Sand Loamy Sand Loamy Fine Sand Loamy Very Fine Sand	
Moderately Coarse Textured		mc
	-Sandy Loams Coarse Sandy Loam Sandy Loam Fine Sandy Loam	

Class	Contents	Symbol
Medium Textured		m
	-Very Fine Sandy Loam Loam Silt Loam Silt	
Moderately Fine Textured		mf
	- Sandy Clay Loam Clay Loam Silty Clay Loam	
Fine Textured		f
	- Sandy Clay Silty Clay Clay	
Very Fine Textured		vf
	- 60% Clay	

g) Soil Compaction:

Soil compaction is grouped into three classes as follows:

Class	Superscript	Landforms Included
Loose	1	Beaches, gleysols, alluvium glaciofluvial deposits
Semi-Compact	2	Marine and glaciomarine deposits, ablation till
Compact	3	Basal till

Soil compaction is a measure of the compation within the developed horizons. In many cases, the underlying soil parent material is more compact. Ablation till and seepage slopes are over compact basal till.

H) Gravel and Stone Content

Particles with a diameter of greater than 2 mm are classified as stone. The following classes have been used.

Symbol %ubscript	Content y Volume	Description	Comments
I	Q - 2		Marine sands, glaciomarine deposits, some glaciofluvial
II	21 - 5	gravelly	Ablation and basal till
III	5 - 90	Very gravelly	Glaciofluvial deposits
Iv	91 +	cobbles or boulders	Some beach deposits

i) land form:

Each unit has been classified according to its mode of origin, using the following classification:1/(Those occurring within the park are described.)

1) Glacial Landforms

Till Deposits (T) - Material deposited directly by glaciers

- Moraines (T1)
- Basal Till (T2) - a compacted layer of material deposited directly by ice. The materials are unsorted and unstratified, and textured is variable.
- Thin Drift (T3) - a very thin layer of basal till, with frequent rock outcrops.

1/Definitions and explanations are primarily from Fairbridge, R.N., 1968, Tie Encyclopedia of Geomorphology, Reinhold Book Corporation, New York, and Runka, G.G., n.d, Descriptions of Landforms, (Cordillera and Pacific Coast) unpublished.

- Ablation Till (T4) - material transported by the glacier, and deposited on the land surface when the ice is melted. The materials may be poorly sorted and stratified. Textures vary, and water-worked materials are common. In the park, ablation till is commonly deposited over basal till.

Glaciofluvial Deposits (F) - materials deposited by glacial meltwater.

- Outwash Plains (F1) - Gravels and sands deposited by melt water. The deposits range from well sorted and well stratified to poorly sorted and poorly stratified. The slopes are gentle. In the park, there is a sandy capping on most of the glaciofluvial deposits, of variable depth. This is generally deeper at the west edge of the deposit.
- Terraces (F2)
- Deltas and Fans (F3)
- Kames (T4) - material deposited by meltwater in contact with glacial ice. Texture is usually coarse, and the deposit is well sorted and stratified.
- Eskers (F5)

Glaciolacustrine (L) - materials deposited in still fresh water.

- Lakesheds (L1)
- Beach Complex (L2) - well sorted and stratified sands. In the park, the beaches of Kennedy Lake have been classified as glaciolacustrine, although these are still active.

Glaciomarine (GM) - materials deposited in still salt water.

Texture is fine, and the materials are sorted, although deposits of sand and frequent stones occur through the profile

Photo 4 **Mullins** Island - showing wide range of stoniness which is possible on **M2-marine** shoreline or beach, Stoniness ranges from I at left to IV at right

Photo 5 Wouwer Island X - **Stoniness** ranges from III in foreground to II **(possibly** I) **to** IV.

2) Post Glacial **Landforms:**

Waterlaid deposits (W) - material deposited by flowing water.

- Alluvial Floodplains **(W1)** - fine, well-sorted materials deposited on the valley floor.
- Deltas or Fans (W2) - materials deposited at strew mouth. Textures are generally coarser at the upstream edge of the deposit.
- Ponds (W3)
- Seepage Slope (WA) - Fines carried downslope by surface runoff and seepage flows. These are deposited at the base of the slope. Texture is very fine, with a high organic content.

Wind (Aeolian) Deposits (A) - materials laid down by wind. Some of the marine sands have been reworked by wind, and dune formation can be found on some beaches and near the **Tofino** Airport. These materials have been classified as marine.

- Sand Dunes (Al)
- Sand Plains (A2)
- **Loessal** Plains (A3)
- Volcanic Ash (AL+)

Organic Deposits (0) - deposits of organic materials that accumulate in and around closed basins, occasionally in lower slope, moisture receiving areas. The seepage areas **(W4),** classified as alluvial and grouped with gleyed ablation till, are transitional to the latter type of deposit. Organic deposits occur on the Broken Islands Group, and are described by Bell and Harcombe. One unit (Unit **114)** occurs in the Long Beach Section.

- Wetlands (01)
- Marsh (02)
- Swamp, fen bog (03)

Gravity Deposits (G) - materials transported downslope by gravity.

- Landslides (G1)
- Talus (G2)
- Colluvium (G3) - loose, unstratified material accumlating at the base of a slope.

Residual Deposits (Q) - In the park, this is used to refer to soils that develop directly from the parent material, in this case bedrock. These soils are very coarse textured, with fragments of rock and gravel, and high organic content (Photo 28). They are mapped as QR.

Marine Deposits (M) - materials deposited in a marine environment. Texture varies from sands to clays, which are moderately well sorted and moderately well stratified. Scattered deposits of shells may occur.

- Marine Plains (M1)
- Shorelines or Beaches (M2) - a plain with long, narrow, small ridges. Materials are sands, well sorted and stratified.
- Tidal Flats (M3) - fine materials, well sorted and stratified, which are inundated at high tide.
- Tidal Marshes (M4) - tidal areas other than beaches or rocks were mapped as M3.

Bedrock (R) - Bedrock geology for the park area is or will be available in the near future. The bedrock was not subdivided in this report.

-Sedimentary (R1)

-Igneous (R2)

- .Metamorphic (R3)

Two additional landform types were added to the guidelines provided to cover sites found in Pacific Rim. These were ablation till and seepage slopes.

j) Soil Depth:

On most of the soils in the park there is a deep organic horizon. Most of the nutrients are provided to the vegetation from this layer. The water table is close to the surface on most soils for at least part of the year, effectively reducing rooting depth. The water table is supported by placic horizons, by shallow soils wer a compacted parent material or bedrock (Photo 5, 6, 7). In many units, poor drainage is also a factor. Soil depth is the depth to an impermeable layer or permanent water table, but may not be the actual rooting depth. The following classification was used:

Symbol	Description	Depth (inches)
VS	Very shallow	0 -- 15
S	Shallow	15 - 30
MS	Moderately shallow	30 - 45
MD	Moderately deep	45 - 60
D	Deep	60 +

Photo 6. Turret Island - Soil depth below *trees* may be very shallow - Light colored material is bedrock, with no developed soil.

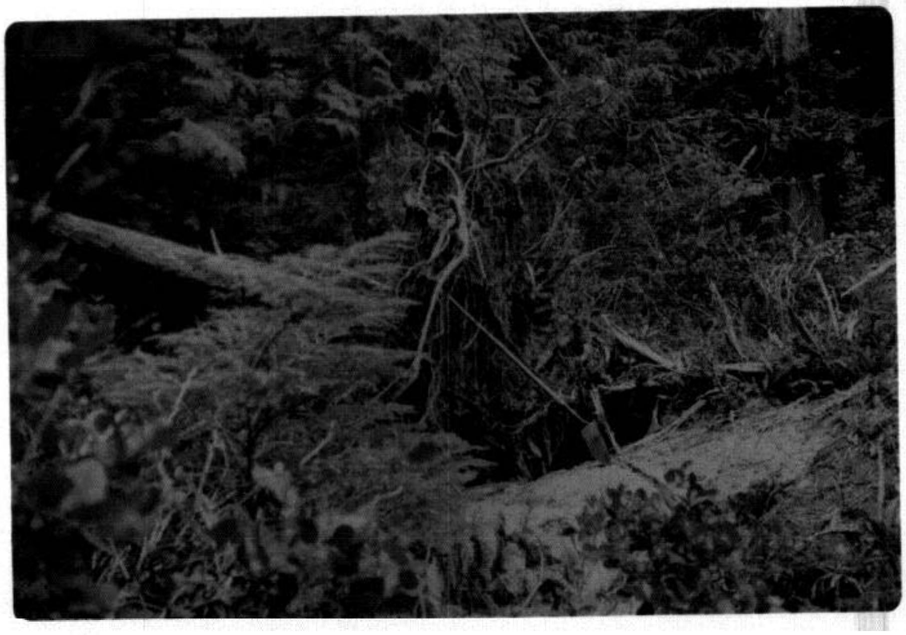


Photo 7. Brabant Island - Wind-thrown tree, showing root material. Rooting is shallow and extensive in spite of moderately deep, semicompact ablation till soil on moderately well-drained site.

IV SOILS

The soils in the park can be grouped into four classes:

a) the till soils

b) the **Tofino**, and

c) Ucluelet terrain systems described by Valentine (1971)

d) the Grice Bay terrain system proposed by Bell (1972).

All four systems occur extensively through the Long Beach Section. In the Broken Islands Group, the till soils are the most extensive* Marine deposits similar to Grice Ray soils occur on many islands. The soils have been tentatively identified to the subgroup level. There may be considerable variation in many units, however, because of soil depth or microtopographic relief.

The main factors influencing soil **development** are the high rainfall, **mcderate** temperatures and topography. Soils are acid, with generally low nutrient content. Rooting depth is restricted in most sites by impermeable horizons or bedrock or by a high water table.

There are a number of unique soil units within the park. Time did not allow detailed examination of these sites, and they have beennoted to appendices as, for example, x Uc, on a **kame** deposit similar to the glaciofluvial gravels and sands. Soil for the Long Beach Section are given in the appendix. **Thc units** were too small to include the entire legend in the Broken Islands Group; the unit legend includes local topography, slope and soil only. The entire legend is shown in the appendix.

Till Soils:

Till soils occur on rolling to rugged topography on the higher elevations in the Long Beach Section - the D.O.T. Hills, Indian Island and the ridges to the south and east of it, the slopes east of Kennedy Iake, and on scattered bedrock outcrops. It is the most common group in the Broken Island Group. Till soils have been classfied as basal till or ablation till soils, and separated further on the basis of soil depth, exposure and topographic position. Parent material is glacial till : ablation till over basal till over bedrock on mid to lower slopes, basal till over bedrock on mid to upper slopes and thin drift on the hilltops.

A) Basal Till:

i) Trr - Thin drift: very shallow basal till, with frequent exposures of bedrock is characteristic of this soil. It is common on upper slopes and hilltops. In the Broken Islands Group, it allso occurs on exposed south-facing slopes (Photos 8 &9). The soil is Lithic Humo Ferric Podeol.

Vegetation:

Long Beach - Lodgepole pine and Cedar-Hemlock communities

Broken Islands - Thuja plicata forest type or Gaultheria shallon shrub type

Legend: A ↘↘

2-3 m - $\frac{3}{III}$ $\frac{T3}{VS}$

Erosion:

1,2 - steep slope, exposure

Foundation:

1 - shallow depth, slope

Photo 8. Dodd Island - *Thuja plicata* - *Vaccinium ovatum* forest type

Photo 9. Dodd Island-very shallow till over bedrock (Trr)

Productivity: 4 (3)

ii) Tr - Basal till: Soil depth is greater than Trr soils, though the soil is still Lithic Humo Ferric Podzol. It is located on mid- slope position, occasionally on protected upper slopes (Photos 10, 11, 12).

Vegetation:

Long Beach - Lodgepole pine or Cedar-Hemlock forest types, occasionally Amabilis fir.

Broken Islands - usually Thuja plicata of Thuja plicata - Vaccinium ovatum forest types.

Legend: 3-2 m $\frac{3}{II}$ $\frac{T2}{S-VS}$

Erosion: 1 - 2 Slopes, (exposure)

Foundation: 1 Steep slopes and depth, stability

Productivity: 3 - 4

B) Ablation till:

i) Tar - Shallow Ablation till: Soils on this unit are very similar to those on basal till units, although the depth of developed soils is greater. It generally occurs on sheltered mid to upper slopes, grading into basal till. Orthic Humo Ferric Podzols are found on most units.

Vegetation:

Long Beach - Lodgepole pine or Cedar-Hemlock forest types

Broken Islands - Thuja plicata or Thuja plicata - Vaccinium ovatum forest types.

Legend: 3(2) m $\frac{2-3}{II}$ $\frac{T4}{S}$

Erosion: 1 2 - slopes

Foundation: 2 - slopes

Productivity: 3

ii) Ta Ablation Till: Generally found on mid to lower slopes positions with a moderate slope, these soils have the highest productivity in the park. Soil depth varies, but is usually moderately deep, showing an Orthic Humo Ferric Podzol soil development. In some cases, there is an incipient placic horizon.

Vegetation:

Long Beach: Lodgepole pine, Cedar-Hemlock or Amabilis fir forest types.

Broken Islands: Thuja plicata - Tsuga heterophylla forest type

Legend:  3(4) m $\frac{T4}{II\ \ MD\text{-}S}$

Erosion: 2 - 1 semicompact soils on slopes

Foundation: 2 - mot usually better than moderately well drained

Productivity: 2 - 3 occasionally 1

iii) Tag Gleyed ablation till: In areas receiving seepage water, two soils occur, both of which are classified as Tag. The major soil is a Gleyed Humo Ferric Podzol on ablation till. Soil depth is generally moderately deep with imperfect drainage.

Seepage water and surface runoff often remove fines and organic matter from the upper slopes, depositing them at lower elevations. This deposit may be up to 30 inches deep in places. The profile development is a Rego Humic Gleysol with till below (Photos 15,16) This soil occurs in units too small to map and is included with gleyed ablation till.

Vegetation:

Long Beach: Amabilis fir or Cedar-Hemlock forest types, occasionally Lcdgepole pine near the shore.

Broken Island: Tsuga heterophylla - Blechnum spicant on the better drained portions, and Tsuga heterophylla-Sphagnum girgensohnii on the gleysolic soils.

Legend: ↘ 4(5) m (mf) $\frac{1}{II}$ $\frac{T4}{MD\text{-}VS}$

Erosion: 3-4-lower slopes

Foundation: 1-2-soil moisture, drainage

Productivity: 3-2

Photo 10. **Wiebe** Island - **Thuja** plicata - **Vaccinium ovatum** forest type cover basal till over bedrock **(Trr)**

Photo 11. Wiebe Island - Basal Till in centre of Photo 10

Photo 12. Turtle Island - Shallow basal. till soil, washed by seepage water. Note thick organic layer, and seepage water in pit.

Photo 13

Benson Island - Ablation till over basal till. The ablation till has been disturbed probably by wind-thrown trees.

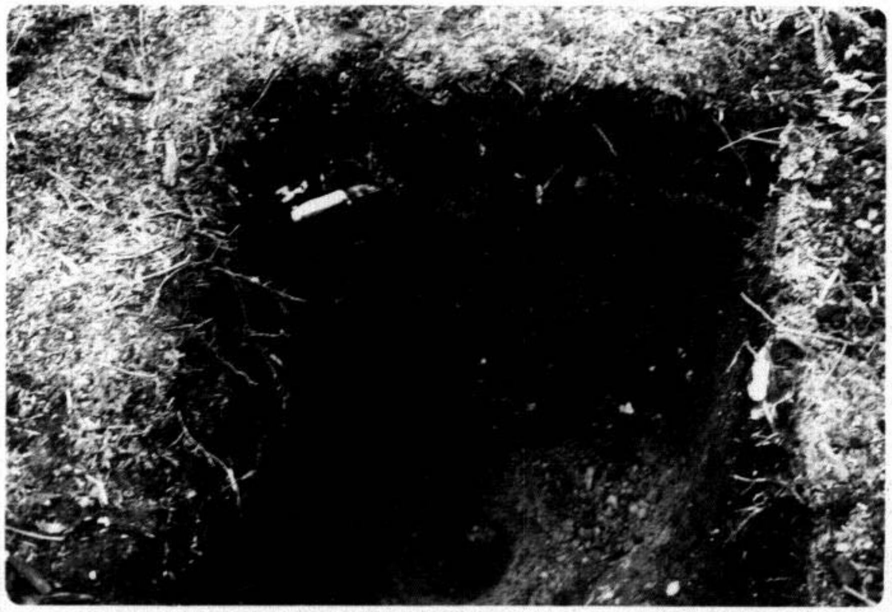


Photo 14

D. O. T. Hills - Ablation till over basal till.

Photo 15 Effingham Island - *Tsuga Heterophylla* - *Blechnum spicant* forest type (T4) on seepage slope behind Indain Reservation.

Photo 16. Effingham Island - Rego Humic Gleysol over basal till on seepage slope behind Indian Reservation. The photograph was taken 2 weeks after the last rain.

Ucluelet Terrain System:

The Ucluelet terrain system is the part of the coastal plain formed from glaciofluvial materials over marine clays (Photo 17). Depth of the outwash material varies, from 10 to 40 feet (Valentine, 1971). Over the gravels, there is a sandy loam to sandy clay loam capping, 12 to 36 inches thick (Photo 18). Topography is gently undulating; slopes rarely exceed 10%. Cemented horizons and intermittent placic horizons occur, which tend to restrict vertical drainage.

There are three soil series within this terrain system,

i) Uclulet Series

The Ucluelet soils are moderately well drained Orthic Humo Ferric Podozols in upper slope positions. Indurated horizons occur intermittently at varying depth that impede vertical drainage and root development.

Vegetation: Ambilis fir forest type or logged-over amabilis fir type, Lodgepole pine.

Legend: /7 ↘ 3 c-vc $\frac{1}{III}$ $\frac{Fl}{D}$

Erosion: 3- some areas, such as banks, may be 2

Foundation: 3- drainage

Productivity: 3-2

ii) Sandhill Series

The Sandhill soils occur on mid-slope positions and in shallow valleys in the glaciofluvial deposits. They are typically Gleyed Orthic Humo Ferric Podzols. Discontinuous iron pans occur in the lower horizons, impeding drainage and root development. These pens are difficult to detect except by sampling.

