VEGETATION STUDY
of
THE EVERGREEN STATE COLLEGE SHOREFRONT PROPERTY

SPRING '1972

by

MARIEL BROCKWAY and ANNSKI WILLIAMS

The Evergreen State College shoreline is part of a campus-wide natural laboratory, invaluable as an educational resource. The land examined in this report is only a small portion of the nearly 1000 acres of school land, yet it contains a multitude of possibilities for research. This study is the initial vegetational description of the campus water-front property.

Bordered on the northwest by cliffs rising as high as one hundred feet from the inlet, the land undulates southeastward for 750 to 1000 feet until it reaches a pronounced flatland. The land is cut by small ravines running into the bay, and by old logging roads and trails. On either side and in the center flow streams, the middle creek emptying into a salt marsh at the beach. The upland boundary - the sharp transition from conifers to alder - is vegetational in nature. The boundaries for the studies were therefore defined by the beach, the outer-most streams and the alder break.

PURPOSE

(2) The Eckbo report, the initial study of the campus waterfront by specialists, contained recommendations for further studies to be undertaken before determining how to develop the school's shoreline. Contained within the "Plant Ecology" section by Al Wiedemann were suggestions for necessary terrestrial studies, beginning with "(1) Description of the vegetation to include a floristic listing, and the delineation and composition of the vegetational types or groupings." The data thus obtained would be utilized in further investigations, some of which Wiedemann described in the Eckbo report as: "(4) The identification of areas of major botannical and ecological interest (such as the occurence of particular species or the presence of unique habitats); (6) Propose the location of walking trails for both recreational and instructional use; (7) Indicate areas which may be of importance from a research point of view; (8) Assess the possible consequences to the present vegetation of such activities as trail construction activity, limited undergrowth removal, extensive undergrowth removal, the effect of use by large numbers of people, especially where the undergrowth has been removed."

(3) The gathering of the information included within our report is the first step of this continuing study of the vegetation of the Evergreen waterfront. It is a general catalog and characterization of the plant life growing in that area in the spring of 1972. Primarily a classification of the forest types, it also includes a plot-by-plot listing of the understory vegetation. The plot sheets (raw data) are not contained within but are available from Al Wiedemann.

PROCEDURE

Because the campus waterfront has been well surveyed, it was used as the baseline from which to run the transects; surveyor's hubs are placed in one hundred foot intervals along the approximate high tide line. One transect runs inland from each hub G through FF, inclusive, at an angle of 126° magnetic. The uplands boundary was determined by a distinct vegetational transition - the alder break - on the southeast, and on both sides by stream courses. Plots were spaced one hundred fifty feet apart. As the measurements between plots follow the contours - up and down gulleys, over hills, etc. - the one hundred fifty foot measurement is not necessarily linear but reflects the topography of the land. It is impossible at this time to accurately map the transect and plot locations as no well defined topographic map exists. All measurements were taken in feet and inches.

The sampling technique used was the Point Quarter method. The area around each point, defined every one hundred fifty feet, was divided into four parts or quadrants by setting up lines running north-south and east-west (magnetic) using a compass, stakes and cord. The tree nearest the point in each quadrant was located. (To be considered a tree and not a seedling, the plant had to be at least three inches in diameter.) The species, diameter at chest height (4.5 feet) and point-to-plant distance was recorded for each quadrant.

The northeast quadrant, measuring six feet by six feet, was used to determine understory coverage and composition. Each species contained in the northeast quadrant was recorded and the coverage by individual plant types was estimated and recorded on a scale of six. The presence of tree stumps was noted at each plot, along with representative diameters and the approximate number that could be seen from each plot. Comments were also added.

In all, twenty-six transects were run for a total of one hundred twenty-six plots (five hundred four trees). Seven of these plots were not used in computing the quantative data; these were the plots taken inside of the alder break.

