

## VEGETATION OF DEWDNEY ISLAND ECOLOGICAL RESERVE, BRITISH COLUMBIA

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Ref. No.:

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ECOLOGICAL RESERVES COLLECTION  
GOVERNMENT OF BRITISH COLUMBIA  
VICTORIA, B.C.  
V8V 1X4

## THE FLORA AND ITS GEOGRAPHIC AFFINITIES

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## INTRODUCTION

Dewdney Island Ecological Reserves was one of the earliest ecological reserves to be established in British Columbia. However, unlike others, this remote reserve has seen very few visits since the time it was first surveyed in its proposal stage and none of these few visits were by botanists. The visit upon which the present paper is based was prompted by the lack of an adequate vegetation inventory of this rather diverse reserve and by the scarcity of vegetation studies available for the northwestern coast in general.

Access was by float plane from Sandspit, the nearest community 150 kilometers to the west, on the Queen Charlotte Islands. The objectives of

the four-day field survey were to gain a quick, but complete overview of all major plant communities of the island and to document the flora by herbarium collections and field notes. This paper presents the synthesis of our field data and observations.

Comparable environments have been described in British Columbia by Banner (1983), Banner, Pojar and Trowbridge (1986), and by Banner, Pojar and Yole (1983). For Southeast Alaska Zach (1950), Ugolini and Mann (1979) and Neiland (1971) discussed equivalent oceanic types of vegetation.

## METHODS

The approach taken was to describe by quick relevés as many as possible vegetation sample plots distributed over all of the island's vegetation types, rather than to carry out more exacting and time-consuming assessments for only a few representative sites. Plant lists with Braun-Blanquet cover-abundance estimates (cf. Ellenberg and Mueller-Dombois 1974), environmental observations on slope, aspect, soil substrate and water conditions, as well as general stand descriptions including estimated canopy heights, were recorded for every plot using a small tape recorder. Regular soil descriptions were not envisaged due to time limitations. However, after some experimentation it proved possible to accurately determine depths of organic soil layers using a wooden sounding rod fashioned from western red cedar (*Thuja plicata*).

Sample plots were deliberately chosen to represent homogeneous vegetation. Plot size was 4 m<sup>2</sup> for lower salt marsh, 9 m<sup>2</sup> for upper salt marsh, 2 m<sup>2</sup> for "Schlenken" bog complexes, 4 m<sup>2</sup> for graminoid bogs, 9 to 25 m<sup>2</sup> for shrubby bogs, 25 to 100 m<sup>2</sup> for bog scrub forest and 400 m<sup>2</sup> for forest.

Concurrently with the collection of plot data herbarium collections of a large portion of the island's vascular flora, with emphasis on less common species, were carried out.

Tabular analysis and classification of vegetation plot data was done using an IBM PC version of the sorting program described by Ceska and Roemer (1971). In a first run of all 105 relevés, species groups were identified which served to define the three major divisions in relevés, i.e. forests, bogs and salt marshes. Each of these groups of relevés was then sorted separately to identify subdivisions corresponding to more detailed community types. Minor re-writings of the obtained vegetation tables resulted in the tables presented in this paper.

## THE STUDY AREA

Dewdney Island is located at 53° North and 129° 30' West near the mainland coast of British Columbia. It is part of the Milbanke Strandflat (Holland, 1964), the seaward zone of Hecate Lowland (ibid.), and is exposed to the open Pacific toward the south. The Queen Charlotte Islands, located due west, do not appear to exert a significant sheltering effect due to their great distance. Consequently, the island experiences the most oceanic climatic conditions found in western Canada. According to Klinka (1984) the island lies in the Hyperoceanic Subzone of the Coastal Western Hemlock Biogeoclimatic Zone, formerly also known as the Coastal Cedars Pine Hemlock Zone (Pojar and Annas, 1980; Banner, Pojar and Yole, 1983). Frequent cloud cover, mist and fog, even during the annual minimum of precipitation in the summer, create conditions conducive to paludification.

Most of the island is low-lying (below 50 m) and the bedrock-controlled topography is flat to undulating, with few hills rising to 100 m and only a single one rising to just over 300 m a.s.l. The shorelines of Dewdney Island are very varied and range from the predominant rocky head-

lands and coves to boulder, sand and shingle beaches, as well as a few muddy lagoons. A characteristic landscape feature on Dewdney Island is the profusion of bog ponds, lakes and sloughs which are scattered throughout the island in flat areas and depressions.

Glacial and post-glacial unconsolidated materials appear to be virtually absent from the island with the exception of scattered areas of thin glacio-marine silts and beach sands.

The bedrock geology of Dewdney Island and its vicinity is dominated by a variety of intrusive rocks of mesozoic, palaeozoic and unknown age. These include quartz diorite, granodiorite, gneissic diorites, hornblende biotite and gabbro. Less widespread are metamorphic rocks including quartzite, schist, conglomerate, metavolcanics and crystalline limestone (Roddick, 1970; Bear, 1973; Geological Survey, 1979). On gentle terrain the influence of these quite different rocks on the vegetation is masked, however, by the organic surface layers. Only on steep slopes and banks, mostly along the seashore, are the richer materials such as limestones expressed in the species combination.

The subdued topography, the climate and the absence of unconsolidated parent materials for richer soils combine to produce a vegetation pattern greatly dominated by blanket bogs and low scrub. Bog formation takes place on all flat, gently and moderately sloping surfaces, while forests are restricted to steep slopes and to the shorelines. Along the shorelines not only steeper terrain, but also well-drained beach sands and gravels combine with better nutrient supply from flotsam and seaspray to produce a continuous fringe of comparatively tall trees surrounding the island. This forest fringe shows two distinct age classes of trees. The largest area is covered with medium to small-diameter trees estimated at 80 to 100 years of age, while smaller remnants of much older trees (probably 250 years and more) are scattered, often on points and peninsulas. Single burnt-out western red cedars remaining in the younger forest are evidence that the latter has grown up after a large forest fire. There is also occasional evidence of this fire history in the upland bog vegetation.