Vegetation: **Lodgepole** pine or occasionally Cedar-Hemlock forests.

Legend: ↘ ↘ **4 c** $\frac{1}{III}$ $\frac{F1}{MB\text{-}S}$

Erosion: 3-2 generally at lower slope positions

Foundation: 2-1 drainage

Productivity: 3 high water table, periodic flooding

iii) Wreck Bay Series

Wreck Bay soils occur on poorly drained lower slopes and depressional areas. The soil is classified as **Placic** Humic **podzol** (Valentine, 1971) and **Gleyed** placic Ferro Humic Podeol **(Bhoojedhur** 1968). Baker (personal communication) feels that placic horizons are more common at the periphery, where the water table fluctuates, and that soils in the bog are Humic Gleysols. Sampling, however, is difficult. Soils are generally very shallow, with an accumulation of organic matter on the surface.

Vegetation: Sphagnum bogs

Legend: ⌣ ↘ **6 mc** _1 **F1**
11 vs

Erosion: 4 - depression

Foundation: 1 - drainage

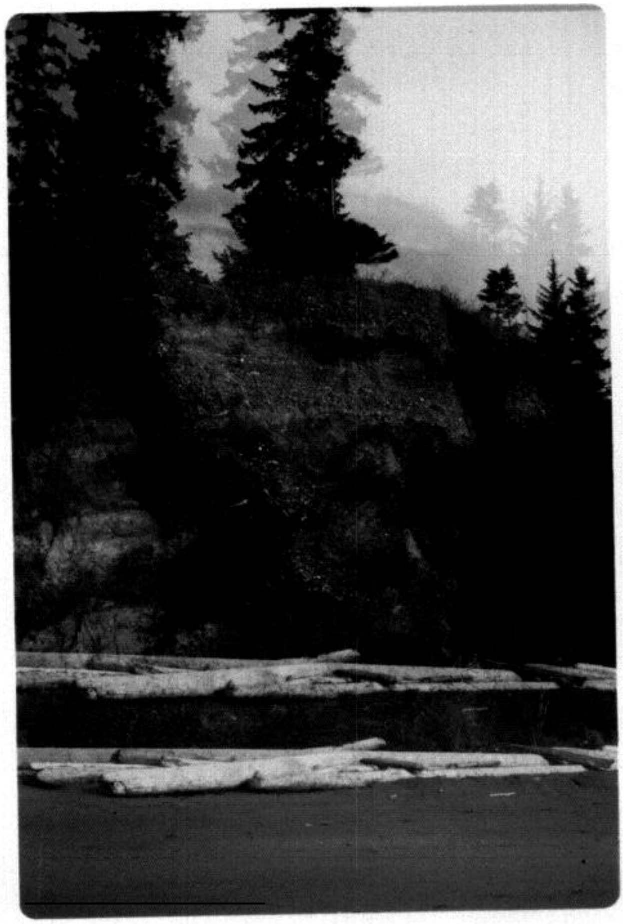
Productivity: 4 - drainage and soil depth

Tofino Terrain System:

The Tofino Terrain system is made up of soils developed from **glacio-**marine clays. The parent material is a bluish gray clay with occasional sand lenses and frequent stones up to 5 inches **in** diameter. Occasional small marine shells occur. The topography is level to gently undulating, sloping to the east.

Photo 17. Wreck Bay - Gravel capping over marine clay."

Photo 18. Gravel Pit near Dept. of Highways compound - The soil development occurs primarily in the sandy capping. The steep face is maintained because of the high iron content, which hardens after exposure to air.



The maximum elevation of this parent material is about 150 feet. A number of bedrock outcrops rise above this level, which are normally covered by till soils (Photo 19). Series delineated are the same as those mapped by Valentine. Variation in each unit is less than in the corresponding series in the Ucluelet terrain system.

i) Kennedy Lake Series:

Soils of the Kennedy Lake series are found on gentle slopes that allow lateral soil drainage. The major units are in the river valleys. Moderately well-drained Orthic Humo Ferric Podzols predominate.

Vegetation: Ambilis fir end Cedar-Hemlock predominate, although there is some Lodgepole pine.

Legend: 3 f $\frac{2 \quad GM}{I \quad MD\text{-}D}$

Erosion: 2 - 3 depending on slope

Foundation: 2 - due to drainage

Productivity: 2 - 3

ii) Kootowis-series:

The Kootowis soils are imperfectly drained and occur on level or gently sloping sites. The soils are usually Gleyed Humo Ferric Podzol, occassionally Gleysols (Baker, personal communication). Mottling occurs in the lower horizons and the soil is wet most of the year.

Photo 19. East of Kootowis Creek - Glaciomarine deposits, with outcrops of rock.

Photo 20. Creek valley in glaciomarine deposits.

Photo 21. Indian Island north side, showing break between glaciomarine deposits and till.

Vegetation: mostly Lodgepole pine, with some Cedar-Hemlock forests

Legend: ~ ↘ 4 f $\frac{2}{I}$ $\frac{GM}{S}$

Erosion: 2 - 3 topography

Foundation: 3 - drainage

Productivity: 3

iii) Tofino Series:

The Tofino siols are Rego Humic Gleysols found in depressions or level topography. The water table is usually just below the mineral soil surface. Organic matter deeper than 10 inches thick is common.

Vegetation: Sphagnum

Legend: ~ ↘ 5 - 6 f $\frac{1}{1}$ $\frac{GM}{Vs}$

Erosion: 4 - base level

Foundation: 1 - drainage

Productivity: 4

Grice Bay Terrain System

The Grice Bay terrain system was proposed by Bell (1972) to encompass the marine deposits at the north and of the Long Beach Section (Photo 22). Soils in this system cover a wide range of textures and development. Three types of soil are defined:

i) Schooner Soils:

The Schooner soils are Placic Humic Podeols that have developed on marine sands. Topography is level to very gently undulating. Drainage varies from monderately well to imperfect. A well-developed placic horizon occurs at varying depth over most of the area, usually between 8 to 30 inches.

An old beach line can be delineated on air photos, to the west of the Tofino Airport. There is the possibility of wind erosion on these soils if vegetation is removed and the sites are drained. This has occured on areas near the airport. Schooner soils in the Broken Islands may not have the placic horizon, but are similar in other respects to those in Long Beach.

Vegetation: Long Beach - Lodgepole pine

Legend: ~ ↘ 4 c 2-3 M2
1 MD-VS

Erosion: 3 - level and cemented

Foundation: 2-4, depending on drainage

Productivity; 4 - shallow, nutrient level extremely low

ii) Grice Bay Service

Grice Bay soils have developed on marine silts and clays deposited in erosion channels in the marine sands. In some cases, the sands and clays are interbedded. Present drainage follows the same channels.. These soils are Gleyed Humo Ferric Podzols similar to the Kennedy lake Series (Baker, personal communication).

Vegetation: Amabilis fir Cedar-Hemlock forests

Legend: ~ ↘(↘) 4-3 f 1 M2-GM
MD

Erosion: 2 - loose, slopes

Foundation: 2 - compaction, stability

Productivity: 3 - 2

iii) Long Beach Series

Long Beach soils are well-drained Regosols, found on the backshore or the beach. They are uncompacted and susceptible to wind erosion. Dune formation may occur on some sites, particularly if vegetation is removed and the soil is disturbed.'

Vegetation:

Long Beach - *Elymus*, *Carex macrocephala* or Sitka spruce

Broken Group - mostly *Picea sitchensis* - *Tsuga heterophylla* forest type or *Thuja plicata* - *Tsuga heterophylla* forest type

Legend: ╰─ ↘ 2-3 c.1 M2
i m-s

Erosion: 1 - compaction

Foundation: 2 - stability

Productivity: 4 - low nutrient level

Photo 22. Schooner, Cove - showing till on hills in foreground, and marine sands on shoreline and in background.

Photo 23. North Wickaninnish Inn - Sanddunes forming on marine sands.

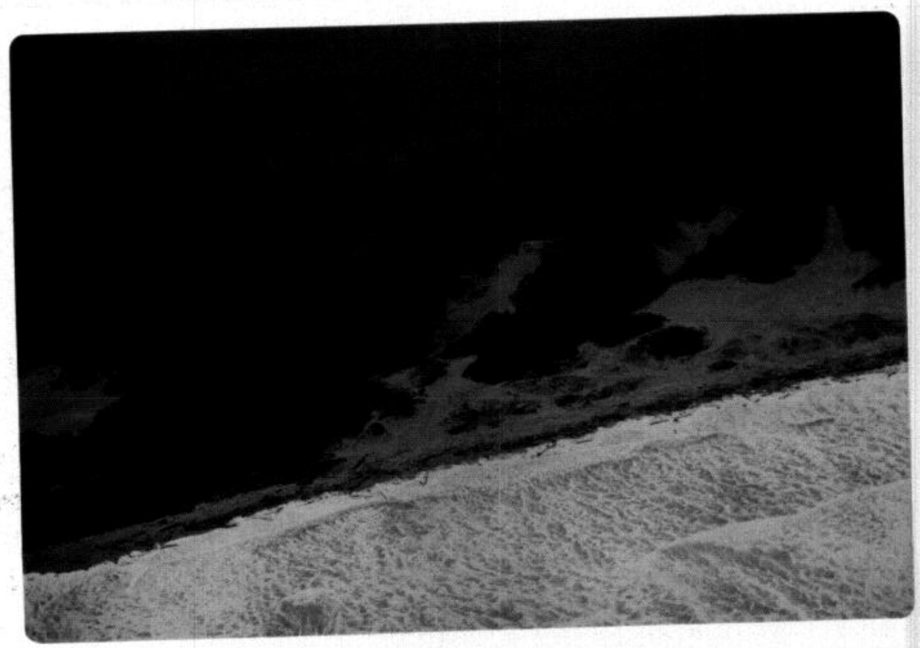


Photo 24. Willis Island northwest side - narrow beach along the shore, with till (Ta, Tr) behind.

There are a number of other soils occurring in the park, that do not fit into the grouping. They occur infrequently, in units too small to map, or a regosolic soils. The following occur:

i) M3 - Tidal Flats. These occur in Grice Bay, and in some lagoons on the Broken Islands Group. Texture in Grice Ray is generally fine; however, it is coarse in the islands.

ii)03 - Organic bogs. These occur in three of the islands in the Broken Islands Group. Soils are deep, composed of organic material including a high proportion of wood. Mineral soil was not found during sampling. Standing water is present throughout the year on all of the bogs. A detailed description of each bog is given in the Flora and Vegetation (Photo 25).

iii)QR- Soils developed in situ on rocky inlets and headlands. The soils are developed from rocks or traces of basal till, and consist mainly of organic matter with rock fragments. Vegetation is usually a dense mat, most commonly Gaultheria shallon (Photos 26, 27).

iv) R - Rocky Headlands - Exposed headlands have been classified as R. Soil occurs only in pockets, and is composed of organic material. Vegetation types are Rock/Festuca rubra in the Broken Islands. Group, and Potentilla villoso in the Long Beach Section.

v) Middens - Middens are an accumulation of cultural refuse deposited by the inhabitants over varying times. These sites are generally located behind sheltered beaches, with fresh water nearby. The Sitka spruce, common immedicately behind the midden, are also significant. No classification was done of middens (Photos 29.30).

vi) L2- Beach complex - an active beach on Kennedy Lake was classified It is similar to Long Beach soils.

vii) W1 - Alluvial flood plain - A small valley flowing through glaciomarine soils into Kennedy Lake is classified as W1. Soils are regosols, mapped as similar to Ko Rg.

viii) W2 - Alluvial fan - at north entrance to the park; similar to Uc.

ix) F4 Kame - Tofino gravel pit just inside the park; similar to Uc.

x)G3 Colluviam - usually over till

xi) Regosols (Rg) - On areas with variable or poor drainage, soils have been mapped as regosolic. Development varies from Humic Regosols to Rego Humic Gleysols. In the Broken Group, marine deposits may be a mixture of Schooner soils and Regosols.

Photo 25. Effingham Island - organic bog; Tag in foreground, and Trr along shoreline in background.

Photo 26. Effingham Island - East end of Lake, showing shoreline conditions.

Photo 27. Windswept islet between Batley and Wouwer - shows QR.

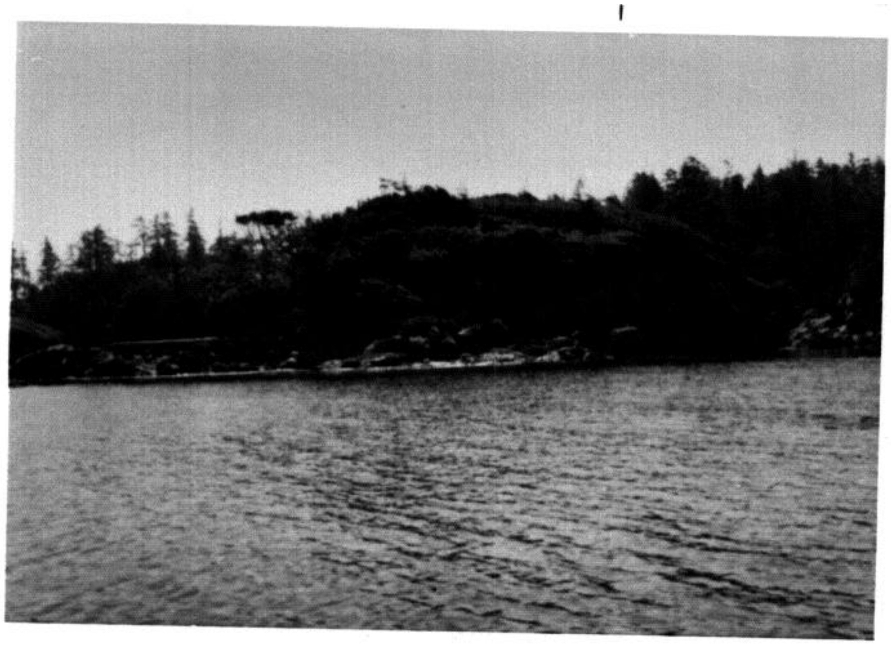


Photo 28. Cree Island - QR under wind-thrown trees.

Photo 29. Nettle Island - Indian Reservation midden site.

30. Wouwer Island - Midden deposit; stratification shows slightly.

Photo 31 Kennedy Lake - Beach complex on shoreline (L2) and glaciomarine deposits behind.

V. MAP OVERLAYS

Susceptibility to Erosion

Four forms of erosion are easily distinquished in the park - wind erosion, mass wastage, wave erosion, and soil erosion due to water flowing over the surface.

i) Wind Erosion: This occurs only in limited areas. There are three areas in the Long Beach Section where this type of erosion is significant. These are near Radar Beaches (units 41, 75), near the southeast end of the Tofino Airport runways(units 98,99, 100), and from the mouth of Lost Shoe Creek to the Wickaninnish Inn (unit 189). There are active dunes in all areas. The most fragile are those on the shoreline. Vegetation on these is Carex macrocephala. If they are to be maintainsd in their present state, use must be restricted. It may be possible to stabilize some of the areas by introducing and maintaining vegetative cover.

ii) Mass Wastage: The areas susceptible to mass wastage are the steeper ablation till slopes, and some of the headlands underlain by marine sediments. There are few units of the former type in the Long Beach section; however, it is a common unit in the Broken Group. Provided that vegetative cover is maintained, and use is limited, there is relatively low hazard. 'Headlands underlain by marine sediments occur along Wreck (Florencia) Bay (unit 203). There is nc practical method of reducing the hazards in these areas. Developments close to the headland should be avoided.

iii) Shoreline Erosion: With a fetch of thousands of miles, the waves that break on the outer coast of the park, expecially during winter storms, have a high erosive potential. All of the beaches and headlands are being continually eroded. Erosion of the beaches follows an annual cycle. Sand is removed during the winter, and redeposited during the spring and Sumner. In the Broken Islands, most of the beaches are sheltered from the direct impact of the ocean waves; however, a similsr cycle is expected.

iv) Soil Erosion: On soils in the Rocky Mountain Reserve of Alberta, The most important soil properties affecting erosion hazard are infiltration rate, grain size characteristics, carbonate cement content and binding strength of silt and clay. The most important external features are vegetation; slope steepness and rainfall intensity (Rutter, 1968). The external features are most important in Pacific Rim National Park. Rainfall intensity is not measured at meteorological sites near the park, but it is expected to be high. Maximum daily precipitation recorded at Tofino Airport is 6.86 inches. The high annual rainfall will tend to saturate the soils during the winter months beyond the infiltration rate. Carbonate cement is absent except possibly in conjunction with limestone outcrops.

The classification used provides an indication of the potential erosion of the soil on each site, once the vegetation and organic layers are removed. Under present vegetative cover, potential erosion on most of the park is low. Trees andunderstory vegetation break the force of wind and rain, and the thick layer or organic matter and roots slows surface water movement and blankets the soil.

Susceptibility of soil to erosion is determined by examining and interpreting the following factors:'

- slope - Increasing slope increases the gravitational pull on particles and the velocity at which water flows, and hence its erosive power.
- Topographic position - Concave upper slopes and steep mid slopes are more susceptible than lower slopes or depressions, in which soil accretion is more likely than erosion. On the flat low lying land, the water tends to accumulate and, without runoff, erosion is low.
- exposure - Winds are predominantly from the southeast during the winter, commonly rising to greater than 32 mph in storms, and from the northwest in summer. Slopes exposed to rains driven by winds of this strength have been eroded to shallow soils. This is particularly evident in the Broken Islands Group. Slopes with a southerly aspect, particularly on the outer islands, have very shallow soils with low dense vegetation only. On the lee side of the islands, soil is deeper. Thuja plicata - Tsuga heterophylla forest communities predominate.
- soil texture soil drainage and evidence of movement (other than mass wastage) are examined in relation to site factors. On Long Long Beach Section, cementation is an important consideration as well. The formation of iron pans, particularly in the marine sands and glaciofluvial deposits, has an effect on other soil factors, and thus on erosion. Under conditions of high leaching, there is an accumulation of iron and aluminum in the lower horizons of these soils which become cemented on exposure to air (Baker, personal communication). For this reason, the exposed gravel and sand banks

maintain almost vertical faces, in spite of the high rainfall.