Larger mammals resident on Dewdney Island are coast black-tailed deer, beaver, otter and wolf. None of these appear to be abundant. Resident bird species include sandhill cranes, Canada geese, bald eagles, ravens, red-throated loons and a large variety of shore and sea birds.

Evidence of human activity in the ecological reserve is restricted to an ancient Indian fish trap fashioned from rocks in a lagoon and to the usual modern flotsam found on ocean beaches throughout the world.

## PLANT COMMUNITIES AND THEIR ECOLOGY

### BLANKET BOG VEGETATION COMPLEX

The term "blanket bog" has been chosen because it is the only commonly understood term for wetlands which occur both on flat areas and on slopes. This complex covers 60 to 75 % of Dewdney Island and includes not only bogs, but also a variety of fens and marshes. In fact, it is not bogs, but fens which predominate in area in this general landscape type.

#### *Pinus contorta* (shorepine) bogs

These bogs dominated by shorepine are shown in section 4 and 5 of table 1. In species combination they are intermediate between the *Pinus contorta* scrub forest and more open *Sphagnum* bogs.

Pines typically cover one third to one half of the bog and reach between three and six (rarely seven) meters in height. They are almost

always accompanied by *Thuja plicata* (western red cedar) usually of smaller size.

*Chamaecyparis nootkatensis* (yellow cedars) are often associated as shrubs and occasionally even exceed *Thuja* in total canopy cover.

Lower shrubs are (in order of constancy) *Ledum groenlandicum* (Labrador tea), *Gaultheria shallon* (salal), *Kalmia microphylla* (bog laurel), *Menziesia ferruginea* (false azalea) and *Myrica gale* (sweet gale). Either *Ledum*, *Gaultheria* or *Myrica* can be the dominant. Dwarf shrubs (in order of constancy) are *Empetrum nigrum* (crowberry), *Vaccinium caespitosum* (dwarf huckleberry), *Vaccinium vitis-idaea* (rock cranberry) and *Vaccinium uliginosum* (bog blueberry). Only *Empetrum* attains occasional dominance.

Always present in the herb layer are *Cornus unalascentis* (bunchberry) and *Linnaea borealis* (twinflower), followed by *Calamagrostis nutkatensis* (Notka reedgrass), *Maianthemum dilatatum* (false lily of the valley), *Fauria crista-gallii* (deer cabbage), *Tofieldia glutinosa* (sticky Tofieldia) *Pteridium aquilinum* (bracken), *Scirpus caespitosus* (deer grass) and *Blechnum spicant* (deer fern). *Cornus*, *Fauria*, *Pteridium* and rarely *Calamagrostis* may be dominant or co-dominant.

The moss/lichen layer is usually either dominated by *Sphagnum imbricatum* or by both or either of *Rhytidiadelphus loreus* and *Hylocomium splendens*. *Cladina mitis* (a reindeer lichen) may be co-dominant, while *Racomitrium lanuginosum* and *Sphagnum rubellum* are of less importance.

The most common combination of dominants in this community type is (in order of layers)

PINUS, THUJA - LEDUM, GAULTHERIA - EMPETRUM/CORNUS - SPHAGNUM, HYLOCOMIUM, RHYTIDIADELPHUS.

There are two subunits in this community type, the normal and the *Sanguisorba/Juniperus* variant (compare table 1). The latter which contains part of the *Sanguisorba* species group may be regarded as transitional to the *Scirpus-Myrica* fens.

Shore pine bogs occur almost exclusively on flat ground or on only gentle slopes. The depth of their peat layers appears to very be variable, from very shallow to over 150 cm deep.

### Sphagnum bogs

*Sphagnum* (peatmoss) bogs are shown in sections 6 and 7 of table 2. They are similar in species combination to the shore pine bogs and there is a fluent transition between them. While in shore pine bogs *Pinus contorta* is a conspicuous and often dominant element and *Sphagnum imbricatum* is only a moderately constant and dominant element, this is reversed in *Sphagnum* bogs: *Sphagnum imbricatum* is always the dominant moss and shore pines often occur with low cover. In addition, the forest mosses, *Hylocomium splendens* and *Rhytidiadelphus loreus* are absent. A positive characterization, although not of perfect constancy, is that of *Sphagnum fuscum*. *Cornus unalascentis* is considerably less dominant and *Gaultheria shallon* is nearly absent.

Tree species are identical with those of the shore pine bog, but are represented by scattered shrub-size specimens only, or entirely absent.

*Myrica gale* is the most common shrub, followed by *Ledum*, *Empetrum*, *Juniperus communis* (common juniper) and *Kalmia*.

The herb layer (in order of constancy) contains *Cornus unalascentis*, *Tofieldia glutinosa*, *Linnaea borealis*, *Scirpus caespitosus*, *Maianthemum dilatatum*, *Eriophorum angustifolium* (cottongrass), and many others.

The moss/lichen layer, as mentioned, is greatly dominated by *Sphagnum imbricatum*, often associated with one or several of the following: *Sphagnum rubellum*, *Sphagnum fuscum*, *Cladina mitis* and *Racomitrium lanuginosum*.

BLANKET BOG VEGETATION OF DEWDNEY ISLAND

[illegible]

[illegible]

Species with low constancy:

Table entries r, +, 1, 2, 3, 4, 5 : Braun-Blanquet cover/abundance scale

Similar to the shore pine bogs, the *Sphagnum* bogs may also be divided into two different subunits, a normal and an *Apargidium* (bog dandelion) variant. The latter is distinguished by the *Sanguisorba* species group and particularly by *Apargidium boreale* (bog dandelion).

*Sphagnum* bogs also occur almost exclusively on flat ground and show relatively deep peat layers of 75 cm depth and more.

In general the successional development between the last two communities appear to be from the more open *Sphagnum* bogs to shore pine bogs. But in some cases long dead, weathered tree snags were noticed amid vigorous *Sphagnum* growth. Remnants of charcoal indicated that in some of these cases fire preceded the invasion of the peat mosses.

#### *Scirpus caespitosus* - *Myrica gale* fens

On Dewdney Island *Scirpus* - *Myrica* fens have the largest areal extent of all wetland communities. They are tree-less and are composed of short graminoid, herbaceous and dwarf shrub species.

*Scirpus caespitosus* is present in all stands with a high degree of cover. *Myrica gale*, also present in all stands, increases from low to high cover along a gradient toward the sites transitional to the *Sphagnum* bogs (compare table 1). *Myrica* is of low stature here and in no way comparable to the tall *Myrica* growing in richer sites, e.g. with *Carex sitchensis*. Besides *Myrica* the only other constant small shrub species is *Juniperus communis*. Less constant small shrubs are *Ledum groenlandicum*, *Empetrum nigrum*, *Vaccinium caespitosum* and *Andromeda polifolia*.

Herb and graminoid species (in order of decreasing constancy) are *Scirpus caespitosus*, *Sanguisorba officinalis*, *Deschampsia caespitosa* (tufted hairgrass), *Dodecatheon jeffreyi* (Jeffrey's shooting star), *Fauria crista-gallii*, *Tofieldia glutinosa*, *Apargidium boreale*, *Trientalis arctica* (arctic starflower), *Eriophorum angustifolium* (cottongrass), *Carex livida* (pale sedge) and *Carex stylosa* (long-styled sedge).

The moss/lichen layer is always dominated by the moss *Racomitrium lanuginosum*. *Sphagnum imbricatum* and *Cladina mitis* are less regularly associated with the latter.

Two sub-units are recognizable in *Scirpus* - *Myrica* fens, a less common one without, and a more common one with the *Ledum* group (compare table 2). The latter relates equally well to the *Pinus* - *Ledum* community as it does to the *Sphagnum* bogs. Both *Sphagnum imbricatum* and *Cladina mitis* are absent from the former.

The *Scirpus* - *Myrica* fens occur on a great variety of slopes, from virtually flat terrain to very steep slopes. Organic matter layers in this community are mostly between 30 (17) and 60 (87) cm thick and are composed of sedge peat or similar material, usually with a slight mineral component which gives to the surface soil a clayey to gritty consistence. The organic layer appears to rest on bedrock in almost all cases. (Only one single instance of till or marine sediments has been encountered.)

#### Special phases or dominance types in bogs and fens

Phases are otherwise normal examples of communities in which a particular species attains high cover. Unlike in separate community types, the dominants in phases do not occur in a consistent manner. Nevertheless, were the phases listed here to occur more widely and consistently in neighboring areas, they could well be raised to type level.

The following phases have been observed and are documented in table 2.

*Pteridium aquilinum* (bracken) Phase: This occurs in shore pine bogs

and *Sphagnum* bogs. It is suspected, but unconfirmed, that this phase is indicative of a fire history. It is common on Dewdney Island.

*Gaultheria shallon* (salal) phase: An uncommon phase in shore pine bogs, this appears to be indicative of drier-than-average conditions and/or a decadent stage in bog development.

*Deschampsia caespitosa* (tufted hairgrass) phase: This common phase of *Scirpus - Myrica* fens may be associated with shallow and less peaty (or more mineral-rich) soils.

*Eriophorum angustifolium* (cottongrass) phase: Not uncommon in fens where *Eriophorum* may replace *Scirpus caespitosus* as the stand dominant and occasional in shore pine bogs, this phase appears to occupy wetter-than-average conditions.

### "Schlenken" community

The word "Schlenken" is part of the German bog terminology and designates the muddy depressions which in most bogs alternate with the raised, vegetated areas. On Dewdney Island, Schlenken are interspersed in the fen vegetation rather than in the *Sphagnum*- or shore pine bogs. They are rarely larger than a few meters across. The vegetation cover in these special habitats averages only 25 to 50 %, sometimes even less. The rest is open mud and, usually, a few stones and pebbles.

Schlenken vegetation typically consists of only few tender herbaceous, graminoid and cryptogamic plants, none of which attain high cover.

The most constant species is *Rhynchospora alba* (beakrush) and this is followed (in decreasing constancy) by the moss *Campylopus atrovirens*, the lichen *Siphula ceratites*, by *Dodecatheon jeffreyi*, *Lycopodium inundatum* (bog clubmoss), *Drosera anglica* (long-leaved sundew), *Drosera rotundifolia* (round-leaved sundew), *Carex livida* and *Pinguicula vulgaris* (butterwort). Of these, *Dodecatheon* and *Pinguicula* typically assume positions along the edges of the "Schlenke" or occur where stones or pieces of dead wood provide some support in the mud.

Due to their sharp physical boundaries Schlenken are rather dissimilar in their species combination to other communities. The few species they have in common with other sections of the table place them nearest to the *Scirpus - Myrica* fens by which they are usually surrounded in the field.

Being depressions, Schlenken occur mostly on flat terrain or on gentle slopes. Their muddy organic layer is usually very thin (10 to 30 cm) and overlies bedrock.