- Other soil characteristics, such as infiltration rate, grain size, characteristics and binding strength, are considered.

On the basis of an interpretation of the above factors, the unit is classified according to the following ratings:

Class 1 - Extreme erodability. No erosion preventative practices would help. These sites should be avoided for any development.

Class 2 - High erodability - These sites should be avoided though some help from erosion practices is possible.

Class 3 - Moderate erodability - Normal erosion preventative practices should be effective.

Class 4 - Low erodability - These sites are reistant to erosive action

It should be noted, however, that the best sites for development in Pacific Rim are usually those of moderate erodability. Low erodability sites include many very poorly drained areas, such as bogs and seepage slopes, which are soil accretion areas. The soil on these sites is inherently highly erodable but, due to topographic position, will remain stable.

Soil Foundation:

The classification for soil foundation provides an indication of the suitability of the unit for development. It is based on an assessment of such soil factors as texture, soil drainage, compressive strength and stability, and site factors such as slope and soil depth.

Class 1 - Extremely low or no suitability - Sandy silty clay loams, sandy and silty clay, as well as clay, alluvium, swamp muck, marsh land and made land compressive strength and stability extremely poor to nil; very poorly drained; slopes greater than 30%; soil depth very shallow to bedrock.

Class 2- Low suitability - sandy loam, gravel and beach sand; compressive strength and stability poor; imperfectly to poorly drained; slopes less than 30%; soil depth shallow.

Class 3- Moderate suitability - gravelly sand to fine sandy loam; compressive strength and stability moderate; moderately well drained; gently sloping; soil depth at least moderately shallow.

Class 4- High suitability - gravelly to stony, sandy loams or gravelly sand or silt loams; high compressive strength and stability; rapidly to well drained, gently sloping. The most important limiting factor in the park is soil drainage. Few units are better than moderately well drained, except on steep slopes.

Soil Productivity:

A rating for soil productivity was assigned by examining and interpreting the following soil characteristics; fertility, moisture holding capacity, soil depth and organic matter content. Site factors such as exposure and soil drainage were additional factors included. The rating is an indication of the amount of difficulty in regenerating a site once the vegetation is removed. It is biased toward forest productivity.

The following guidelines were used:

Class 1 - High productivity - deep to moderately deep soil (46"+); no restriction to extensive root development; well to imperfectly drained, having good water holding capacity and permeability; topographic position favorable for receiving seepage and nutrients from adjacent areas; high natural fertility; medium texture; organic matter content usually high.

Class 2 - Moderate productivity - moderately deep to moderately shallow soil (31-45") ; slight restrictions to root development; well to moderately well drained with good moisture holding capacity; medium to fine texture; organic matter content moderate. Most common limitations are deficient soil moisture, somewhat low fertility, little topographic advantages to seepage and nutrient supply.

Class 3 - Low productivity - Generally moderate to shallow soil depth (16-30"); extensive root development restricted; excessively or imperfectly to poorly drained; coarse to fine textured; moderate to poor water holding capacity; moderate to low natural fertility; organic matter content low. Most common limitations are excessive or deficient moisture, poor soil structure, excessive carbonates, moderate exposure of bedrock.

Class 4 - Soils with a severe producitivity restriction - very shallow soil (less than 15"), or no soil to bedrock; little or no root development zone; excessively drained (extreme coarse texture) or regularly flooded (very fine textured, or fluctuating water table); extremely low fertility with toxic and/ or high levels of soluble salts; frequent inundation or extreme soil moisture deficiency; extreme exposure of bedrock or excessive stoniness.

The most common limitations in the Park are due to the excessive moisture and poor drainage. On many soils, nutrient levels are low, and vegetation is supported by the nutrients in the organic levels.

d) Recreation Value:

For sites in the long Beach Section, a tentative rating of recreation value was assigned. It is intended to indicate units of high interpretable value. However, it does not indicate the intensity of use which the site can bear. A viewpoint on rock, and a unique sand dune area are rated as class1, the former being almost indestructible, the latter very fragile.

The rating is subjective, and does not consider sites beyond the park boundary. The following classes were used:

Class 1 - high recreation value, this site is rare within the park

Class 2 - moderately high recreation value. This type of site occurs in several areas of the park, or is only of moderate interest.

Class 3 - moderate recreational value. This is the average average site in the park, suitable for general or extensive use, but not of exceptional interest.

Class 4 - limited recreational value. Because of limitations, i.e. poor drainage, this class is of little value for interpretation or recreation.

The Broken Islands were not rated. The entire Group must be considered as a single entity, although there are highlight areas.

Bog areas have been rated as 4, to 3, but possibly should be higher.

This system has developed in the office, and ratings are tentative. The shoreline units have bean classified beyond landform, and are not rated. Sphagnum bogs were rated Class 4, but this may not be correct.

No recreation rating was assigned to units in the Broken Islands. The entire group must be considered as a single entity and cannot be realistically rated as separate units.

VI VEGETATION SOILS RUATIONS

Pacific Rim National Park is located within the Coastal Western Hemlock Zone of the Pacific Coastal Mesothermal Forest, in the Pacific silver fir-western hemlock (wetter) subzone (Krajina, 1965). Due to the climate, the conditions most important to vegetation are exposure on sites along the coast and in the islands, and moisture surplus. Photo 32 shows the difference in height growth in a valley on Cooper Island. The major soil factor in this area is drainage, which is a function of topography. Rooting depth is limited by the fact that the soils are frequently saturated. Most . plants have developed shallow rooting systems, In almost every pit examined, 75-90% of the roots are in the organic layer and in the first few inches of mineral soil (Photo 5, 3, 4). Even on sites where soil conditions appear favorable, the plants develop an extensive root system.

Long Beach Section:

Except where disturbed by man, the park vegetation is predominantly forest. The dominant species are western hemlock (Tsuga heterophylla), western red cedar (Thuja plicata), amabilis fir (Abies amabilis) and lodgepole pine (Pinus contorta) Sitka spruce (Picea sitchensis) and Douglas-fir (pseudotsuga menzeisii) grow only in restricted areas. The three dominant plant communities mapped are Lodgepole pine, Amabilis fir and Cedar-Hemlock. Each is related to site more than to soils.

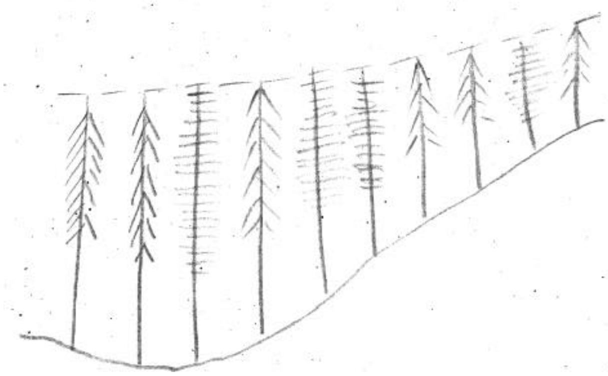
i) Lodgepole pine conununity: This is a broad community described by Bell. It occurs on all parent materials on a range of sites. The community is too broad to relate to specific sites; it occurs on bogs, on imperfectly to poorly drained soils with western red cedar and western hemlock, and on the imperfectly to moderately well drained till slopes.

ii) Amabilis fir community: This community is the climax forest in the Long Beach area (Bell, 1971). It occurs on well drained sites on all landforms. It is most common on glaciofluvial gravels, although it is also mapped on shallow to bedrock units and on beach complex on Kennedy Lake and on clay soils near Grice Bay. It frequently occurs along creak beds. Relief on these sites is favorable to lateral drainage. On theg'laciofluvial soils, most of this community has been logged. Removal of the trees has drastically changed the environment as the water table has risen above the surface and changed them to very poorly drained sites.

iii) Cedar-Hemlock community: This 'type is common on intermediate sites, which are usually imperfectly drained. Under some conditions, scattered lodgepole pine occur. It is common on the hill soils, other than on the D.O.T. hills, and on the Tofino and Grice Bay terrain systems, usually near drainage channels that provide some lateral drainage.

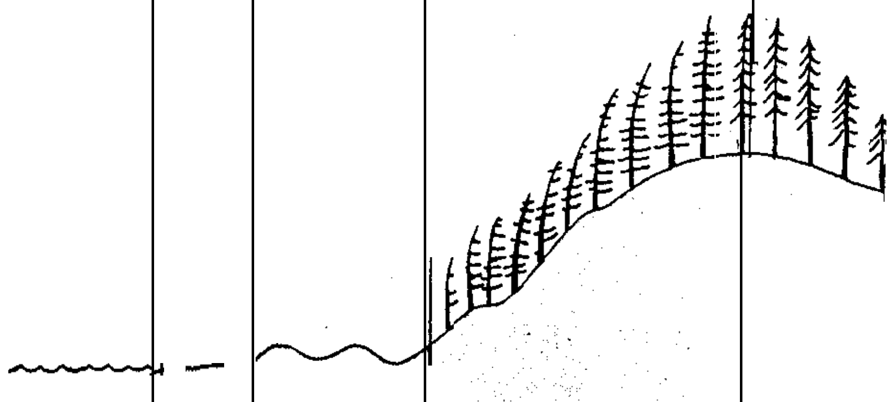
Two other forest communities occur in the Long Beach section: Sitka spruce and Douglas-fir. The former grows in a shallow belt along the exposed coast. Sitka spruce is tolerant to salt and can withstand periodic flooding or saturation of the site. Douglas-fir grows on dry rocky areas, on the southeast end of Indian Island.

Figure 4 shows the relationship between site and vegetation in the long Beach Section. Landforms are not directly related to vegetation, except on the beach sands and the steep till slopes.



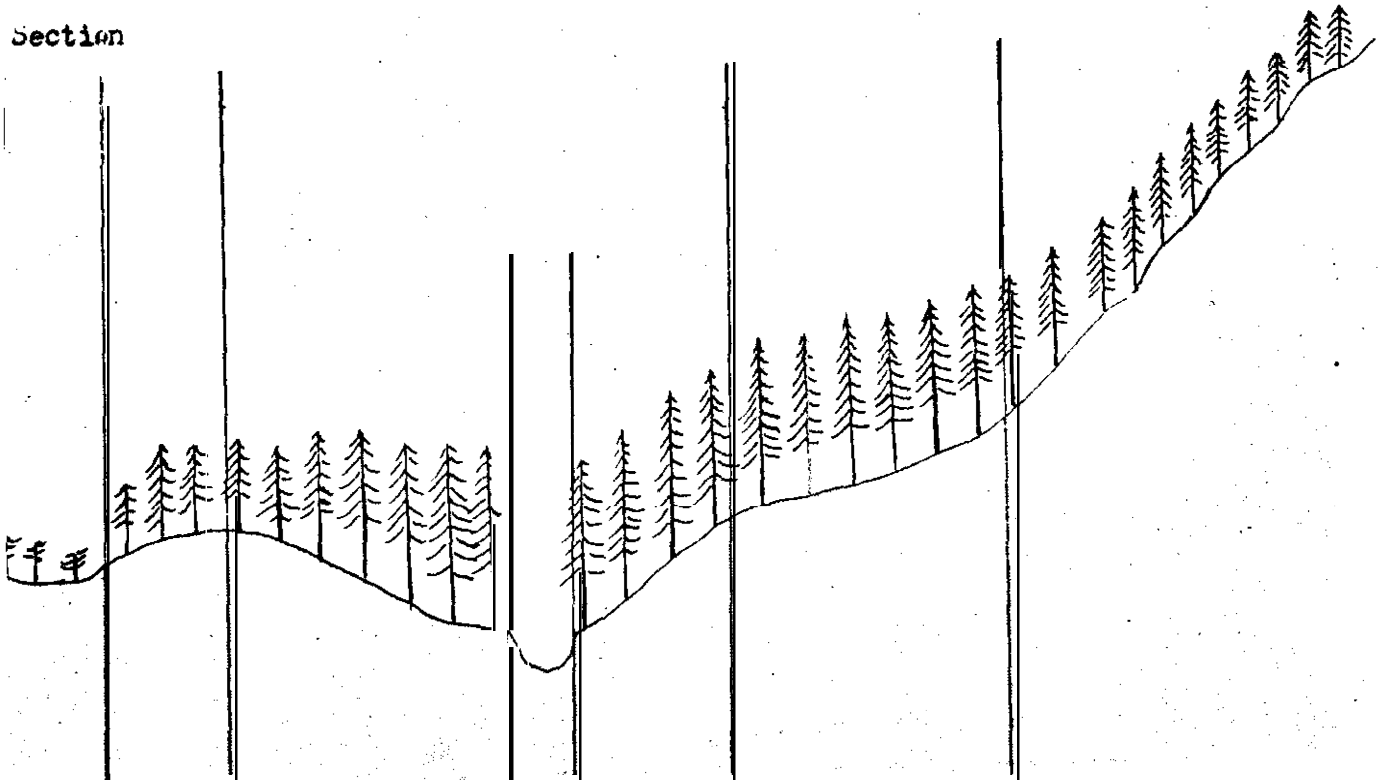
32. Cooper Island, west end - Illustration of the difference in productivity with slope position.

Figure 4. **Vegetation** - Topography relationship in Long Beac



Plant community	Elymus E	Carex macroce-phala C	Sitka Spruce SS	odgepole Pine LP
Topography	each	dunes	xposed backshore and headlands	evel to gently undu-ating
Drainage	ari-ble	rapid to well	moderately well to well	oderatel well to perfect
Soil	12	Lb	UC (Kl)	., Lo, Sc, Ta

Section



Sphag-num bog S	LP	Cedar Hemlock CH		ransit-ional E - A	Amabilis Fir A	Cedar Hemlock CH
depression	ditto	gently sloping	valle	ditto	moderately to gently sloping	moderately to steeply sloping
poor to very poor	ditto	moderately well to imperfect	var	ditto	moderately well	moderately well well to imperfect)
ab, T	Sa, SC,	Uc, Kl, Gb	Hg	Uc, Kl, Gl	Ta, Uc, Kl, (Gb)	Ta, Tar, Tr

Broken Islands Group:

Landforms in this section are less varied than in the Long Beach Section. The major terrain system is Till soils and only one vegetation community, Thuja plicata - Tsuga heterophylla, covers almost 80% of the area. Other communities and types occur under specific conditions of exposure, climate and soil. Comparison of the soils and vegetation maps show that major boundaries roughly coincide. Climate has a greater immediate effect on vegetation types than on soils; thus other boundaries differ, though the site conditions within units agree.

i) Thuja plicata - Tsuga heterophylla forest community: The relationship between soil and forest types within this community are shown in Figure 4.

ii) Picea sitchensis forest community: The Picea sitchensis-Gaultheria shallon forest type grows on sites in the outer islands. Its occurrence is not restricted to the shoreline fringe, as in Long Beach, though the sites are usually exposed. Soils are usually shallow tills, though it does occur on beach deposits on Clarke and Trickett Islands. The second forest type in this community, Picea sitchensis - Tsuga heterophylla, is closely related to Indian midden sites. The trees have been trimmed and are significant as burial sites (White, personal communication).

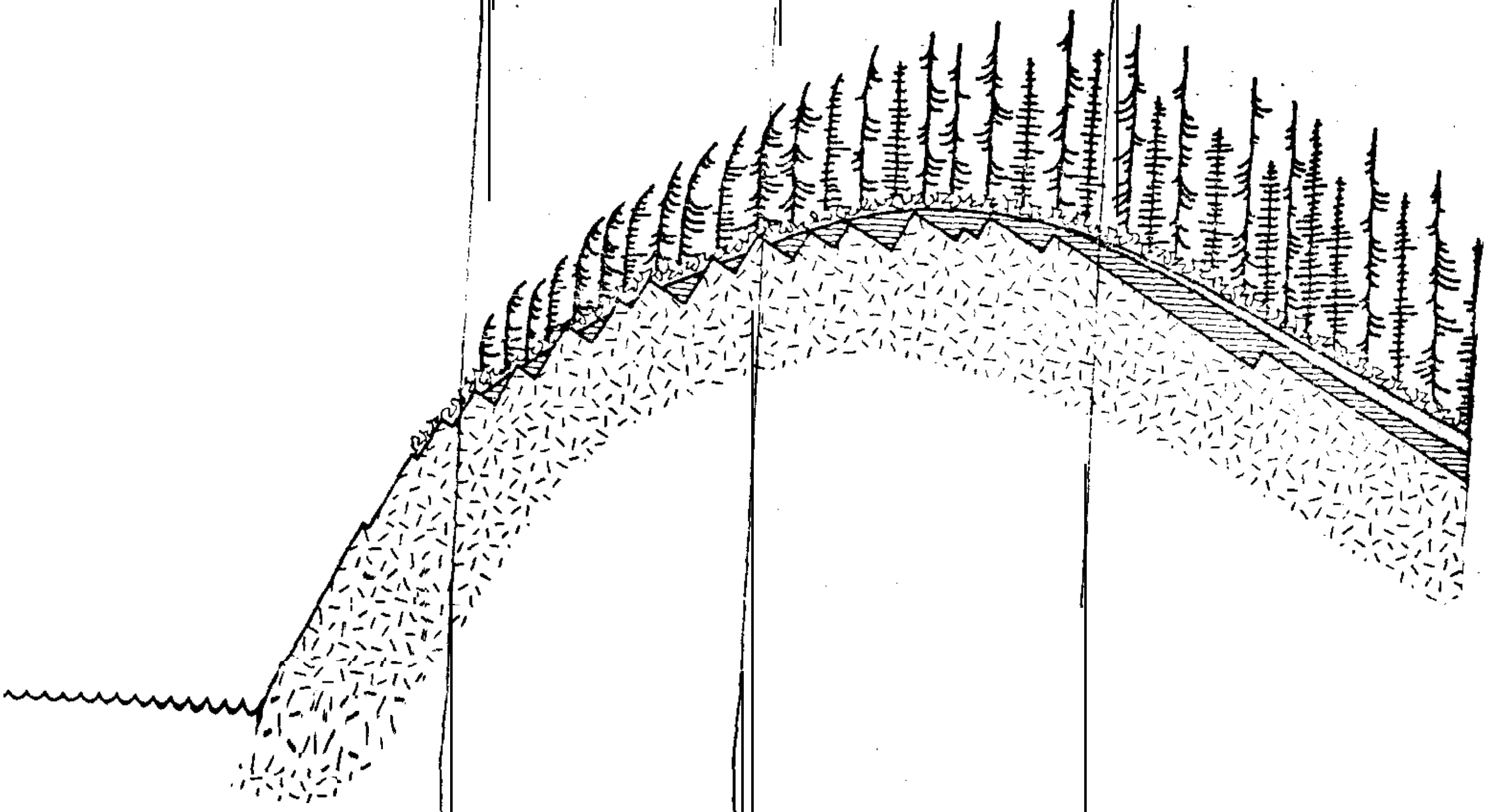
iii) Gaultheria shallon shrub community: Dense, almost impenetrable vegetation is characteristic of this community. It commonly occurs on shallow basal till soils (Trr) or on soils developed in situ (QR) (Photo 28). Gaultheria shallon shrub type occurs on exposed sites on the outer edges of the islands. Pinus contorta - Thuja plicata shrub type occurs on the edges of islands in moderately exposed sites.