### *Carex sitchensis* - *Myrica gale* meadow

The majority of examples encountered of this community consist only of the two name-giving species. In many cases *Carex sitchensis* (Sitka sedge) even occurs only alone. Due to this simple composition and because this community is not very common, only three examples have been included in table 2, one of which is transitional to the other wetlands shown in the table. (Placement of these three samples at the end of the table is a matter of convenience rather than of special relationship to the adjacent section 7.)

*Sanguisorba officinalis* and *Deschampsia caespitosa* are the only moderately common associates in the *Carex - Myrica* meadow.

The described samples were found to have 20 to 25 cm standing water and a 50 to 65 cm thick muddy to peaty organic layer over an unknown solid lower substrate. The most common habitat of *Carex sitchensis* - *Myrica gale*



meadows was in old sloughs and ponds created by the activity of beavers.

#### Other Freshwater Wetlands

None of the following communities are documented in synthesis tables. However, their presence and species combination was recorded on site.

*Dodecatheon jeffreyi* shore fringe: While only very narrow (10 to 40 cm wide), this is a conspicuous and consistent community which occurs along the boggy margins not only of muddy depressions (see "Schlenken" communities), but also of a variety of ponds, sloughs and small streams. Narrow bands of *Dodecatheon jeffreyi* meandering through fens make the course of moving water evident. *Dodecatheon* is more vigorous where peat is shallow or where there is a higher mineral soil component. There are no consistent associates of *Dodecatheon*.

*Juncus supiniformis* (spreading rush) community: This is a strictly mono-specific community which typically occupies shallow ponds and water holes with less than 15 cm free water over floating, peaty mud of varying depth (up to 63 cm measured). The plant forms a floating and partly emergent mat. Upon drying up of their pools, *Juncus supiniformis* plants change to a terrestrial growth form similar to that of *Juncus bufonius*.

*Menyanthes trifoliata* and *Menyanthes trifoliata* - *Sparganium minimum* communities: *Menyanthes trifoliata* (bog buckbean) is another plant which forms stands on its own. Alternatively, it can be associated with *Sparganium minimum* (small burreed). *Menyanthes* communities occupy small bog ponds with about 30 cm of water over up to 70 cm of very loose, suspended muddy peat over bedrock. *Menyanthes* is one of the most common semi-aquatic plants on Dewdney Island.

*Scirpus validus* - *Sparganium minimum* community: Not a very common plant on Dewdney Island, *Scirpus validus* (great bulrush) appears to find sufficiently mineral-rich water only in a few larger ponds and lakes, probably on a marine soil parent material. *Sparganium* and sometimes *Utricularia intermedia* (flat-leaved bladderwort) are associated.

*Nuphar polysepalum* (pond lily) community: Pond lilies on Dewdney Island appear to need a combined depth of water and loose mud of at least 120 cm

Free water is rarely less than 50 cm deep and often considerably deeper. *Nuphar* rarely occurs with any associated species.

*Potamogeton natans* and *Potamogeton gramineus* (pondweed) communities: Each of these two species appears to prefer different conditions and therefore they are usually not found in mixed stands. Like *Nuphar*, they occur mostly without associates, but sometimes *Sparganium minimum* is found with *Potamogeton gramineus*.

The habitat of *Potamogeton natans* is similar to that of *Nuphar*. However, pondweeds occur on less muddy-peaty bottoms. *Potamogeton gramineus* prefers shallower water (20 - 60 cm). *Potamogetons* are uncommon on the island as compared to other aquatics.

#### FOREST VEGETATION COMPLEX

Forest and forest-like vegetation amounts only to between 25 and 35% of the island's area. Tall forest occurs only on well-drained sites near the sea shore. This pattern is well shown in plate 1. Stunted forest occurs in all areas further inland, in swamp and bog forest communities on less well-drained soils, and in a community on rocky, very steep hillsides and hilltops where soils are nearly absent. Especially the latter has a large overlap in species with the shorepine bogs. This is despite the great differences in topography (very steep versus flat) and in substrate (nearly bare rock versus peat). The only, but possibly an important trend the two sites have in common is that they are both very poor nutritionally.

Table 2

## FOREST VEGETATION OF DEWDNEY ISLAND

		Pinus	Thuja-Veratrum -Lysichiton	Transi- tional	Thuja-Tsuga -Picea-Lys.	Thuja-Tsuga- Picea-Maianthem.	Pic- Cal- Maja
		scrubf.	swamp forest		forest		
releve >		0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	0 0 0
number >		0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0	0 0 0
(read >		8 1 8 9 6	8 8 3 6 2 6 7 1 4 1	4 5 9 6	5 0 4 5 7 5 4	5 4 5 7 7 5 2 4 5	5 2 2
spp. down) >		4 3 2 1 7	1 3 8 8 1 1 3 6 1 8	0 0 4 0	1 3 8 6 2 9 9	2 2 3 0 1 5 2 7 7	4 3 4
group	section no.	1	2	3	4	5	6
no.							
	ledu groe	+ 2 + 1 1	1 2 +				
	lyco clav	+ + 1 +	+ 1				
	copt aspl	+ +	3	2 1			
	vacc viti	2 1 + 3	+				
	clad miti	4 1 4 3 2					
	empe nigr	2 2 4 2	+				
1	juni comm	4 1 3 4 +					
	ligu cald	+ r 2		1			
	vacc ulig	+ 1 2					
	sang offi	1 +		+			
	rhac lanu	3 3 3					
	clad rang	1 1 2					
	vacc caes	+ + 2					
	corn unal	2 2 3 3	2 2 2 1 2 3 2 2	2 2 3		+	
	cham noot	1 2 2 3	5 2 + 4 1 4 4 4 1 4	1			
2	linn bore	+ 1 + 3	2 1 1 2 2 1 2	r +			1
	dier maju	1 + 1	3 1 1 + 1 1	1 +	+		
	pinu cont	4 5 4 3 4	4 3 3 2 3 3 3	3 3			
	spha girg		+ 1 2 1 1 3 3	2 1 2			
	habe sacc		+ r ++	r 1 + r +		r	
	care anth	+ + 2	1 1 3	r +			
	faur cris	3 3	1 1 1 3 3	+			
3	care obnu		1 1 1 3 + 1 1	2			
	rubu peda		+ 1 r +	+ +		+	
	spha papi	2 +	+ 1 3	1			
	care phyl	+ +	1 + + 2				
	lysi amer	2 2 3	x 4 3 3 4 3	3 4 4 4	4 3 4 2 2 3 4	1	
4	stre rose	1 2	++ + 2 r	1 + r 2	1 1 + + 3	3 2 + + 2	
	vera esch	+ 2	4 + 2 2 3 3 4 2 3 3	3 3 + 2 r			
	plag undu	+		+ +	+ + r + r + +	+ + + + + + +	
	rhiz glab		1 +	1 + + 2	2 1 2 1 3	+ + 1 + 1 +	
	stre ampl		+ 1	+ 1	r 1 r r	1 1 + + + 1	+
5	dryo assi		+		1 + 3 +	+ 1 3 x +	
	list caur			r + +	+ r +	1 + + +	
	tiar trif			1 2 2	+ + 2 1	+ 2	+
	scap bola				r +	+ r 1 r 1 + r	

to follow p. 7, (b)

[illegible]

Species with low constancy:

myri gale (D084: 3, D091: 2), lyco obsc (D082: +, D084: 3), pogo maco (D053: 2, D059: 1), tofi  
glut (D081: +, D084: +), frit cams (D013: +, D023: r), apar bore (D067: +, D084: +), lepi rept  
(D052: r, D072: +), cora mert (D042: 1, D053: 1), dode jeff (D018: 2, D091: +), pucc pauc  
(D048: +, D049: 1), bazz sp. (D022: +, D072: r), scir caes (D084: 2, D091: 1), pell nees  
(D061: 1, D094: +), cast mini (D023: r), isot stol (D022: +), dicr scop (D067: +), habe hype  
(D067: +), ange luci (D024: 1), hypn circ (D071: r), coni paci (D024: 1), stre stre (D041: +),  
dicr fusc (D072: r), herb saku (D061: 2), clad sylv (D082: +), clad pyxi (D082: +), thel phev  
(D083: r), taxa brev (D047: 1), camp alas (D023: r), lois proc (D084: +), trie arct (D084: +),  
agro aequ (D084: r), spha capi (D091: +), spha imbr (D091: 1).

Table entries r, +, 1, 2, 3, 4, 5 : Braun-Blanquet cover/abundance scale

x = present; X = present and dominant

Table 2 is much less clearcut than was table 1, indicating more complex interrelationships between its various parts. However, stated in simplified form, there are two major, approximately equal parts. The left half may be described to by and large represent the *THUJA PLICATA* / *TSUGA HETEROPHYLLA* - *PINUS CONTORTA* (western red cedar / western hemlock - shorepine) spectrum, and the right half the *THUJA PLICATA* / *TSUGA HETEROPHYLLA* - *PICEA SITCHENSIS* (western red cedar / western hemlock - Sitka spruce) spectrum. The central, overlapping part (section 3 of the table) has features of both and the two extreme wings (section 1 and section 6) have elements of their own.

*Pinus* and *Picea* are not the only distinguishing features in the two major halves of table 2. In fact it is necessary to consider the majority of species in species groups 1 to 3 versus those in species groups 5 and 6 for reliable distinction. These species may be regarded as bog/swamp species on one hand (sp. groups 1, 2 and 3) and as more typical forest species on the other (groups 5 and 6). However, stands occur also in a transitional zone where both kinds of species groups occur together (section 3 of table 2).

Well sorted vegetation tables frequently exhibit environmental gradients and it is usually the moisture gradient which is most strongly expressed in tables of forest vegetation. It is interesting to note here, however, that the sequence of species groups 1 to 6 expresses equally or more strongly the gradient in nutrient richness. This may be explained by the hypermaritime climatic conditions where a lack of soil moisture is rarely a limiting factor.

For practical reasons, the community names used for the forest communities in the following are kept as brief as possible and may omit some of the co-dominant or characteristic species. However the latter are mentioned in the descriptive text. Communities are treated in the same order as they occur in table 2.

#### *Pinus contorta* (shorepine) scrub forest (section 1 in table 2)

Shorepine scrub forests (as opposed to shorepine bogs or bog forests) cover only a very small portion of Dewdney Island. Typically, the tree layer is only 5 m tall or less. Other tree species which are always present besides *Pinus contorta*, but usually less dominant, are *Chamaecyparis nootkatensis* and shrub-size *Thuja plicata*. *Tsuga heterophylla* (western hemlock) is rarely of significance.

Tall shrubs common in some, but not all stands are *Alnus sinuata* (Sitka alder) and low shrubs are almost always *Gaultheria shallon* and *Ledum groenlandicum*. Dwarf shrubs are *Juniperus communis*, *Empetrum nigrum* and *Vaccinium vitis-idaea*.

The herb layer contains *Cornus unalascentis*, *Maianthemum dilatatum*, *Linnaea borealis*, and often *Calamagrostis nutkaensis*.