33. Turtle Island - North end, behind midden - disturbed regenerated forest

34. Clarke Island, Southwest point - vegetation type is Thuja plicata forest type in the foreground, Gaultheria shallcm shrub type on the point. Soils are Trr in the foreground, QR on the point.

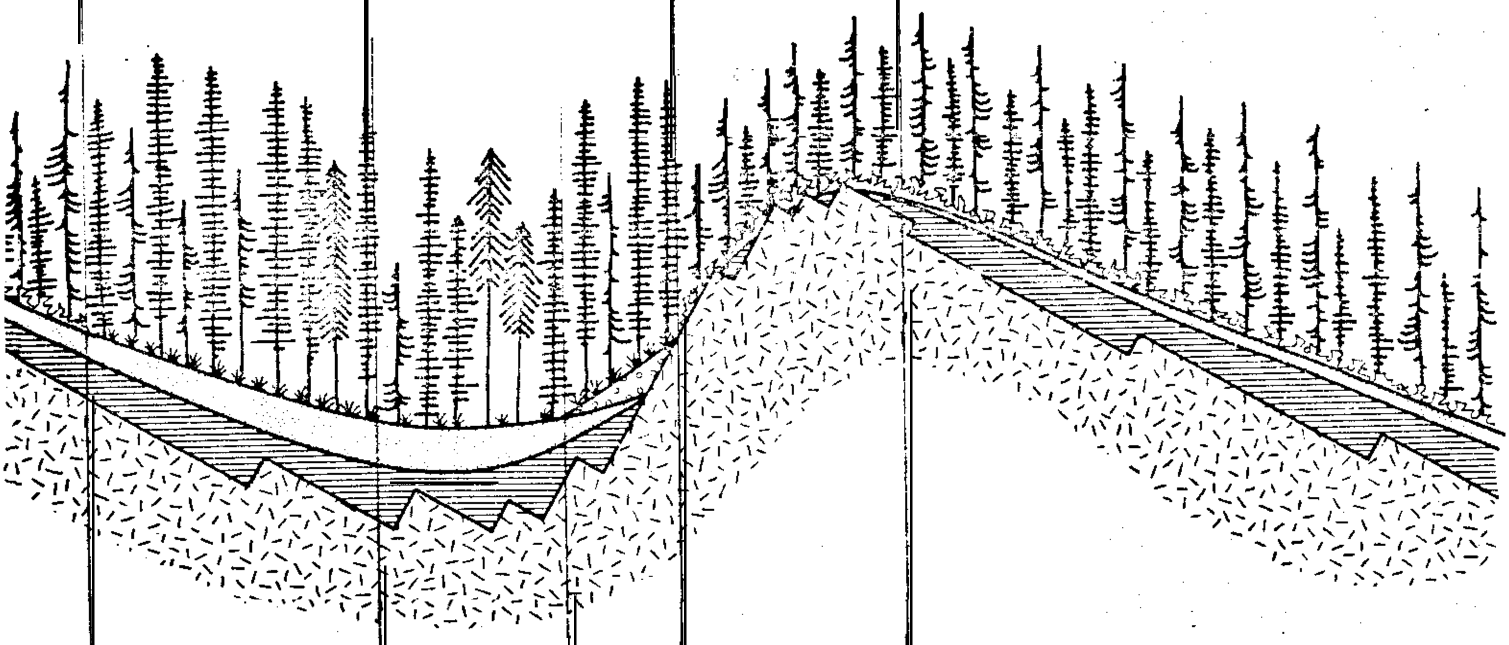
Figure 5. Vegetation Soil relationship in Broken Islands Group

VEGETATION			
Forest type >	Tp	TpVo	TpTh
Dominant. tree	Thuja *plicata*	Thuja *plicata*	Thuja *plicata*
Dominant undergrowth >	*Vaccinium ovatum*	*Vaccinium ovatum*	*Gaultheria shallon* and *Vaccinium ovatum*
Physiognomy >	stunted and shaped by wind	uniform stands of small trees	irregular canopy, all tree Sizes



PHYSICAL FEATURES			
Wind exposure	strongly exposed	moderately exposed	moderately exposed
Surficial materials	till pockets or shallow till over rock	basal till over rock	shallow ablation ti over basal till
Soil	Trr	Tr	Tar

TpBs	TpSg	TpBs	TpVo	TpTh
Tsuga heterophylla	suga h. , some icea s.	Tsuga h.	Thuja plic.	Thuja plicata
Blechnum spicant	Blechnum spicant	Bl. sp..	Vaccinium ovatum	Gaultheria shalion and Vaccinium ovatum
dense, tall canopy and half-open ground veget.	irregular canopy & ground veget.	ditto	ditto	ditto



sheltered	shelt.	shelt.	moderately exposed	moderately exposed
1 ablation till over basal till	gleyed ablation till and seepage	collu- vium and/or ablat- ion till	ditto	ditto
Ta	Tag	Ta	ditto	ditto

VII RECOMMENDATIONS

A) Guidelines:

i) If maps and air photos are to be provided to the contractor, than these should be availahle to him prior to field season. A list of available materials, perferably with samples, should be included with the contract during negotiations.

ii) Criteria and Legend: The legend was provided, but not the criteria. If uniformity is desired, then the terms should be defined, or clear references provided.

iv) Criteria and Coding for Special Overlays: There should 'be a preamble with each set of criteria, explaining the purpose of the interpretation. This is particularly true if the differences between classes are qualitative. For instance, the criteria for soil foundation could be applied equally well for campground feasibility or for location of trails. The levels of the site characteristics, particularly compressive strength and stability, in each class will vary with the two uses.

iv) Recreation Potential: A classification of units for the recreation potential, used in conjunction with productivity, would be better than using the productivity alone. The rating system must consider

- a subjective rating of the value of the unit for interpretation, or other specified use.
- en index of site trafficability.
- some consideration of access - potential, actual.

The interpretations of soil erodability, foundation and productivity should be presented in a fashion which will enable the information to be easily transferred. Before specifying a method such as that in the quidelines, a sample should be prepared. Experimentation with different methods of presentation willenable the best method to be used. The choice of letratone has a number of limitations. The range must be greater than that suggested, to show different units clearly. Overlays done in this fashion must be done with extreme care, difficult on large maps. Slight differences in alignment of the Letratone will produce different impressions when another overlay is used.

A further consideration is the presentation of complex units. Due to the effect of microtopography in Pacific Rim, many units include more than one class. If this is not considered, the results may be misleading.

B) long Beach Section:

As suggested by Dooling (1972) the best sites for development are on the glaciofluvial soils. If logged over areas are used, then much rehabilitation will be necessary. However, the site has already been severely disturbed, and construction will have less effect than on undisturbed sites. Construction in the latter areas will involve a windthrow hazard, particularly in older stands, the alteration of vegetation types from the natural conditions, and possible changes in site characteristics, particularly drainage.

Developments near the shoreline, should be avoided. Most headlands, particularly in Wreck Bay are susceptible to mass wastage.

If the sand dune areas near the beach are to be preserved, then use must be restricted. Vegetative cover may require management, possibly by transplanting of seeding.

A network of climatic stations should be established to determine the variation in microclimate throughout the park. Results of a study over three or more years can be tied to existing station records to obtain probable long term predictions.

C) Broken Islands Section:

Trails which have been developed on Benson, Effingham and Gibraltar Islands could be improved and extended to provide access to a range of sites on the islands. The trail on Benson originate at the homestead site, end cross the island to fresh water pools on the outer edge. On effingham, there is a trail from the Indian Reservation to Effingham Bay. This could be extended to cross the island, passing near the organic bog, and the lake. On Gibraltar, there is a trail from the midden site crossing the island. This could be extended to include the lagoon, and the outer edge.

Trails which are developed should, if possible, avoid steep ablation till slopes. These sites are subject to erosion and heavy use may cause mass wastage.

Bidden sites should be surveyed. Those which are important historically should be preserved, and camping on these should be restricted.

The following units are the ones which should be checked first for any development: 8 Reeks; 126, 139, Effingham; 301, 302, Jacques; 337, Turtle; 357, Turret; 387, Benson; 392, Clarke; 411, Willis; and 464, Hand.

The following observations are based on experience gained through camping in the islands over a summer, rather than as a soil surveyor. They are based on an assumption of increasing day use of the islands.

There is a general pattern to daily weather, calm in the morning, and windy during the afternoon. Fog is an additional hazard. In an open boat, a trip from the islands in the afternoon may take two to five times as long as the trip in the morning. A check point should be established in Ucluelet, possibly also in Bamfield, to ensure that persons using small boats are aware of the conditions, and that the boats are adequately equipped. The possibility of establishing a boat rental concession in the islands, with a cruise boat providing the link to shore might be considered.

There is a need for a communicationlink between the islands and the shore. Most visitors have up to now relied on the goodwill of cottagers on the islands, most of whom have radios.

During periods of heavy use, a high speed rescue-patrol boat should be stationed in the islands.

Sites where water is available should be cleared, and marked. Many of these are seasonal, and occassionally in the summer, fresh water is scarce. An up to date record of all areas should be maintained through the summer.

VIII. SOIL DESCRIPTION

Till soils - Orthic HumoFerric Podzol (Tar or Tr)

Horizon	Depth	pH	% C	% N	Texture % S	Si	Clay
L-H	1-0						
Aeh	0-2						
Ae	2-8	3.85	4.43	.326	46	39	14
Bh	8-9	4.15	7.80	.217	24	14	62
Bf	9-16	4.85	2.92	.060	66	21	13
BC	16+	5.35	.52	.024	65	26	9

Bedrock below

The parent material is the thin albation till and weathered basal till over basal till. The Bh horizon is a thin layer, with high organic content, over the relatively impermeable basal till. During wet periods, seepage water flows through this horizon. It remains moist for most of the year.

Rooting is concentrated in the litter layer (L-H) and in the Bh horizon, with only a few roots in the Ae horizons.

Photo 35. D.O.T. Hills-Monolith sample before mounting.

Glaciofluvial materials. **Orthic Humo** Ferric **Podzol.**

Horizon	Depth	pH	X C	% N	Texture % Sand	Si	Clay
L-H	8-0						
Ae	0-5	3.85	5.39	0.193	65	18	17
Bhf	5-6	4.10	8.38	0.318			
Becj -							
Bf	6-19	4.55	7.62	.208	58	30	12
		4.90	4.12	.110			
Bccj -							
IIBC	19+	5.40	.69	.052	90	8	2
C		5.35	.58	,022			

The soils have developed primarily in a finer capping over coarse glaciofluvial gravels. Texture and depth of the capping vary in the area. There are two incipient hardpans in this profile.

Growth on these areas is generally good, except in poorly drained lower slope positions.

Photo 36. Wreck Bay-face of pit in glaciofluvial soils prior to taking monolith sample.

Glaciomarine clays. Gleyed Humo Ferric Podzol (Ko).

Horizon	Depth	pH	% C	% N	Texture % S	Si	Clay
L-H	4-0						
Ahegj	0-3	3.50	2.51	.258			
Bfhgj	3-10	3.90	4.47	.251	18	36	46
Bfg	10-15	4.20	3.05	.158	11	37	52
BCg	15-26	4.35	1.26	.063	15	35	50
Cg	26+	4.30	0.91	.051	27	28	4s

These soils are part of the Tofino Terrain System. which developed on s toney clays. The clays are compact and only slowly permeable. This causes the water table to remain near the surface for most of the year.

Photo 37. Glaciomarine soils. Face of cut prior to taking monolith sample.

Marine Sands. **Placic Humic Podzol** (SC)

Horizon	Depth	ph	% C	% N	Texture % S	Si	Clay
	2-o	distrubed organic matter, plus drifted sands					
Ae	0-3						
Bh	3-15	4.40	3.64	.138	74	16	10
Bfh	15-24	4.40	4.20	.153	79	16	5
Bfhc		pan					
Bf(BC)	24+	5.00	1.30	.054	89	6	5
C					96	2	2

On the almost level topography surrounding the Tofino airport most areas have been disturbed. The iron pan maintains a high water table for most of the year and help maintain nutrient status by accumulating organic matter and nitrogen. The pan and the compacted sands below inhibit development at deep rooting systems. If vegetation and organic matter are removed, the nutrient status of the soil will be so poor that it will be very difficult to re-establish vegetation.

Photo **38.** Near Tofino Airport-marine sands. showing varying depth of **development** over well-developed pm.

Photo 39. Near Tofino Airport. **Monolith** sample on marine sands prior to mounting.

Photo 40. Effingham Island. Meares Bluff on a rainy Thursday.

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RSA 30442- 39-43

TSA 30484 27-28, 53-57

-Scale approx. 1:250,000, in 70 mm photography covering centres of above flights, in black and white, black and white infrared, and colour near infrared.

Soil Monoliths

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X. LIST OF MAPS

Long Beach

Maps 1/2, 2/2, scale: 1:12,000

Base map, from Lock and Surveys maps, prepared for National and Historic Parks Branch. Soils overlay, showing classified soil units Soil characteristics overlay, suitable for preparation of overlays for soil drainage, soil erodability, soil foundation, productivity and re-creation value.

Reduction of soils overlay, scale: 1:24,000

Map, scale 1:24,000, one sheet. showing sampling sites, and points of interest.

Broken Island

Base map, planimetric, from Biocon services.

Soils overlay, showing unit boundaries, landform, slopes and soils.

Soil characteristics overlay, suitable for preparation of overlays for soil drainage, soil erodability, soil foundation, productivity.

Chart 3638, showing location of points of interest.

Chart 3638, showing location of sample sites, and major transects made across the islands.

Legend

A	B	C	D	E	F	H
123			3	m	1 iii G	$\frac{T_2}{MD}$ J

A Unit Number

B Local Topography

C Slope

D Soil Drainage

E Soil Texture

F Soil Compaction

G Gravel and Stone Content

H **Landform**

J Soil Depth

Local Topography

A	Knob
A	hill
	knoll
	Plateau
	slope
	complex slope
	flat
	depression or wide valley
	valley
	rolling mostly uplands
	rolling mostly lowlands
	rough, broken

Slope Percent

	o-l.5
	16 - 30
	31 - 60
	61 - 100
	101 +

Soil Drainage

1	Rapid
2	Well
3	Moderately well
4	Imperfect:
5	Poor
6	Very Poor

Soil Texture

Very coarse	vc
Coarse	c
Moderately coarse	mc
Medium	m
Moderately fine	m
Fine	f
Very fine	vf

Soil Compaction

loose	1
Semi-compact	2
Compact	3

Graveland Stone Content

20	I
Gravelly	II
Very gravelly	III
Rubby	Iv

S oilDepth

Very shallow	vs
Shallow	S
Moderately Shallow	MS
Moderately deep	MD
Deep	D

Landform

T2	Basal till
T3	Thindrift
T4	Ablation till
F1	Outwash plain
F4	Kame
12	Beach complex
GM	Glacio-marine
W1	Alluvial floodplain
W2	Delta or fan
W4	seepage slope
03	Organic bog
G3	Colluvium
Q	Residual
M2	Shoreline or beach
M3	Tidal flats
R	Bedrock

Erodibility

1. Extreme
2. High
3. Moderate
4. Low

Soil Foundation

1. Extremely low
2. Low
3. Moderate
4. High

Productivity

1. High
2. Moderate
3. Low
4. Severely Restricted

Recreation

1. High
2. Moderately high
3. Moderate
4. Limited

soil Types

Till Soils

Tr	Basal till
Trr	thin basal till
Ta	ablation till
Tar	shallow ablation till over basal till or rock
Tag	gleyed ablation till and/or seepge area

Ucluelet Terrain system - glaciofluvial

Wc	Uclulet
Sa	Sandhill
wb	Wreck Bay

Tofino Terrain System - glaciomarine

Kl	Kennedy Lake
Ko	Kootowis
T	Tofino

Grice Bay Terrain System - Marine

SC	Schooner
Lb	Long Beach
Gb	Grice Bay

Others

QR	Shallow residual soils
Rg	Regesol
X	similar to

Unit Number

A number assigned to each soil unit the numbering generally follows air photo flight lines.

APPENDIX

Pacific Rim National Park

A SURVEY OF SOILS AND LANDFORMS • PHASES I & II

T.W. Pierce

APPENDIX I. LONG BEACH LEGEND

Unit	Legend	Eros	Found	Prod	Rec	Ac	soil
1	2-3 c 1/1 M2/MD=D	3	3-2	3	2	58	Lb
2	1-4 m 2/II T4/VS	2	2	3	2	158	Tar
3	3-4m 1/II T4/S	3	1	2-1	4	17	Tag
4	2 m 3/III T3/VS	2	1	3	3	4	Trr
5	1-2 m 3/II T3/VS	2	1	4	2	17	Trr
6	5-6 f 1/1 W4/VS	2	1	34	3	2	Tag
7	2-3 m 3/III T2/S	3-2	2	3	3	33	Tr
8	2 m 3/III T2/VS	2	2	3	3	9	Tr
9	4-3 m 2/II T4/MS	3	2	2	4	31	Ta
10	3-4 m 2/II T4/S-MD	2	2	3	4	71'	Ta
11	1 m 3/III T 3/VS	1	1	4	1	3	TII

Unit	Legend	Eros	Found	Prod	Rec	Ac	soil
12	2 m 3/111 T3/vs	2	1	4	2	3	Trr
13	2-3 m 3/111 T3/VS	2	1	4	2	7	Trr
14	2-3 m 3/111 T3/VS	2	1	4	2	6	Tr r
15	3 m 2/11 T4/S	2-3	2-1	2-1	3-2	234	Tar
16	2m 3/111 T3/S	1-2	1	4	2	3	Tr r
17	3-2 m 3/m T3/u	1-2	1	4	3	49	Tr r.
18							
19	2 c-vc 2/1V-111 F4/D	2	2-3	3	2	20	XUc
20	3-5 m 2/11 T4(W4)/S	3	2-3	2-3	4	160	Tag
21	3 m 2/11 T4/MS	2-3	2-3	2	3	11	Ta
22							

Unit	Legend	Eros	Found	Prod	Rec	Ac	Soil
23 ⌒	↘ 3-2 m 2/11 T4/VS	2	2	3-2	3	3	Tar
24 ⌒	↘ 2-3 m 3/111 T3/VS	2	1	3	3	2	Tr
25 ‿	↘ 4-5 m 1/11 (W4 + T4)/S	4	1	3	4	2	Tag
26 ∧	↘↘ 2-1 m 3/111 (T3+R3)/S	2	1	4	1	9	TIT
27 A	↘ 2-3 m 3/111 T2/VS	2	1	'4	2	7	Trr
28 ⌒	↘ 2-3 m 3/111 T3/VS	2	1	4	2	8	TIT
29' A	↘↘ 2-3 m 3/111 T3/VS	2	1	3	2	7	TIT
30 ‿	↘ 5-4 m 1/11 W4+T4/s	4	1	3	4	3	Tag
31 ∼	↘ ↘ 3-2 m 3/Ill (T4+T2)/s	2	1	3	3	43	Tar
32 ∧	↘↘↘ 2-3 m 3/111 T3/VS	2	1	3	2	7	Trr

Unit	Legend	Eros8	Found	Prod	Rec	Ac	Soil	
33	2-3 m 3/111 T3/VS	2	1	3	2	2	Trr	
34	3 m 2/11 T4/S	3	3-2	3	3	4	Ta	
35	2-3 m 3/111 T3/VS	2	1	3	2	11	Tar	
36	6-5 m 1/11 W4+T3/VS	3	1	2	4	6	Tag	
37								
38	3 m 2/111 T4/MD	3	2	1-2	4	13	Ta	
39	1-2 m 3/111 T3/VS	1	1	4	1	23	Trr	
40	4-3 m 2/11 T4+W4/MD-S	3	2	1-2	4	61	Ta	
41	1-3 c 1/1 M2/D	1-2	2	3	3	24	Lb	Some dune formation mostly stabilised by vegetation
42	4-2 c 1/1 M2/MD-D	1-2	2	3	3	111	Xlb	silt layers interbedded with sands

Unit			Legend 9	Eros	Found	Prod	Rec	Ac	Soil
43	⌒	↘	3-4 m 2/111 T4/MD	2	2	2-3	4'	63	Ta
44	◡	↘	5-4 m 1/11 W4+T4/MD	4	1	3	4	1	Tag
45	∧	↘↘	2-1 m 3 111 T2 S-VS	2	1	3	2	10	Tar
46	⌒	↘	4-2 m 2/111 T4/S	3	2	3	4	31	Tar
47									
48									
49									
50	A	↘↘	3-2 mc 2/1 M2/MS	2	1 (3)	3	2	23	SC
51	∧	↘↘	3-2 mc 2/I M2/VS	2	1-3	3	2	11	XSc
52	∼	↘	3-4 c 2/1 M2/MD	2	2	3-2	3	98	xSc less well. drained, power prod.
53	A	↘	3-2 m 3/II T4/S	2	1	3	3	8	Ta

Unit	Legend 9	Eros	Found	Prod	Rec	AC	soil
54	⌒ ↘ 2-3 m 3/11 T4/S	2	2(3)	2-3	2	23	Ta
55	⌒ ↘ 2-3 m 3/111 T2/VS	2	2(3)	2-3	2	134	Tr
56	⌒ ↘ 2-4 m 2/11 T4/VS-S	3	2(3)	3	2	15	Tag
57	╲ ↘ ↘ 2-1 m 2/I T2/VS	2	1	3	2	32	Tr headland
58							
59	╲ ↘ 1-4 vc 1/111 M2/VS	1	1	3	2	11	XSc M2 over rock
60	— ↘ 5-4 mc 1/I M2+W4/S	3	2	3-2	4	9	XSc Seepage slope
61	~ ↘ 3-4 m 1/1 M2/MD	3	3-2	2	3	214	Sc Frequent seepage areas
62	⌒ ↘ 3 mc-c 2/1 M2/D	3	3	2-3	3	10	Gb
63	◡ ↘ 4 mf 1/1 M2-GM/ND	2	1-2	2-3	3	119	Gb SiL in valley

unit		Legend	Eros	Found	F'rod	Rec	Ac	Soil
64	↘	3-4 mc $\overline{\text{I}}$ $\overline{\text{MD}}$	3-2	3	3	3	21	SC
65 7	↘	3-4 mc $\overline{\text{I}}$ $\overline{\text{MD}}$	2	3	3	3	24	XSc
66	↘	5-4 mc $\frac{\text{2-3}}{\text{1}}$ $\frac{\text{M2-GM}}{\text{s}}$	3	3	3	3-2	356	Sc Drainage 4(5) Predominately
67	↘	4-3 mf $\overline{\text{I}}$ $\overline{\text{MD}}$	2	1	2	3	488	Gb
68	↘	2-3 m $\overline{\text{III}}$ $\overline{\text{VS}}$	2	1	3	2	33	Trr
69	↘	5-4 mc $\frac{\text{1}}{\text{1}}$ $\frac{\text{M2}}{\text{S}}$	3	1'	4 '	4	10	xsc
70	↘	5-3 c $\overline{\text{1}}$ $\overline{\text{S}}$	3-4	3(1)	4(3)	4	1867	sc West bdry probably an old beach line.
71	↘	3-2 c $\overline{\text{I}}$ $\overline{\text{S-MD}}$	3	3	3-2	3	167	Sc
72	↘	2-3 c $\overline{\text{I}}$ $\overline{\text{S-MD}}$	2	2	2	3	73	SC
73								

Unit		Legend	Eros	Found	Prod	Rec	Ac	soil
74		↘ 3-2 c $\frac{1}{1}$ $\frac{M2}{MD}$	3	3	3	3	152	SC
75		↘ 2-3 c $\frac{1}{1}$ $\frac{M2}{D}$	2	2	3	2	134	SC
76		↘ 4-5 c $\frac{1}{1}$ $\frac{M2}{S-VS}$	4	1	4	4	29	SC
77								
78		↘ ↘ 3-2 mf $\frac{1}{1}$ $\frac{GM}{MD}$	1	1	2	3	113	XKL
79		↘ 3-4 mf 1 GM i's	2	2	2	3	75	Kl
80		↘ ↘ 3 m $\frac{3}{111}$ $\frac{T2}{S}$	2	1	3	2	9	Tar
81		↘ 4-3 mf $\frac{1}{1}$ $\frac{GM-M2}{MD}$	2	2	3-2	3	53	Kl
82	A	↘ 3 m $\frac{3}{111}$ $\frac{T2}{S}$	2	1	3	2	8	Tar
83		↘ 3-4 mf $\frac{1}{1}$ $\frac{GM}{S}$	2	2	2	3	24	Tar

Unit	Legend	Eros	Found	Prod	Rec	Ac	Soil
84	⌢ ↘ 4-3 c 2/1 M2/S-MD	3	3-2	3	4	176	Sc
85	⌢ ↘ 4-3 c 2/1 M2/S-MD	3	3-2	3	4	221	SC
86	⌢ ↘ 4 c 1/I M2/MD	2	3	3	3	13	XSc Sand and silt interbedded
87	⌣ ↘ 4-3 mf 1/I GM/S	2	1	2	3	34	Gb
88	⌢⌢ ↘ 3 mf-c 1 G+M2 / 11 MD	2	1	2	4	364	SC Gb Mixed ares- sands and silt.
89	⌣ ↘ 5-6 clM2 i s	4	1	4	4	17	SC
90	⌣ ↘ 5-6 c 1/1 M2/S	4	1	4	4'	10	SC
91	⌣ ↘ 5-6 c 1/1 M2/S	4	1'	4	4	15	SC
92	⌣ ↘ 6-5 c 1/1 M2/VS	4	1	4	'4	22	SC
93	A ↘ l-2 mc 1 T3 / 111 VS	1	1	4	2	62	Trr

Unit	Legend	Eros	Found	Prod	Rec	A c	Soil
94	6-5 c 1/I M2/VS	4	1	4	4	6.	sc
95	5-6 c 1/1 M2/S	4	1	4	4	17	SC
96	3-2 c 2/1 M2/MD	3	2	3	3	56	sc
97	1 c 1/1 M2/S	2	3	4	1	170	Lb backshore to Long Beach
98	1 c 1/1 M2/S	1	1	4	2	22	dune formation disturbed
99	lclM2 i-3	1	1	4	2	22	dune formation disturbed
100	c 1/I M2/S	1	1	4	2	1	dune formation- used as gravel. Pit
101	3-4 f 2/I GM/MD	2(3)	2	3-2	3	1125	Kl
102	4-5 f 2/1 GM/MS-S	2	2	3	3	14	Ko
103	4-5 f 2/I. GM/MS-S	2	2	3	3	41	Ko

Unit	Legend	Eros	Found	Prod	Rec	Ac	soil
104	2-3 c-m 2/111 M2+GM/s	1	1	4	2	45	Kl includes beach terraces
105	4-5 f 2/1 GM/S	3-2	2-l	3	3-4	853	Ko
106	6f 1/1 GM/VS	4	1	4	4	5	T includes Sphagnum bog
107	6-5 f 1/I GM/VS	4	1	4	4	3	T
108	6 f 1/1 GM/VS	4	1	4	4	3	T includes Sphagnum bog
109	3-4 f 1/1 GM/MD	2(1)	2-3	2	3	160	Kl clay, over R3, T at higher elevations
110	3-2 f 1/1 GM/S	2	2	3	2	8	Kl island- shallow soils
111	3 f 1/1 GM/S	2	2	3	2	5	Kl island- shallow soils
112	3-2 f 1/1 GM/S	2	2	3	2	12	Kl island- shallow soils
113	4-1 f-m 1-3/1-111 T2+W4/VS	2	1	3	3	518	Tr Tag soils variable- gleyed areas, rock outcrops, and till

Unit	Legend	Eros	Found	Prod	Rec	Ac	Soil
114	6 f 1/I O2/VS	4	1	4	3	14	0 organic
115	1 m 3/III T3+R/VS	2	1	4	2	6	Trr
116	5-6 c 2/1 M2/VS	3	1	3	4	61	sc
117	3 f-c 1/1 GM+M2/M	2-1	1-2	2-3	3	630	Gb variable sand and silt interbedded
118	13 f-c 1/1 GM+M2/M	2	2	2	3	51	Gb Variable sand and silt interbedded
119	3 f-c 1/1 GM+M2/M	2	2	2	3	9	Gb variable sand and silt interbedded
120	3 c-f 1/1 GM+M2/MD	2	2	2	3	22	Gb variable sand and silt interbedded
121	3-4 c-f 1/11 M2+GM/MD	2	3	3	3	86	Gb variable sand and silt interbedded
122							
123	4-5 f 1/I GM/MS-S	3	1	3	4	7	Ko

Unit			Legend	Eros	Found	Prod	Rec	Ac	soil
124	-	-	4-5 f/1 1/MS-S GM	3	1	3	4	5	Ko
125	⁓	↘	4-5 f/1 1/MS-S GM	3	1	3	4	212	Ko
126	⌣	↘	6-5 f 1/1 GM/VS	4	1	4	4	10	T
127	◡	↘	3-2 f/1 1/MD GM	1	1	2	3	41	Kl
128	∿	↘	3-2 f 1/1 GM/MD	1	1	2	3	148	Kl
129	⌒	↘	3f 1/I GM/MD	1	1	2	3	45	Kl
130	∧	↘	2-3 f-mc 1/I+III T4+GM/MD	1	1	3	3	14	Tar
131	—	↘	5-4 f/1 1/S GM	2	1	3	3	96	Ko
132	—	↘	5 f 1/1 GM/S	2	1	3	4	8	Ko
133	◡	↘	6 f/1 1/VS GM	4	1	4	4	8	T

Unit	Legend	Eros	Found	Prod	Rec	Ac	soil
134	6-5 f 1/I GM/VS	4	1	4	4	27	T
135	5 f 1/I GM/VS	2	1	3	4	37	Ko
1.36	1-2 m 1/1V T4+G3/S	1	1	4	2	23	XT_a
137	3-2 m 2/111 T4/MD	2	2	3-2	2	100	Ta
138	3-2 m 2/111 T3/VS	2	1	3	2	8	Trr
139	3-2 m 3/111 T4/S	1	1	3-2	2	I.31	Ta
140	3 f 1/I GM/S	2	1	2(1)	3	17	Kl shallow GM over till
141	3 f 1/1 GM/S-MS	2	1	2(1)	3	128	Kl
142	2 m 3/111 T2/VS	1	1	4	2	24	Tr
143	1 m 3/111 T3/VS	1	1	4	1	23	Trr Mostly rock, Douglas Fir

Unit	Legend	Eros	Found	Prod	Rec	Ac	soil
144	1-5 c 1/11 M2/D	1	1	4	1	6	Gb
145	3 f 1/1 GM/MS	2	2	2	3	24	Kl shallow glaciomarine and till
146	2 m-f 3/Ill T4/s-vs	1	1	3	2	50	Tr
147	3 f l/I GM/S	2	1	2	3	23	Kl
148	3 m 2/111 T 4/MS	2	2	3	3	63	T a
149	3-2 m 2-3/III T4+T2/S	2	1	2	2	120	Tar
150	2-3 m 3/III T2/VS	2	1	4-3	2	95	Tr
151	2-3 m 13/111 T3/VS		1	3	4	8	Trr
152	4 f 1/1 GM/MS-D	2	1	2	3	68	Ko(Kl)
153	3-2 f 1/1 GM/S	1	1	3	3	38	Kl

Unit	Legend	Eros	Found	Prod	Rec	Ac	soil
154	3 m 2/111 T4/S	2		3-2	3	30	Ta
155	5-4 m 2-1/111 T4+W4/S-VS	2	1	2	4	44	Tag
156-y	3-2 m 3/111 T2/VS	1	1	3	3	41	Tr
157	3-2 m 3/111 T4/VS	2-1	1	2-i	3	13	Ta
158	2 m 3/111 T3/VS	1	1	4	2	29	Trr
159	2 m 3/111 T2/VS	1	1	4	3	46	Tr
160	2-3 m 3/111 T2/VS	1	1	4	3-2	15	Tr some seepage areas
161	2 m 3/111 T4/VS	1	1	4	3	9	Ta
162	4-3 m-f 3-1/11-1 T4(GM) 2-1/S		1	2	3	9	Ta seepage areas, some GM capping
163							

Unit	Legend	Eros	Found	Prod	Rec	Ac	Soil	
164	↘↘ 3 - 4 f 1/1 GM+T2/S-VS	1	1	2	2	83	KlTr	very shallow GM Wer T2
165	↘ 3 m -3/111 T3/VS	3	2	4	2	29	Trr	
166	↘ 3 m 3/III T3/VS	3	2	4	2	8	Trr	
167	↘↘ 3 m 3/111 T3/VS	2	2	4	2	11	Trr	
168	↘↘ 3 m 3/111 T3/VS	2	1	3	3	57	Trr	
169	↘ 4-5 f 1/1 GM/MS-S	3	1	3	4	16	Ko	
170	↘ 4-5 f 1/1 GM/MS-S	3	1	3	4	26	Ko	
171	↘ 2-l f(c) 1/1(111) M2/S	1	1	3	2	116	Kl	
97	↘ l-c 1/111 M2/S	2	3	4	1	170	Lb	Map 2/2
105	↘ 4-5 f 2/I GM/S	3-2	2	3	3-4	853	Ko	
135	↘ 5 f 1/l GM/- s	2	1	3	4	37	Ko	

Unit			Legend	Eros	Found	Prod	Rec	Ac	Soil
172	⌣	↘	6 f 1/1 GM/VS	4	1	4	2	6	T includes **Sphagnum** bog
173	—	↘	3-4 f 2/1 GM/MD	3	2	2-3	3	103	Kl
174	∼	↘↘	3 f 2/1 GM/MD	1-2	1 9	2	3	241	Kl
175	—	↘	3-4 f 2/1 GM/MD	2	1	2	3	40	Kl
176	—	↘	3-4 f 2/1 GM/MD	2	1	3	3	18	dieturbed
177	—	↘	4-3 f 2/1 GM/MD	2	1	2	3	58	Ko
178	∼	↘	3-4 f 2/1 GM/MD	2	1	2	3	1504	Kl
179	⌣	↘	6 f 1/1 GM/VS	4	1	4	4	12	T
180	∼	↘	3-2 mc 1/111 Fl/MD	3	3	3	3	30	XUc Intergrade of Glacioflwial **Glaciomarine-** boundaries arbitrary
181	⌣	↘↘	3-2 md 1/111 Fl/S-D	1	1	2	2	178	Uc+Rg