The moss layer is dominated by the lichen *Cladonia mitis* and the moss *Rhytidiadelphus loreus*. In addition, but not in all stands, occur the mosses *Racomitrium lanuginosum*, *Stokesiella oregana* and *Dicranum majus*, and the reindeer lichen, *Cladonia rangiferina*. *Lycopodium clavatum* (forked clubmoss) is also frequent.

The shorepine scrub forest typically occurs on hilltops and steep slopes, always on very shallow soils, with an organic horizon of 12 to 30 cm over bedrock. Trees in all examined stands were estimated younger than 80 years of age. It appeared possible that at one time fire may have swept these exposed sites which due to lack of soil would quickly become droughty in an extended dry spell. However, no charred snags or other sign of fire was found.

Transitions between this community type and the shorepine bogs which are rather similar in species combination are found. Transitions between this community type and the community described below are also fluid.

### Thuja - Veratrum swamp forest (section 2 in table 2)

This is one of the most common forest types on Dewdney Island and occurs in a zone between the *Pinus contorta* bogs and the shoreline forest types described below, or, occasionally on slopes further inland.

*Thuja plicata* is usually the tallest and most dominant tree, but in some stands this role is taken by *Chamaecyparis nootkatensis*. The canopy of these species averages about 10 meters (6 to 15 meters) tall. *Tsuga heterophylla* is always present, but usually smaller, suppressed and of poor form. *Pinus contorta* is admixed in about two thirds of all stands.

Dominants in the shrub layer are *Gaultheria shallon* and *Menziesia ferruginea* and these are followed in decreasing constancy and dominance by *Vaccinium parvifolium* (red huckleberry), *Vaccinium ovalifolium* (oval-leaved blueberry), *Rubus spectabilis* (salmonberry) and *Alnus sinuata*.

The herb layer is very rich and always has *Veratrum eschscholtzii* (false hellebore), *Maianthemum dilatatum*, and nearly always *Blechnum spicant*, *Lysichiton americanum* (skunk cabbage), *Streptopus roseus* (rosy twistedstalk), *Cornus unalascentis* and *Calamagrostis nutkaensis*. The latter may be quite dominant in a few stands with small openings allowing in more light. Rarely dominant, but equally characteristic, are species such as *Linnaea borealis*, *Fauria crista-gallii*, *Carex obnupta* (slough sedge), *Carex phyllomanica* (coastal stellate sedge), *Habenaria saccata* (slender bog orchid), *Carex anthoxantha* (another sedge) and *Rubus pedatus* (dwarf trailing raspberry).

The two constant and dominant mosses are *Rhytidiadelphus loreus* and *Hylocomium splendens*. Moist depressions often hold *Sphagnum girgensohnii* and sometimes *Sphagnum papillosum*. Other mosses are *Dicranum majus* and *Stokesiella oregana*.

The *Thuja - Veratrum* swamp forest occurs on a variety of slopes from gentle to moderately steep. As a consequence of their typical location between bog forest and shoreline, wetness in this forest is by heavy seepage. The organic soils are a peaty muck and are between 30 and 60 cm thick, overlying rock.

### Transitional swamp forest (section 3 in table 2)

This forest is less common than the one described above. It may be considered intermediate between the previous and the following forest type.

It has the same tree and shrub combination as described above, except that *Vaccinium parvifolium* and *Vaccinium ovalifolium* are more constant.

The herb layer is definitely dominated by *Lysichiton americanum*, followed (with decreasing dominance and constancy) by *Maianthemum*, *Blechnum*, *Streptopus roseus*, *Veratrum*, *Habenaria*, *Cornus* and *Tiarella trifoliata* (three-leaved foamflower).

The moss contains additional *Rhizomnium glabrescens*.

### Thuja/Tsuga/Picea - Lysichiton forest (section 4 in table 2)

This forest is yet another step further removed from the bog- and swamp forests and closer to the species combination which would qualify as a "normal" coniferous coastal forest under less humid climatic conditions. In fact, *Lysichiton americanum* is the only prominent species in this combination which would indicate wetness. The full slate of mesic forest species is present here.

In the tree layer *Tsuga heterophylla* becomes virtually equally important to *Thuja plicata* and the two are closely followed by *Picea sitchensis*. No other trees are present.

Shrubs are *Vaccinium parvifolium* and *Menziesia ferruginea*. *Rubus spectabilis* and *Gaultheria shallon* are present in some stands.

In the herb layer, *Lysichiton americanum* and *Maianthemum dilatatum* are always present and nearly equally dominant, followed by *Streptopus roseus*, *Blechnum spicant* and less commonly *Tiarella trifoliata*, *Listera caurina* (northwestern twayblade), *Dryopteris assimilis* (spiny shieldfern) and *Step-topus amplexifolius* (clasping-leaved twisted-stalk).

The bulk of the moss layer is made up of *Rhytidiadelphus loreus*, *Hylocomium splendens* and *Stokesiella oregana*. *Plagiothecium undulatum* is always present, but not abundant.

This forest is most common on gently sloping to flat ground on well-drained, probably marine materials close to the shore. The surface layer of organic matter (moder) may be 70 cm thick or more.

#### *Thuja/Tsuga/Picea - Maianthemum* forest (section 5 in table 2)

Only this section in table 2 represents "normal" forests on well-drained ground which elsewhere would be subject to commercial forestry.