Unit	Legend	Eros	Found	Prod	Rec	Ac	Soil
182	↘ 6 f 1/I GM/VS	4	1	4	4	8	T
183	↘ 6 f/1 1/VS Fl	4	1	4	4	7	T includes Sphagnum bog
184	↘ 3-2 c/111 1/D Fl	2-3	4	3	3	190	Sa
185	↘ 4 c 1/111 Fl/MS	3	2	3-2	3	113	Sa Glaciofluvial Glaciomarine interface, boundaries arbitrary
186	↘ 6f/111 1/MD Fl	4	1	4	4	14	
187	↘ 3(4) c-vc 1/111 Fl/MD	3-2	4	3-2	3	60	UC
188	↘ 4-(3) mc 1/111 Fl/MS-MD	3-2	3(2)	3	3	1148	Sa drainage 4-5 .
189	↘ lc/111 1/D M2	1	1	4	1	107	Lb sand dunes
190	↘↘ 3-2 c 1/111 Fl/D	3-1	3-1	4-2	2	99	Sa-Uc beach cliff and top
191	↘ 6 mc 1/11 Fl/VS	4	1	4	4	44	Wb includes Sphagnum bogs

Unit	Legend	Eros	Found	Prod	Rec	Ac	Soil
192 ⌣	↘(↘)2-5 c 1/111 Fl/VS-MD	1	1	3	2	99	Sa-Uc
193 ⌣	↘ 4 (5) c 1/111 Fl/MS	2	1	3	3	61	Sa-Wb
194 ~	↘ 3 mc 1/II Fl/MD	3-2	4	3-2	3	85	Uc
195 ⌣	↘ 6-5 mc 1/11 Fl/VS	4	1	4	4	52	wb-sa includes Sphagnum bogs
196 ⌣	↘ 6 mc 1/II Fl/VS	4-3	1	4	4	7	Wb
197 ⌢	↘ 6-4 mc 1/II Fl/S-VS	3-4	1	3	3	25	Sa Wb
198 ~	↘ 3 mc 1/111 Fl/MD	3	1	2	3	18	Uc
199 ~	↘ 6-5 mc 1/II Fl/V S-MS	4-3	1-2	3	4	15	wbsa
200 ~	↘ 6-4 mc 1/11 Fl/V S-MS	4-2	1(3)	3	4-3	57	Wb Sa
201 ⌢	↘↘↘3 mc-c 1/111 Fl-GM/MS	1	1	3	2	26	xUC

Unit	Legend	Eros	Found	Prod	Rec	Ac	Soil	
202	3-4 mc-c 1/lll F-GM/MS	2-1	2	3	2	44	UC	mostly glaciomarine (F washed off)
203	4-3 f-mc 1/l-ill GM+Fl/S	1	1	2	3	28	xKL	dangerous slumping, sand and gravels eroded leaving mostly clays.
204	3 mc-c 1 Fl iiib	2-l	3(2)	3	2	9	UC	
205	3-2 c 1/lll Fl/D	2-1	1	3	2	124	XUc	bill on cliff tops
206	3-2 c-vc 1/lll Fl/D	3	3(4)	2	3	348	UC	
207	2 c 1/lll F/S	1	1	4	3-2	105	Reg	sands and gravels overlying marine clays ("blue clays")
208	4-6 c-mc 1/lll Fl/MD-S	[illegible]	2(3)	4-2	3	1431	Sa	near mouth of Lost Shoe Creek
209	3-2 c-vc 1/lll Fl/D	3	3	2	3	65	UC	
210	5-4 c 1/lll Fl/S-MS	3	1	3	3	11	Sa	
211	6 mc 1/ll Fl/VS	4	1	4	3	10	Wb	

Unit		Legend	Eros	Found	Prod	Rec	Ac	Soil
212 ‿	↘	4-6 mc-c! 1/111 Fl/VS	3	1	3	3	24	Sa
213 ⌒	↘	3(2) c 1/111 Fl/MD	3	3	2	3	634	Uc generally drainage 3-4 in subunit.
214 —	↘	3 (2) c 1/111 Fl/MD-D	3	3-4	2	3	61	UC
215 ‿	↘	6 c 1/111 Fl/VS	4	1	4	3	7	Wb
216 ‿	↘	6-5 c 1/m Fl/m	4	1	4-3	3	6	Wb
217 ⌒	↘	3 c 1/111 Fl/MD	3	2	3	3	43	UC
218 ∩	↘ ✗↘	3-2 vc 1/111 Fl/S	1	1	3	3	10	XUc
219 ╲	✗↘	3-2 vc 1/111 Fl/S	1	1	3	3	14	XUC
220 ∩	↘ ✗↘	3-2 vc 1/111 Fl/S	1	1	3	3	13	xuc
221 ~	↘	2 mc 1/111 M2/D	2	2	3-2	2	3	XUC

Unit			Legend	Eros	Found	Prod	Rec	Ac	soil
222	—	↘	4-3 c 1/111 Fl/MS	3-2	2-3	3(2)	3	98	Sa
223									
224	⌣	↘	6-5 mc 1/111 Fl/VS	4	1	4	3	4	wb
225	—	↘	4-6 mc 1/111 Fl/MD-S	3-4	3(-1)	2-4	3	2	Sa
226	⌣	↘	6-5mc 1/Ill Fl/vs	4	1	4	3	15	wb
227				4	3	4	4'	49	gravel pit
228				4	2	4	4	6	gravel pit
229				4	2	-4	4	9	gravel pit
230	⌣	↘	6-4 mc 1/111 W4-Fl/VS	4	1	4	3	13	xwb
231	⌣	↘	6 mc 1/111 Fl/VS	4	1	4	3	4	Wb
232	⌣	↘	6 mc 1/111 Fl/VS	4	1	4	3	6	Wb
233	⌣	↘	5-4mc 1/111 Fl/S	3	1	4	4	13	Sa

Unit	Legend	Eros	Found	hod	Rec	Ac	soil	
234 ⌣ ↘	6 f 1-2/1 GM/VS	4	1	4 - 3	4	13	T	
235 ⌣ ↘	6 f 1/1 GM/VS	4	1	4	4	2	XT	
236 ﹨ ↘	4-5 f 2/1 GM/VS	2-3	1	3	3	15	XKo	
237 ⌣ ↘	5-6 f 2/1 GM/VS	4	1	4		96	T	includes Sphagnum bog
238 ⌣ ↘	6 f 1/1 GM/VS	4	1	4	3	2	T	includes Sphagnum bog
239 ⌣ ↘	6 f 1/1 GM/VS	4	1	4	4	3	T	includes Sphagnum bog
240 ⌣ ↘	6 f 1/1 GM/VS	4	1	4	4	3	T	includes Sphagnum bog
241 ⌣ ↘	6 f 1/1 GM/VS	4	1	4	4	1	T	includes Sphagnum bog
242 ⌣ ↘	6 f 1/1 GM/VS	4	1	4	4	2	T	includes Sphagnum bog
243 ﹨ ↘	3 f 2/1 GM/—	3-2	1	4	4	11	XKl	disturbed

Unit	Legend	Etos	Found	Prod	Rec	Ac	soil
244	~ ↘ 3 f 2/1 GM/MD-MS	3	1	3-2	3		Kl
243	~ ↘ 3-4 f 2/1 GM/MD	2	1	3-2	3	1	Kl
246	⌣ ↘ 6-5 f 1/1 GM/VS	4	1	4	4	76	T
247	⌣ ↘ 5 f 1/1 GM/S	4	1	4	3	3	T includes disturbed area (homestead)
248	⌣ ↘ 6 f 1/1 GM/VS	4	1	4	4	7	T includes Sphagnum bog
249	⌒ ↘ ↘ 3 m-f 3/11 T4+GM/VS	2	1	3	3	6	IQ Tar Till& rock outcrop, clay at base.
250	⌒ ↘ 3 f 2/1 GM/MD	2-l	2	2	3	29	Kl
251	⌣ ↘ 6 f 1/1 GM/VS	4	1	4	4	7	T
252	⌣ ↘ 6-5 f 1/1 GM/VS	4	1	4	4	4	T
253	⌣ ↘ 6-5 c 1/11 Fl/VS	4	1	4	3	48	Wb

unit	Legend	Eros	Found	Prod	Rec	A c	soil
254	4-3 c 1/111 Fl/MS	3	2-3	3-2	3	47	Sa
255	3 c-1/111 Fl-/MD-D	3	3	2-3	3		Uc
256	6-5 c 1/11 Fl/VS	4	1	4	4	4	Wb includes Sphagnum bog
257	6 c 1/111 Fl/VS 1	4	1	4	4	13	Wb
258	4 c 1/11 Fl/MS	3	2	3-2	3	15	Sa
259	6-5 c 1/11 Fl/VS	4	1	4	3	26	Wb includes Sphagnum bog
260	6-5 c 1/11 Fl/VS	4	1	4	3	39	Wb includes Sphagnum bog
261	3-4 c-1/111 Fl-/MD-D	3-2	3-2	3	3	115	UC
262	6-5 c 1/11 Fl/VS	4	1	4	3	6	wb
263	3-1 c -- 1/111 Fl/VS	1	1	4	2	3	XUc rock outcrop

Unit		Legend	Eros	Found	Prod	Rec	Ac	Soil
264	↘	4-5 c 1/111 Fl/MD-S	3	2	3	3	39	Sa
265	↘	3-1 c 1/111 Fl/VS	1	1	4	2-3	3	XUc rock outcrop
266	↘	6-5 c 1/11 Fl/VS	4'	1	4	3	2	wb
267	↘	3-1 c 1/111 Fl/VS	1	1	4	2	6	XUc rock outcrop
268	↘	3-2 c 1/111 F/S	1	1	3	2	5	XUC rock outcrop
269	↘	3 vc 1/111 Fl/MD	3	3	3	3	55	Uc
270	↘	2(5)/vc 1/111 Fl/Mu-s	2	2	3	3	6	Uc occ. flooding-flood channel
271	↘	4 c 31/111 Fl/MS		2	3	3	24	Sa
272	↘	4 c 1/111 Fl/MS	3	1	3	3	57	Sa
273	↘	6-5 c 1/111 Fl+O/VS	3	1	4	2	11	Rg lakeshore

Unit	Legend	Eros	Found	7 Prod	Rec	Ac	Soil
274	5-6 c 1/11 Fl/VS	4	1	4	3	6	Wb
275	6-5 c 1/11 Fl/VS	4	1	4	3	4	wb includes Sphagnum bog
276	6 c 1/11 Fl/VS	4	1	4	3	17	Wb includes Sphagnum bog
277	3-2 vc 1/111 Fl/MS	2	1	3	3	60	Uc Rg
278	4 c 1/111 Fl/MS	3	2	3	3	36	Sa
279	4 f 2/1 GM/MS-S	3	2	3	3	20	Ko
280	3-2 m 3/11 T4/S-VS	2	1	3	3	36	Tr
281	6-5 f 1/I GM/VS	4	1	4	3	9	T
282	4-5 f 2/1 GM/MS-MD	3	2	3	3	619	Ko
283	3-4 m 2/111 T4/MD	2	2	2-3	3	15	Ta some Tag

unit	Legend	Eros	Found	Prod	Rec	Ac	Soil
284	3 m -3/111 T2/VS	2	1	3-2	3	20	Tr
285	3-2 m/m 3/m T3	2	1	4	2-1	15	Trr
286	3(2) m 3/111 T2/VS-S	2-l	1	3-2	2-3	361	Tr
287	3 m/111 3-2/MS-S T4	2	2	3-2	3	104	Ta
288	3-4 f-m 2/xl-1 T4+GM/MD	2	2	2	'3	75	XK1 glaciomarine deposits on till, depth vauable seepage area.
289							
290	3-4 f 2/1 GM/S	2	2	3	3	11	K1 GM over rock.
291	2c -1/111 L1/MD	2	1	2	1	13	Rg
292	5 f 1/1 GM-W1/VS	2	1	4	2	40	Rg flood plains
293	2-3 f 1/1 GM/VS	1	1	4	2	16	XK1 rock outcrop

Unit	Legend	Eros	Found	Prod	Rec	Ac	Soil
294	3-4 f2 GM / I S-MS	2	1	3	3	47	Kl GM variable depth over rock
295	3-2 f 2 GM / I VS-MS	1-2	1	3-4	3	48	Tr rock outcrop- some T2 higher elevations
296	6-5 mc 1/11 Fl/VS	4	1	4	4	18	wb
297	3 m 3 T4 / 111 MS	2	1	3	3	43	TIT
298	4 c 1 T4-W4 / 11 MS	2	2	3-2	3	8	Ta
300	3 f 2 GM / 1 MS	2	2	3	3	37	Xo depth torock shallow-deep
299	6-5 c 1/II Fl/VS	4	1	4	3	96	Wb includes Sphagnum bog
301	(4)3 m 3-2/111 T4/MS	2	2	3	'3	32	Ta upper part at base
302	3 m 2/111 T4/MS	2-3	2 - 3	3	3	16	Ta
303	3-2 m 3 T2 / m m	1	1	3	3	35	Tr some tock outcrops

Unit	Legend	Etos	Found	Prod	Rec	Ac	soil
304	3-2 m 3 T2 / Ill vs	1	1	3	3	16	T r
305	4-2 m 2-3 T4 / 111 MS	2-3	1-3	3-2	3	1.74	Tar
306	3-2 m 3 T3 / III VS	1	1	3-4	2	12	Trr
307	1-2 m 3 T3 / Ill vs	1	1	4	3	4	Trr
308	3 f 2 GM / 1 MD	2-3	1	3	3	11	Kl
309	3 m 2 T4 / II MS	1	1	3	3	2	Tar
310	2 m 2 T4 / 111 VS	1	1	4	3	2	Tar
311	3-2 m 3 T4 / II S-WS	1	1	3	3	31	Tar
312	3 f 2 GM / I SS	1	2	3	3	27	Kl
313	3 m 2 T4 / 111 S	1	1-2	3-4	3	10	Tar

Unit	Legend	Eros	Found	Prod	Rec	Ac	Soil
314	3-2 c/111 1/MD Fl	3-2	3-2	3	3	27	UC
315	3-2 m 3/111 T3-T4/MS	1	2	3	3	45	Tar
316	4 vc 1/111(1V) Fl/S-D	2	3	3	3	148	UC
317	3 c 1/111 R-Fl/S		1	4	3	72	XUC
318	3-4 f 2/I GM/MD	2-3	2	2	3	106	Kl seepage slope
319	3-2 m 3/II T2/VS	1	1	4	3	34	Tr
320	3-4 f 2/I GM/MD	2	1	2	3	10	XKl seepage (fen development?) shallow to R
321	2-3 f 2/1 GM/MD	1	1	4	2	2	Kl rock outcrop
322	3 m 3/111 T2/VS	2	1	3	3	19	Tr
323	2-5 c 1/111-1V Fl W2/D-S	3	3r/2	3	2	14	XUc alluvial fan

APPENDIX II. BROKEN ISLAND GROUP **LEGEND**

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Reeks	1	⌒ ↘ 3 m 3-2/111 T2/S	2	1	3-2	15.9	Tr	112
	2	⌒ ↘ 1-5 vc 1/lV M2/MD-S	2	l-2	4	0.9	Rg	112
	3	∧ ↘(↘) 3 m 3/111 T2-/S-VS	3-2	1	3	2.3	Tr	112
	4	A ↘ l-5 vc 1/lV M2/MD-S	2	l-2	4	1.6	Rg	112
	5	∧ ↘(↘) 3 M 3/111 T2/S-VS	3-2	1	3	6.4	Tr	112
	6	⌒ ↘ l-5 vc 1/lV M2/MD-2	2	1-2	3	0.7	Rg	112
	7	⌒ ↘ 2-3 M 3/111 T2/S-VS	2-3	1	3	6.0	Tr	112
	8	- \ 3-4 mc 2/ll M2/S	2-3	3-2	2-3	2.8	SC	112
	9	⌒ ↘ 3 m 3/111 T2/S-VS	2-3	1	3	4.4	Tr	112
	11	✗ ↘ 2-3 mm 111 VS + R	1	1	4-3	8.9	Trr	112
Turner lt.	12	⌒↘ (↘) 2-3 c 3/111 T2+Q/VS	1	1	3	6.2	Trr	112

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Turner	13	⌒ ↘ 2-3 c 2/111-IV Q+T2/VS	1	1	3	2.3	Trr	112
	I.4	. ↘ 3-4 c 2/111-IV M2/S	2	l-2	3	1	SC	112
	15	⌒ ↘ 3-4 c 2/111-1V Q+T2/VS	1	1	3	2.5	Trr	112
	16	⌒ ↘ 3-4 c 2/111-1v Q+T2/VS	1	1	3	3.7	Trr	112
	17	⌒ ↘ 2-3 m 3/111 T2/VS-S	l-2	1	2	6.0	Tr	112
	18	⌒ ↘ 2-3 m 3/111 T2/VS-S	l-2	1	3	4.1	Tr	112
	19	⌒ ↘ 2-3 m 3/111 T2/VS-S	l-2	1	3	1.6	Tr	112
	20							
	21	∼ ↘ l(5) c 2/1V M2+R/S-VS	1	1	3	0.7	SC	112
	22	∼ ↘ l(5) c 2/1V M2+R/S-VS	1	1	3	1.8	SC	112
Nettle	23	⌒ ↘(↘)2-3 mc 2,3/111 Q/VS	1	1	4	4.6	Trr	112

Island	Unit			Legend	Eros	Found	Prod	Ac	soil	Photo
Nettle	24	~	↘	l mc-c 5 1 M2 / 111(1V) S-MD	2	2-1	3	6.2	SC	112
	25	⌒	↘	1(5)Midden +M2				6.2		
	26	⌒	↘	2-3 m 3 / 11 T2 / Vs-S	2	2	3-2	4.6	Tar	112
	27	⌒	↘	2-3 m 3 / 111 T2 / VS-S	2	2	3 2	27.4	Tar	112
	28	◡	↘	3-4 m 2 T2 / n - 3 -	3-2	2	2-3	5.5	Tar	112
	29	◡	↘	5-3 m 1-3 / iii T2+W4 / S T2+W	2	1.	3	1.1	Ta	112
	30									
	31	~	↘	3m 3 / 111 T2 / vs (W1)	2-l	1	3(2)	17.9	Tr	112
	32	~	↘	3m 2 / II T4 / MD-D	2	2(3)	2-1	78.2	Ta	135
	33	◡	↘	4m 2 / 111 T2 + W4 / S	2	1	2-3	3.4	Tr	135
	34	⌒	↘	3 mc 2 / 111-lv T2(+Q) / VS	1	1	4	1.4	Trr	135

Island Nettle	Unit			Legend	Eros	Found	Prod	Ac	soil	Photo
	35	⌒	↘	3mc 1-2/111-1V T2(+Q)/VS	1	1	4	6.2	Trr	135
	36	⌒	↘	3 m 3/111 T2 + Q/VS	1	1	4	1.4	Trr	135
	37	⌒	↘ ↘	3m 23/111 T2/VS-S		1	3	5.1	Tr	
	38	⌣	↘	4-6m 1/1 T4+0/VS-S	4-3	1	3	7.1	Tag	
	39	∪	↘	6-5 vf 1/1 0/VS	4	1	3-2	1.4	0	
	40									
	41	⌣	↘	5-4 mf 1/11 1 W4 + T4/MS	3	1	2	3.9	Tag	135
	42	⌣	↘	5-4 mf 1/11 W4 + T4/MS	3	1	2	2.9	Tag	
	43	⌣	↘	5-4 mf 1/11 W4 + T4/MS	3	1	2	4.8	Tag	
	44	⌒	↘	3 m 2/11 . T4/MD-S	2-1	2	3-2	9.2	Tar	

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Nettle	45	3 m 2/11 T4/MD-S	2-1	2	3-2	6.4	Tar	135
	46	3m 2/11 T4 + T2/S-MD	2-1	1-2	3-2	7.1	Tar	
	47	3 m 2/II T4/MD - MS	2-3	2	3-2	37.0	Ta	
	48	3 m 2-3/11 T4/MS	2	2	3-2	8.7	Ta	
	49	2·4 m 3/111 T3+W4/VS	1	1	3	13.3	TrrRg	
	50							
	51	3 m 3/iii-5 T2	2	2	3	11.7	Tar	
	52	3-5 m 3-1/111 T4+W4/vs-MD	2-1	1	3-2	6.7	TarRg	
	53	2 -5 m 3·1/111 T2+W4/vs	1	1	3	2.3	TrRg	
	54	3 m 3/111 T2/S	2	1	3	6.4	Tr	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Nettle	55	3–5 m 3/111 T2+W4/MD-S	1	1	3	11	TrRg	135
	56	3–5 m 3/111 T2+W4/MD–S	1	1	3	11	TrRg	
Nettle	57	3 mf–m 2/11 T4/MD	2	2	1-2	10.3	Ta	135
	58	3-2 m 2-3/11 T4/S	1	1	3	4.6	Ta	135
Prideaux	59	\3–4 m 3/111 T4/S-VS	2	2	3–2	9.4	Tar	135
	60							
	61	1-4 vc 1/III-IV M2/MD–S	1	2	4	4.1	Rg	
	62	3–2 m 3/111 (1V) T4/MS–S	2–1	2–;	3	24. 1	Tar	
	63	3–4 c 1/11 M2/S	2	2	4	0.7	Sc	
	64	4–3 m 3/III T2/VS	2–3	1	4	22.5	Tr	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo	
	65	3(4) m 3-2/111 T2/S	2-3	2	3	24.6	Tr	135	
	66	4-3 m 3/III T2/VS	2	1	4	3.2	Tr		
Prideaw	67	3-4 m II if&--	3-2	2(3)	3-2	6.9	Ta		Logged- possibly remains of a camp
	68	3-4 m 3/111 T3/VS	2	1	4	2.1	Trr		
	69								
	70								
	71	4-3 m 3/111 T3/VS	2	1	4	2.5	Tr		
Denne	72	3-4 m 3/111 T3/VS-S	2	1	3	20.2	Tr		faults with some beach deposits
	73	3-4 m 3/111 T4+T3/S-VS	2	2.1	3(2)	23.9	Tar		
	74	3 (4) m 3/111 T4+T2/S-VS	2	2-1	3	14.3	Tar	135	M2 at NE side
	75	2-5 c 1/111-1V M2/S-M	1	1	4	2.5	SC	113	beach with cliff behind

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo	
Gibraltar	76	midden				0.7			beach with cliff behind
	77	2-5 c 1/lV-lll M2/S-M	1	1	4	1.1	SC	113	"
	78	3 m 3/lll T2/VS-MD	3-2	2	3	17.2	Tr		
	79	4-5 c-mf 2/lll M2+W4/vs	2	1	2-3	4.4	ScRg		
	80								
	81	3 c 2/iii-s M2	2	2	3-4	0.9	SC		
	82	4-3 m(mf) 1/ll T4(W4)/S	2-1	l-2	2-3	49.4	TaTag		
	83	3m 3/lll T3/VS	2	1	4	3.9	Tr		
	84	3 m 3/iii T3/VS	2	1	4	7.1	Tr		
	85	3 m 3/III T4/S	2	1	3	5.7	Ta		fault
	86	3 m 3/III T2/S	2	1	3	6.4	Tr		

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Gibraltar	87	3 m 3/iii T2/S	2	1	3	5.7	Tr	113
	88	3 m 2-3/ii T4/S	2	2	3-2	22.5	Tar	
	89	3 m 2-3/iii T4/S	2	2	2-3	16.8	Ta	
	90							
Cibraltar	91	1(4) vc 1/iii-iv M2/MD	1	1	4	4.6	Rg	113
	92	3-2 m 3/iii T3Q/VS	1	1	4	2.8	Trr	
	93	2-3 m 3/iii T3/VS	1	3.	4	2.5	Trr	
	94	3-2 m 3/iii T2/VS	1	1	4	7.8	Rg	
	95	1-(3)vc(m) 1/iii M2(Q)/MD(VS)	1	1	4	7.8	Rg	
	96	2-3 m 3/III T3/VS	1	1	4	12.2	Trr	
	97	3 m 2/ii T4/MS	2	2	3-2	3.7	Ta	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Gibraltar	98	3 m 3/111 T3/VS	1	1	4	4.6	Trr	113
	99	3-2 m 3/111 T2/s-vs	1	1	3-4	2.3	Tr	
	100							
	101	3(4) m 3-2/11 T4/MS	2	2	3-2	10.1	Ta	
	102	3-2 m 3/111 T2/MS 3	2-l	2	3	6.9	Tr	
	103	(↘)3-2 m 3/111 T2/MS 3	1	1	3-4	6.2	Tr	
	104	4 m 2-3/11 T4+W4/MS	3	2	3-2	2.3	Ta	
Dempster	105	2-3 m 3/111 T3/vs	1	1	4	1.4	Trr	1 1 5
	106	3-2 m 2/11 T4/S	2	1	3	3.0	Ta	
	107	l-4 v_c 1/lV M2/MD	1	1	4	0.7	Rg	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo	
Dempster	108	2-3 m 3/iii T3/Vs	1	1	4	4.1	Trr	115	
	109	3-2 m 2/II T4/S	2	2	3(2)	11.0	Ta		
	110								
	111	3-2 m-c 1/iii T2+Q/VS	1	1	4	1.8	TIT		
	112	2-3 m 2-3/111 T2/S	2	2	3	4.6	Tr		
	113	l-3 c 1/111-1V M2/MD	1	1	4	1.4	Rg		
	114	Midden				1.1			
	115	3m 3/iii T3/VS	2	1	4	3.2	Trr		
	116	1(4) vc 1/1V-111 M2/MD	l-l	1	4	r6.4	Rg		gravel on S, sandier with bedrock outcrops on N
	117	3(4) m 2/111 T_4/MD-MS	2	2	3-2	12.4	Ta		

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo	
Dempster	118	3 (x) 2-3 T3 / III VS	1	1	4	10.3	Trr	115	fault
	119	3-2 c-m 1 / III-IV . M2(T3)2-1 / MD	.1	1	3	0.9	SC		
	120								
	121	3 m 3 / 111 T2 / MS	2	1	3.4	4.1	Tr		
Wiebe	122	2-4 c 1-2 / III M2 / MD	2	2-3	3	5.1	SC	116	
	123	3 m 3 / 111 T3 / VS	1	1	4	U.7	TIT		
	124	1 c-vc 1 / 111-1V M2 / MD	1	1'	4	3.4	Rg		rock outcrops - frequent
	125	2-3 c-m 3 / 111 T3+Q / VS 3	1	1	4	0.9	Trr		
	126	3-2 mc 2 / 111 M2 / MS	2-3	2-3	3-4	11.5	S C	119	
	127	3 - m 3 / III T2 / S	2	1	3	7.6	Tr		

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo	
Effingham	138	4-5 m-mf 1/111-11 W1+M2/S	2-3	1	3	2.8	Rg	114	old floating tow prob. some trace in this unit
	139	3 m 1/11 · T4/MS	2	2-3	2(1)	10.3	Ta		
	140								
	141	3-2 m 1/111 T4/S	2	1	4	7.8	Tar		
	142	Midden and bog				4.6			
Effingham	143	3 m 3/111 T2/S	2	1	4	7.8	Tr	119	
	144	Midden				1.1			
	145	3(4)m 2 T4	2-3	2	3-2	5.5	Ta		
	146	3-2m 2 11/11 S-MS T4/MS	1	1	2-3	17.5	Ta		
	147	3-2 m 3/11 T2 T3/VS	2	1	4	46.2	Tr		
	148	4 m 2-1/111 W1+T4/S-VS	2-1	1	4-3	8.5	Rg		

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Effingham	160							119
	161	3-2 m 3/111 T2/S	2	1	3	4.4	Tar	
	162	4(5) m 1/11 W4+T4/S	3	1	3-2	17.2	Tag	
	163	3-2 m 3/111 T2/S	2	1	3	2.5	Tar	
	164	6 f 1/I 0/VS	4	1	4	2.3	0	
	165	3-2 m 2/ii T4/MD	1	1	2-3	14.0	Ta	
	166	2 m 2-1/1V T4+G3/VS	1	1	4	4.8	Tar	
	167	4-3 m- 1/11 T4+W4/S	2-1	1	3	8.7	Tag	
	168	2-3 m 1/111 T2+G3/S	1	1	4	3.2	Ta	
	169	3-2 3/111 T3/VS 3	1	1	4	35.9	Trr	
	170							

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Effingham	171	2-3 m -- 3/111 T3/VS	1	1	4	14.3	Trr	119
	172	2-3 m 3/111 T3/VS	1	1	4	2.8	T r r	
	173	3-m 2/'iii T4/MS	2	2	3	21.6	Ta	
	174	3-2 m 3/iii T2/VS-S	1	1	4	9.7	T r	
	175	3-4 m 3/111 T3/MS	2	2	3	6.2	Ta	
	176							
	177	3 m 2/11 T4/S-MS	2	2	3	11.7	Tar	
Bauke	178	2-3 m -3/111 T3/vs	1	1	4	12.4	Trr	123
	179	3 m 2/111 T4 T2/S	2	1	3	4.8	Tr	
	180							
	181	3 m 3/111 T4/S	2	1	3-4	18.6	Tar	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Bauke	182	⌒ ↘ 4-1c 1/IV M2/MS	2	2	4	1.8	Rg	123
Austin	183	⌒ ↘↘ 2-3 m 3/III T3/VS	1	1	4	3.2	Trr	
	184	∪ ↘(↘)3 m 2/iii T3(W4)/s	2	1-2	3-4	3.2	Trr	
	185	⌒ ↘↘ 2-3 m 3/III T3/VS	1	1	4	5.7	Trr	
	186	~ ↘↘ 3(4) m 2/II T4/MS-S	2	2	3	12.9	Ta	
	187	∪ ↘(↘)3m 2/iii T4 (W4)/s	2	1-2	3-4	1.8	Ta	
	188	⌒ ↘↘ 2-3 m 3/III T3/VS	1	1	4	4.1	Trr	
	189	⌒ ↘↘ 2-3 m 3/II T2/S	2	1	3-4	3.9	Tr	
	190							
	191	⌒ ↘ 1-4 c 1/IV M2/MS-MD	2	1	4	1.8	Rg	

Island	Unit	Legend	Eros	Found	Prod	Ac	Boil	Photo
Austin	192	↘(↘)3-2 m 3/111 T3/VS	1	1	4	1.1	Trr	121
	193	↘↘3-1vc 1/1V Q/VS	1	1	4	5.5	Q	
	194	↘ 2 vc 1/1V Q/VS	1	1	4	5.5	Q	121
	195	↘ 2-4 vc 1/1V Q/VS	1	1	4	2.8	Q	
	196	↘ 2 vc 1/1V Q/VS	1	1	4	0.9	Q	
DiceBox	197	↘ 2 vc 1/1V Q/VS	1	1	4	2.8	Q	
	198	↘ 1 vc 1/1V M2/VS	1	1	4	1.1	Rg	
	199	↘ 2-1v 1/1V Q(T3/VS Q(T3/VS	1	1	4	4.4	Q	
	200							
Howell	201	↘↘2-3 m 3/111 T.3/VS	1	1	4	7.1	TIT	126

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Howell	202	↘↘ 3-4 m 3-2/III T2/VS	1-3	1	4	48.1	Tr	126
	203	↘↘ 2-3 m 3/iii T3/VS	1	1	4	6.2	Trr	
	204	↘ 3-5 m 3-2/II T4 W4/MS-S	2-3	2(3)	3	9.0	TrRg	
	205	↘↘ 2-3 m 3/Ill T3/vs	1	1	4	3.9	Trr	
	206	↘↘ 3 m 3/Ill T3/vs	1	1	4	23.7	Trr	
Wouwer	2072	↘ 3(4) m 3-1/111 T3/vs	1	1	4	17.0	Trr	
	208	↘ 3 m 3/111 T3/V S	1	1	4	4.1	TIT	
	209	↘ 3 m 3/III T´3/VS	1	1	4	8.9	Trr	
	210	↘ 2-4 vc 1/lV M2/vs	2	1	4	1.4	Rg	
	211	↘ 6-4 m-mf 10/II +T2/VS	3	1	4	7.1	Tag	126

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Wouwer	212	Midden				0.9		126
	213	1-4 c 1/111-1V M2/MS	2	2	3	2.5	Rg	
	214	1-4 c 1/111-1V M2/MS-S	2	2	3	3.2	Rg	
	215	3 m 3/111 T2/s	2	1	4	34.7	Tr	
	216	l-4 c 1/1V-111 M2/MS	1	1	4	2.3	Rg	
	217	1-4 c 1/111-1V M2/S	1	1	4	2.3	Rg	
	218	3 m 1/111 T4/MD	2	2	3-4	5.5	Tar	
	219	l-4 c 1/111-1V M2/MD-MS	2	2	3-4	5.3	SC	
	220							
Batley	221	3-2 m 3/111 T2/S	l-2	1	4	33.8	Tr	

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Camblain	222	3-4 m 3-2/111 T2 (W4)/S-VS	2	1	4	1.8	Tr	127
	223	3-2 m 3/11 T3/VS	1	1	4	13.1	Trr	
	224	1-2 c 1/111-1v M2/MS	2	1	3-4	1.6	Rg Sc	
Cooper	225	2-3 m 3/111 T4/S	2	1	3-4	1.1	Tar	
	226	3(4) m 2/11 T4/MS	1	1	3	28.1	Ta	
	227	3-2 m 3/111 T2/S	1	1	4	4.6	Tr	
Cooper	228	1-3 c 1/111 M2/MS	1	1	4	1.4	Rg	127
	229	2-3 m 3/111 T2/VS	1	1	4	8.5	Tr	
	230							
	231	2-3 m 3/111 T3/VS	1	1	4	4.4	Trr	
	232	3-(4) m 2/111 T4+W4/MS	2	2	3-4	23.5	Tag	

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Cooper	233	2-3 m 3/III T2/S	1	1	4	13.6	Tr	127
	"234	2-4 c 1/III(IV) M2/MS	2	2	3	2.5	Sc	
Moreton	235	2-3 c 1/III(IV) M2/VS	1	1	4	3.2	SC	
	236	3-2 m 3/III T3(Q)/VS	1	1	4	4.6	TIT	
	237	3-m 3/III T2/VS	2	1	3-4	6.4	Tr	
Gilbert	238	2-3 m 3/III T2/VS	1	1	4	1.8	Tr	128
	239	3(m) 2/II T4/MS	2	2	3	10.3	Ta	
	240							
	241	3-2 m 2/II T4/MS	1	1	3	13.8	Ta	
	242	2 m 3/III T3/VS	1	1	4	13.3	TIT	
	243	2 m 3/III T3/VS	1	1	4	15.9	Trr	

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Gilbert	244	↘ 3 m 3/111 T2/S-VS	2	1	4	4.6	Tr	128
	245	Midden				1.1		
'Gilbert	246	↘ 3 m 3/111 T2/VS	2	1	4	0.9	Tr	128
	247	↘ 1-3 c 2/111 M2/D·MD	2	3-2	3	2.5	SC	
Onion	248	↘ 3-1 c 1/111-1V M2/S	1	1	4	0.7	Rg	132
	249 A	↘ 3-2 m 3/111 T3/vs	1	1	4	2.3	TIT	
	250							
	251	↘ 1-3 c 2-1/III-IV M2/MD-S	2	2	3-4	5.5	SC	
	252	↘ 2-3 m 3/III T3/VS	1	1	4	0.7	Trr	
	253 A	↘ 2-3 m 3/Ill T3/vs	1	1	4	3.0	Trr	
	254	↘ 3-2 m 3/111 T3/vs	1	1	4	2.1	Trr	