Together with the previous community which is closely related, this forest community forms the relatively narrow shoreline belt where taller trees occur on Dewdney Island. The species combination is very similar to hemlock and red cedar forests found elsewhere on the coast, from western and northern Vancouver Island northward. While the total species combination is fairly uniform in this section, several forest types may be recognized here in terms of dominant species. For example, there are two plots of a *Thuja/Tsuga - Gaultheria* type, one of a *Thuja/Picea/Tsuga - moss* type with *Maianthemum* almost lacking, and one *Tsuga - moss* type. None of these sub-types are found over larger areas, as the total available growing sites for tall forest are so restricted on Dewdney Island to begin with.

The main combination of this forest has a tree layer of 25 (20) to 35 (37) m height composed on the average of equal amounts of the name-giving tree species.

The shrub layer is relatively open and is composed of *Menziesia ferruginea* and *Vaccinium parvifolium*. Those stands characterized by the *Oplopanax horridum* (devil's club) species group (group 6 in table 2) also contain *Rubus spectabilis*. *Oplopanax* is rarely very dominant.

The herb layer is always dominated by *Maianthemum dilatatum* and contains varying small amounts of *Blechnum spicant*, *Streptopus roseus*, *Dryopteris assimilis*, and rarely *Polystichum munitum* (sword fern) and *Athyrium filix-femina* (lady fern).

The moss layer is vigorous and composed of *Rhytidiadelphus loreus*, *Hylocomium splendens* and *Stokesiella oregana*.

This community type occurs on gentle to steep slopes and always on well-drained parent materials, often of marine origin. The soils, usually with well developed, podzolic B-horizons, always have very thick organic matter accumulations (45 to 70 cm measured). Where overlying bedrock, this appears deeply weathered or fractured.

The richest sites, some of them over pockets of limestone, are characterized by the *Oplopanax* species group. As occurrences within this group are rather diffuse, the group has not been utilized to distinguish a separate community type. The table allows interpretation of this group as straddling the boundary between sections 4 and 5, thus marking a nutrient-rich part both in the *Thuja/Tsuga/Picea - Lysichiton* forest and in the *Thuja/Tsuga/Picea - Maianthemum* forest.

Picea - Calamagrostis - Maianthemum fringe (section 6 in table 2)

This forest type which occurs strictly as an outer shoreline fringe, is quite uncommon on Dewdney Island, at least in those parts visited. This is why only three stands have been sampled. However, this distinctive type is of wide distribution elsewhere in the hypermaritime subzone and is common on other islands.

The overall appearance of this fringe forest is that of an open spruce stand with a tall grass ground cover. Trees are between 8 and 25 m tall.

The tree layer consists entirely of widely spaced, wind-blown *Picea sitchensis*. If any other tree species are present, then these occur as shrub-sized, stunted specimens.

The shrub layer is usually absent, but there may be small clumps of *Gaultheria shallon* and/or *Rubus spectabilis*, sometimes growing intertwined with stunted *Thuja* or *Isuga*, or with young specimens of *Picea*. *Alnus sinuata* may be present in some stands.

The tall herb layer is a dense cover of *Calamagrostis nutkaensis* (Nootka reedgrass) under which a lower herb layer of *Maianthemum dilatatum* is hidden. On Dewdney Island *Prenanthes alata* (white lettuce) was also regularly present in the latter layer in small amounts.

The moss layer is somewhat open due to the dense grass and herb cover and contains only *Stokesiella oregana* and *Rhytidiadelphus loreus*.

This outer fringe community occurs mostly on exposed shorelines under wind and sea spray influence, and always on shallow organic soils over bedrock outcrops.

## SHORELINE VEGETATION COMPLEX

### Beach vegetation

Distinctive communities are only found in the tidal marsh environments. The vegetation of shingle, gravel and sand beaches is very sparse and mostly composed of scattered, salt-tolerating species which do not form continuous stands. The only, albeit fragmentary, occurrence of a community common elsewhere is that of *Elymus mollis* (dune ryegrass) which is found on some dry, gravelly and sandy shorelines. No other species are associated.

The following other beach plants were noted elsewhere along the island's shorelines:

- Honkenya peploides* (honkenya)
- Cakile edentula* (American searocket)
- Atriplex patula* (salt bush)

In the outer shrubby fringes of the forest toward protected beaches the following were typical:

- Rosa nutkana* (Nutka rose)
- Rubus parviflorus* (thimbleberry)
- Vicia gigantea* (giant vetch)
- Galium aparine* (cleavers)

### Vegetation of rocky shorelines

These have equally sparse and scattered vegetation restricted to crevices and small ledges above the high tide mark. In a zone readily accessible to salt spray the following occur:

- Plantago maritima* (sea plantain)
- Hordeum brachyantherum* (meadow barley)
- Puccinellia* sp. (alkali grass)
- Sagina maxima* (sticky pearlwort)

In a zone somewhat less influenced by salt spray we find:

*Conioselinum pacificum* (hemlock parsley)  
*Festuca littoralis* (beach fescue)  
*Fritillaria camschatcensis* (indian rice)  
*Campanula alaskana* (Alaska bellflower)  
*Sisyrinchium angustifolium* (blue-eyed grass)  
*Potentilla villosa* (villous cinquefoil)  
*Fragaria chiloensis* (coastal strawberry)  
*Dodecatheon pauciflorum* (few-flowered shooting star).

### Salt marshes

Salt marshes on Dewdney Island are developed in areas where low-gradient silty, fine-sandy, and muddy substrates are available in protected locations, usually combined with estuaries of small creeks. Coarse shingle or stony substrates give rise to an algal plant community of a single species, *Fucus furcatus* (rockweed). This is found as a continuous cover below about the mean tide level under these conditions and may occupy large areas.