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	photo
Onion	255	1-4 c-vc 1/III-IV M2/MS-MD	2	2-1	3-4	1.1	sc	132
	256	3 m 3/III T3/VS	1	1	4	2.3	Trr	
Mullins	257	4-3 mc 1/III M2(W2)/MS-S	2	1	3-2	0.7	Rg	
	258	1-3 c 1/IV(III) M2/MS	3	1	3-4	4.6	Rg	
	259	3(4) m 3-2/III T4/MD	2-1	2-3	2-3	14.9	Ta	
	260							
	261	3(5) m 2/II T4 +W1/S-MS	1	1	4	2.8	Ta	
	262	3-2 m 3/III T2/S	1-2	1	4	7.4	Tr	
Mullins	263	1-3 c 1/III-IV M2/S	2	1	3	0.5	Rg	132
	264	3-2 m 3/III T2/S	1-2	1	4	57	Tr	
	265	1-3 c 1/III-IV M2/S	2	1	4-3	3.0	Rg	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Keith	266	↘ 1-3 c 1/111 M2/MD-S	2	1-3	3-4	5.1	SC	132
	267	↘ 3 m 3/111 T2/MS	2	1	3	3.2	Tr	
	268	↘ 2-4 c 1/111-1V M2/MD-S	2	2	3	4.1	SC	
	269	↘ ↘ 3-2 m 3/111 T2/S-MS	1	1	3	10.8	Tr	
	270	MIdden and Beach						
--	271	↘ 2-3 m 3/111 T3/vs	2	1	4-3	4.8	TIT	
--	272	↘ 1-3 c 1/1V-111 M2/S	2	1	4	0.5	SC	
--	273	↘ 2-3 m 3/Ill T3/vs	2	1	4-3	3.7	TIT	
--	274	↘ ↘ 2-3 m 3/111 T3/VS	2	1	4-3	1.1	Trr	
Jarvis	275	↘ 2-3 m 3/111 T3/vs	2	1	4-3	1.8	Trr	I.33
	276							

Island	Unit	Legend	Eros	Found	F-rod	Ac	soil	Photo
Jarvis	277	1-3 c 1/111(1V) M2/MS	2	2	3-4	2.3	SC	133
	278	3-2 m 3-2/11 T4/s	2	1	3-4	35.9	Tar	
	279	3-2 m 3-2/Ill T4T2/MD	1-2	1	3(2)	60.8	Tar	
	280							
Jarvis	281	5-4 m 1/11 T4W4/S	4	1	3	3.7	Tag	
	282	3 m 3/111 T3/VS	2	1	4	4.1	Trr	
	283	4 mc 2/111-1V M2/S 2	3	1	3	1.8	Rg	
	284	5-4 mf 1/11 T4 W4/S	3	1	3-2	5.5	Tag	
	285	3 c 1-2/111-1V M2/VS-S	2	1	3-4	1.4	SC	
	286-L	4-5 mf-m 2/11 T4W4/S-VS	3	1	3	11.3	Tag	
	287n	3-4 m 2/111 T4/MS	2	2	3-2	1.4	Ta	

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Jarvis	288	3-2 m 3/111 T3/VS	2-1	1	4	1.1	Trr	132
	289	3 m 3/111 T2/S	2	1	4-3	8.5	Tr	
	290							
	291	3-2 m 3/111 T3 Q/VS	2	1	4	3.0	Trr	
	292	2-3 m 3/111 T3 Q/VS	2	1	4	5.7	Trr	
Jaques	293	3-2 m 3-2/111 T4T2/MS	1	1	3-4	47.4	Tar	
	294	3 m 3/111 T2/MS	2	2	3	4.1	Tr	
	295	3 (4) m 2/11 T4/MS	2-1	1	3	a.8	Ta	
	296	5-3 m 1 W2-T3/111 S	2	1	3-4	1.8	Rg	
	297	3-4 m 2/11 T4/MD	2	2(3)	3-2	49.4	Ta	

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Jaques	298 ∼	↘ 2(4) c-mc 1/III(IV) M2/MD	2	2-3	3	6.2	sc	133
	299 ∼	↘ 3-2 m 1/III T2/S	2-1	1	3-4	11.0	Tr	
	300							
	301 —	↘ 1-4 vc 1/W-III M2/MS	2	2	3	1.4	Rg	Small midden
	302 ∼	↘ 1-4 vc 1/IV-III M2/MS	2	2	3	0.7	Rg	
	303 ⌒	↘↘ 2-3 m 1/iii T 3/VS	1-2	1	4-3	11.5	Trr	
	304 ∼	↘ 2-5 c 1/III M2/MS-S	2	2	3-4	18.4	SC	
	305 ⌒	↘ 3-2 m 3/III T3/VS	2	1	4	3.2	TIT	
	306 ⌒	↘ 2 m 3/III T3/VS	2	1	4	0.9	Trr	
	307 n	↘ 2 m 3/III T3/VS	2	1	4	0.7	TIT	
	338							
	309 ∼	↘ 4-2 c 1/III M2/S	2-3	1	3	2.6	Rg	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
	310							
	311							
Jacques	312	4–2 c $\frac{1}{111}$ $\frac{M2}{S}$	2–3	1	3	1.1	Rg	133
	313	3 m $\frac{2}{111}$ $\frac{T4}{MS\text{–}MD}$	2	2–3	3–2	25.3	Ta	
	314	3–2 m $\frac{3}{111}$ $\frac{T2}{S}$	2	1	3	4.1	Tr	
	315	3–2 m $\frac{3}{111}$ $\frac{T2}{S}$	2	1	3–4	13.1	Tr	
Jaques	316	3 m $\frac{3\text{–}2}{111}$ $\frac{T4T2}{S}$	2–1	1–2	3(2)	11.0	Tar	133
	317	6–4 m-f $\frac{1}{11}$ $\frac{W2\ M2}{VS}$	3	1	4	3.0	Rg	
	318	3 m $\frac{2\text{–}3}{111}$ $\frac{T4T2}{S}$	2	1–2	3	9.2	Tar	
	319	2–3 m $\frac{3}{III}$ $\frac{T3}{VS}$	1	1	4	5.7	Trr	
	320							

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
	321							
- -	322	3 m 3/111 T3/VS	1	1	4	7.8	Trr	
- -	323	3 m 3/111 T3/VS	2	1	4	3.9	Trr	
Chalk	324	2-4 c 1/111 M2/MS	2	1	3	1.6	sc	147
	325	3 m 3/111 T4/MS	2	2	3	29.2	Tar	
	326	5-4 m 1/11 W4 T4/VS	4	1	4	4.8	Tag	
	327	Midden				11		
- -	328	4-2 c 1/1V-111 M2/S	2	1	4	4.4	Rg	
	329	3-2 m 3/111 T2/S	2	1	4	13.8	Tr	
	330							
	331	4-2 c 1/1V-111 M2/S	2	1	4	3.2	Rg	

Island	Unit	Legend	Eros	Found	F-rod	Ac	Soil	Photo	
	332	2-3 m 3/111 T3/VS	2-1	1	4	2.1	Trr		
--	333	2-3 m 3/111 T3/V3	2-l	1	4	3.9	Trr		
Turtle	334	3-2 m 3/111 T2/S	2+1	1	3-2	22.3	Tr	148	
	335	3 c 2/111(1V) M2/MS	2-3	2-3	3	8.3	Sc		
	336	Midden, Homestead				3.0			
	337	4(5) c 2/1 M2/VS-MD	3	2-3	3-2	14.9	SC		Seepage, some gleyed areas
	338	3-2 c 2/111(1V) M2/MS	2-1	2-1	4-3	3.7	SC		Foreshore-rock or rocky
	339	3-2 m 3-2/11 T4/MD-S	2	2(4)	3-2	30.8	Ta		
	340								
	341	1-4 c-vc 1/111(1V) M2/MD1	2	1	4	1.6	Rg		
	342	1-4 c-vc 1/111 (1V) M2/MD	2	1	4	5.0	Rg		

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Turtle	343	3 m 3 T4 T2 11 S-MS	2-1	1	3	44.2	Tar	148
	344	3 m 2 1i MS	2-3	2(3)	3-2	38.4	Ta	
	345	4(5) m(mf) II ~~S-VS~~	3	1	3	5.5	Tag	
	346	6-5 f 1/1 0/S	4	1	3	3.4	0	
	347	4-5 mf 2/11 W4 T4/S	4	1	3 -2	3.4	Tag	
	348	3 m 2/11 T4/MD-S	2	2(3)	3(2)	64.4	Ta	
	349	Midden				0.9		
	350							
Turtle	351	3 c 2/II M2/MS 2	2	2-3	3(2)	3.4	SC	148
	352	3-2 c/II 2 M2/MD	2	2	3	1.4	SC	
	353							

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Turtle	354	3-5 c 1/IV-III M2/S-VS	1	1	3	3.0	Rg	148
	355	3 m 3/III T2/S	2-1	1-2	3	26.9	Tr	
	356	5-4 c-mf 2/iii W1/VS	3	1	4	2.3	Rg	
Turret	357	2 c 1/111 M2/MD	2	3	3	8.9	RgSc	150 Extensive, shallow **Midden** deposits.
	358	3 m 2/11 T4/MS-MD	2	2-3	3(2)	20.7	Ta	
	359	Midden				1.4		
	360							
	361	3-2 m 3/111 T3/VS	1	1	4	1.1	Trr	
	362	3 m 3/111 T2/S-VS	1	1	4	16.8	Tr	
	363	3 m 2/11 T4/S	2	2(3)	3-2	51.1	Tar	
	364	4-3 mf 1/II W4-T4/MS	2	2	3(2)	18.2	Tag	Narrow Beach unit included

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Turret	365	Midden				0.5		150
	366	Midden				0.2		Tumbled down shack
	367	↘(↘) m-2 m-mc 3-2/111 T4/MD	2	2	m-2	8.5	Ta	
Turret	368	↘↘ m (2) m 3/111 T2/S-VS	2	1	m	71.3	Ta	150
	369	↘ 4-2 c 2/111 M2/S-MD	2-1	1	m	7.4	Rg	
	370							
	371	↘ 5-4 2/11 M2+W1/S-MS	3	1	4	1.8	ARg	
	372	↘↘ 3 m 2/111 T4/MS	2	2	3-2	29.4	Ta	
	373	ω ↘ 5-m m 1/11 W1+T4/VS-MS	2	1	3(2)	4.6	Rg	
	374	↘↘ 3 m 2/111 T4/MS	2	1	3-2	17.2	Tar	
	375	∧ ↘ ω-2 m 3/111 T3/VS	1	1	4	17.9	Trr	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
- -	376	3-2 m 3/111 T3/VS	1	1	4	4.1	Trr	
- -	377	3-2 m 3/iii T3/VS	1	1	4	4.8	Trr	
- -	378	3-2 m 3/iii T3/VS	1	1	4	2.1	Trr	
- -	379	3-2 m 3/111 T3/VS	1	1	4	5.5	Trr	
- -	380							
- -	381	3-2 m 3/III T3/VS	1	1	4	11.0	TIT	
Zodiac	382	3 m 3/III T3/VS	1	1	4	8.7	Trr	152
	383	3-4 m 2/111 T4/MS	2	1	3	3.4	Ta	some indication of placic horizon over water table
Benson	384	3-2 m 3/111 T3/vs	1	1	4	38.4	Trr	156 Benson boundaries uncertain air-photo do not provide clear picture
	385	3 mc 3/111 T4/MS-S	2-l	2-1	3	12.9	Ta	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Benson	386	↘ 3-4 m m 2/II T4/MD	2	2(3)	3(2)	3.9	Ta	156 Logged 1900
	387	Midden & Homestead-pasture				4.6		
	388	↘ 6-4 m-mf 1/II W4T4/VS	3-4	1	4-3	6.0	Rg	
	3 8 9	Midden garden, building site				1.4		
	390							
Clarke	391	↘ ↘ 3-2 m 3/111 T3/VS	1	1	4	10.8	Trr	157
	392	↘ l-2 c 1/111 M2/D	2	3	4	6.0	ScRg	
	393	↘ ↘ 3 m 2/II T2/D	l-2	1	3	21.6	Tr	
	394	↘ 2 c 1/111 M2/MS	2	1	4	2.1	Rg	
	395	↘ ↘ 3-2 m 3/III T3/VS	2-1	1	4	12.2	Trr	
	396	↘ 3-2 c 1/111-1V M2/MD	2	2(3)	3	3.4	Rg	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo	
Clarke	397	↘ 3-2 m 3/111 T3/v s	1	1	4	2.1	Trr	157	
Owens	398	↘ ↘ 3 m 3/iii T2/MS-MD	2	2	3	14.7	Tr		
Lovett	399	↘ 3-2 m 2/11 T4/MS	2(3)	2(3)	3	5.3	Ta		
	400								
	401	↘ 3(4) m 2/111 T4/MS M	2(3)	2	3	22.3	Ta	157	
	402	Midden & Shell beach				1.6			
	403	↘ 2-4 c 1/IV M2/MD-S	l-2	2	4	2.5	SeRg		
Trickett	404	↘ 3-2 c 1/111 M2/MD	1	2-3	4	2.7	SC	159	
	405	↘ 3 m 3/111 T2/S	2	1	4-3	9.7	Tr		
	406	↘ 3-2 c 1/111 M2/MD	1	2-3	4	4.4	SC		
Hankin	407	↘ ↘ 3 m 3/111 T3/VS	1	1	4	5.3	Trr		Sheltered pocket in centre of island

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Hankin	408	4-3 m 2/II T4/MS-S	2-3	2	3(2)	4.4	Ta	154 leeward side
Willis	409	3-2 m 3/111 T3/VS	1	1	4	43.9	Trr	
	410							
	411	4-2 c 1-2/11 M2(W2)/MD	2(3)	2-3	3(2)	5.7	Rg	Gleyad, sands veriabl water table
	412	Midden				0.2		
	413	4-3 m 2/111 T4(W4)/MD	2	2'	3-2	10.3	Tag	
	414	3 m 3/111 T4/S	2	1	3	7.1	Tar	
	415	3 m 3-2/iii-3 T2	2	2	3	11.5	Tr	logged area near homestead
	416	Midden				0.2		
	417	2(4) m 2/111 T2/S	1	1	4	34.9	Tr	
	418	3 m 3/111 T3/VS	2	1	4	6.9	TIT	site

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Dodd	419	4-3 n 2/II T4/MD	2	2	3-2	6.4	Ta.	161
	420							
	421	3-2m 3/III T3/VS	1	1	4	17.1	Trr	
	422	3(4) m 2/II T4/MS-MD	2	2(3)	3-2	42.8	Ta	
	423	4 m 2/II T4 (W3)/MD	2	2	2-3	10.3	Tag	
	424	4-3 c 1/III M2/S	2.	1	4	0.9	Rg	
	425	Midden				0.5		
	426	4-3 c 1/iii M2/5	2-3	1-2	4	0.7	Rg	
	427	4 m 2/III W1(T4)/S	3	1	3(2)	8.7	Rg	
	428	3-2m 3/III T3/VS	1	1	4	34.9	Trr	
	429	3(4) m 3/III T3/VS	2	1	4	24.6	Trr	

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Dodd	430							161
	431	4-2 c 1/lll W1 M2/S	2	1	3	2.1	Rg	
	432	3 m 3/lll T3/VS	1	1	4	7.8	Trr	
	433	3 m 3/Ill T2/VS	1	1	4-3	9.4	Tr	
	434	5-4 m 1/ll W1M2/VS	3	1	4	7.6'	Rg	
	435	3 m 2-3/lll T2/MS	2	2	3	9.7	Tr	
	436	3 m-c 2-3/lll M2 T3/MS	2	2-3	3	20.0	Sc Tr	
	437	**Midden and Garden**				5.7		161
	438	3-2 m 3/iii T3/VS	1	1	4	3.4	Trr	
Brabant Group	439,	2 c 1/iii M2/MD	2	3-2	4	1.6	Rg	163
	4.40							

Island	Unit	Legend	Eros	Found	Prod	Ac	soil	Photo
Brab ant Group	441	3 m 3/111 T3/VS	2	1	4	8.3	Trr	163
	442	3 m 3/111 T3/S	2	1	4	7.6	Tr	
	443	4 -3 c 1/111. 1V M2/MS	2	1	4	1.8	Rg	
	444	3(4) m 2/111 T4/MS-MD	2	2	3(2)	18.2	Ta	
	445	2 c 1/111 M2/MS	2-3	1	4	1.1	Rg	Shell Beach
	446	2cl /1V M2/MS	2	1	4	1.1	Rg	
	447	3 m 2/11 T4/MD	2	2	3	61.9	Ta	
	448							
	449	2 -4 c 1/1V-111 M2/MD	2	1	4	2.7	Rg	
	450							

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Brabant Group	4 5 1	↘ 3(4) m 2/11 T4/MD	2-3	2	2	2.8	Ta	163
Mence	452	↘ ↘ 3 m 3/iii T2/.5	2	1	4	4.8	Tr	
	453	↘ 3-4 m 2/II T2/S	2-3	2-3	4	8.3	Tr	
	454	↘ 3 m 2/111 T4/MS	2-3	2-3	3	3.4	Ta	163
	455	↘ 3 m 3/111 T3/vs	2.	1	4	2.3	TIT	
	456	↘ 3 m 3/111 T3/VS	2	1	4	5.5	Trr	164
Hand	457	↘ ↘ 3-4 m 2/II T4/MD-S	2-3	2	3(2)	55.4	Ta	
	458	↘ 4 m 2/III T4/MS	3	2	2-3	23.3	Tag	
	459	↘ 4-2 c 1/111 M2/MD-S	3	1	3	9.4	Rg	
	460							

Island	Unit	Legend	Eros	Found	Prod	Ac	Soil	Photo
Hand	461	~ ↘ 4-2 c 1 M2/MD-S iii	3	1	3	3.9	Rg	164
	462	~ ↘ 4-2 c 1/111 M2/S-MD	3	1	3	5.5	Rg	
	463	∪ ↘ 5-3 m 1-3/111 W1+T3/vs	3-1	1	3	2.5	Trr	
	464	⌒ ↘ 2 c 1/111 M2/MD	2	2	3	3.0	SC	