The salt marshes composed of vascular plants show at least four distinctive communities and several additional dominance phases:

#### *Carex lyngbyei* (Lyngby's sedge) marsh

This community which covers the lowest zone in the salt marsh contains no other vascular plant species. *Fucus furcatus* in its small, immature form is sometimes present in minor amounts. The *Carex lyngbyei* marsh covers a larger area than any of the other saltmarsh communities and occurs on a variety of substrates, from fine sediments to stony materials, but all of these have at least a component of silt or mud (this is in contrast to the above-mentioned *Fucus* community).

No samples of this community are included in table 3 because of its simple composition.

#### *Salicornia pacifica* (glasswort) marsh (table 3)

In this community *Salicornia pacifica* is usually associated with *Plantago maritima* (seaside plantain), *Cochlearia officinalis* (scurvy grass), *Glaux maritima* (saltwort) and sometimes *Triglochin maritima* (seaside arrow grass).

Two variants may be distinguished (compare sections 1 and 2 in table 3), one with the above species combination only, and one with the three additional species *Puccinellia pumila* (dwarf alkaligrass), *Fucus furcatus* (as above) and *Spergularia canadensis* (Canadian sandspurry).

While *Salicornia* is always present and dominant in most cases, there may also be stands dominated by *Triglochin maritima*, or *Puccinellia pumila*, or *Glaux maritima*.

The *Salicornia* marsh, in both variants, is located only slightly higher in elevation than the *Carex lyngbyei* marsh, that is at or near mean tide. The *Triglochin* phase in particular may be at the same level as the *Carex lyngbyei* marsh.

No distinct difference in substrates between these communities was observed, but the *Salicornia* community may occur under less muddy and more sandy conditions.

#### *Deschampsia caespitosa* meadow (section 3 in table 3)

This community is sharply distinguished in physiognomy and species combination from the *Salicornia* communities. But transitions or patchy mixed stands do occur occasionally. Additional to *Deschampsia*, other species always present are *Plantago macrocarpa* (Alaska plantain), *Potentilla pacifica* (Pacific silverweed) and *Glaux maritima*. Not always present, but character-



Table 3  
MIDDLE AND UPPER SALT MARSHES  
OF DEWDNEY ISLAND

		Salicornia	Deschampsia	Cala.- Desch.	
	releve >	0 0 0 0 0	0 0 0 0 0 0 0 0	0 0 0 0 0	
	number >	0 0 0 0 1	0 0 0 0 0 0 0 0	0 0 0 0 0	
	(read >	0 4 5 9 0	9 4 3 9 3 3 3 0 9	3 3 3 3 9	
spp.	down) >	2 6 8 6 0	5 3 0 7 1 4 5 6 1 8	2 3 7 9	
group	section no.	1	2	3	4
1	pucc pumi	x 4 4 3 2	3		x
	fucu furc	x 4 + 3 2			
	sper cana	x 3 4	3		
2	plan mari	x 2 2 2	3 3 3	2 1 1 1	
	coch offi	x r + 3	3 + 2	r 2 +	
	trig mari	x	5 4 + 4	4 + + x 1	
	sali paci	x 4 4 4 3	4 5 1	+	
3					
	pote paci			+ 1 1 3 2 x 4	+ 1 1 4
	fest litt			1 1 1 2 x +	3 1 1 2
	hord brac			3 2 3 2 x 1	+ 1 +
	junc balt			2 2 2 x 3	+ 2 +
	apar bore			1 2 1 2 1 3 +	
	ligu scot			3 1 2 3 + 2	
achi mill			1	2 1 2 1 3	
4					
	cala nutk				3 3 2 3
	cast mini				2 1 3 +
	ange luci				+ 1 1 +
	care sp.		2	3	+ 1
	desc caes		1	5 4 4 4 4 x 4	2 3 4 4
	glau mari	x 1 4 4	2	3 + + + 1 x 1	
	plan macr	4		+ 2 4 3 4 x 4	3 4 3 3
	care lyng		2	+ 1 + x	1

Species with low constancy:

stel humi (D034: +, D035: +), dode pulc (D032: 2,  
D033: 2), coni paci (D033: 2), sisy angu (D032: +),  
maia dila (D033: +), gali trif (D033: +), rhyt squa  
(D033: 3), care obnu (D098: +), lath palu (D099: 3).

Table entries r, +, 1, 2, 3, 4, 5 : Braun-Blanquet  
cover/abundance scale  
x = present; X = present and dominant

istic are *Festuca littoralis* (beach fescue), *Hordeum brachyantherum* (meadow barley), and *Juncus balticus* (Baltic rush).

After the *Carex lyngbyei* marsh, the *Deschampsia caespitosa* meadow is the most extensive salt marsh community found on Dewdney Island. It is located distinctly higher than the *Salicornia* marsh and the substrate is a silty sand. The general appearance is a lush green, tall meadow. Flooding still occurs daily at every high tide.

*Calamagrostis* - *Deschampsia* meadow (section 4 in table 3)

A number of meadow, and even forest fringe species, occurring in addition to the saltmarsh species, determine the character of this community. Only relatively minor areas are covered by this meadow on Dewdney Island. This is the highest of all estuarine meadow communities, usually located on better drained, slightly raised or mounded necks of land, low terraces, and narrow bands along the forest margin. Occasional tree clumps or individual trees of *Pyrus fusca* (crabapple) and/or *Picea sitchensis* occur here and flooding does only occur rarely, at storm-driven high tides.

The dominant species is still *Deschampsia caespitosa*, but a conspicuous second-most dominant species is *Calamagrostis nutkaensis*. *Plantago macrocarpa* is equally dominant, but less visible. Attractively flowering species are *Castilleja miniata* (red indian paintbrush) and *Dodecatheon pauciflorum*. One stand was recorded with co-dominant *Lathyrus palustris* (marsh peavine).

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