Example

In the east side above small valley w/Al. ru. S
Flat slightly above and east 2
May 6

Ps. he,	20'8" 20.2"	
Al. ru.	10'2" 4.4" 6'3" 3.6"	Al. ru #2 growing from stump described below
Ps. me.	16' 3.9"	
Hoss	2	
C. no. seed.	1	
A. mu.	1	
U. sp.	1	
A. br.	4	seedlings - several branches growing up from fallen trunk all between 1" and 3"
E. ne.	1	
A. sh.	1	

Ps. me. stump 60" dia. 2 others of similar size
3 smaller (17"-25")

Example

T
3
4/26/72

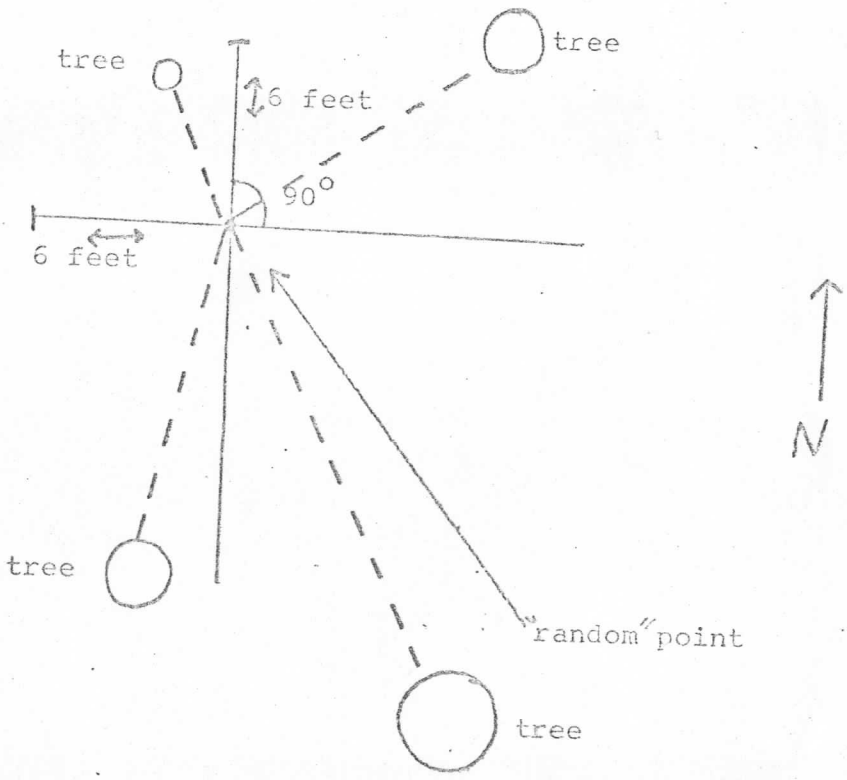
Have crossed trail and over ridge - down into salt marsh marine - on s. side
Large downed Thpl around Sparse ground covering

	NE	NW	SW	SE
Thpl.	12'8" 10.2"	1'4" 21.1"	15'1" 3.2"	
Ac.ma.			19'1" 19"	2 growing from same base

Tsh. seed. 1
Ee. ne. +
Ac.ma. seed. 2
Moss 1

Thpl. stump 56.8" dia. — lots of sinuses visible from here

POINT QUARTER SAMPLING PROCEDURE



– – – – – measured distance

DATA ANALYSIS

In summarizing the data, relative density, dominance and frequency values were determined for each tree species. These figures, when added together for each individual species, indicate the importance value. Dominance refers to the basal area (crown coverage) per unit area, density to the number of individuals per unit area, and frequency to the fraction of sample plots containing the species. Using the point-to-plant distances, the mean area occupied by an individual and the number of individuals per acre were determined.

After the forest types were characterized (see "Discussion"), the understory within each of the three forest types was examined to determine the species types, average coverage and frequency. The figures thus obtained will change should the forest types be regrouped. The coverage scale for the northeast plot is as follows:

\+ Individuals of a species very sparsely present in the stand; coverage very small

1 Individuals plentiful, but coverage small - to 5%

2 Individuals very numerous if small; if large, covering 5% to 25% of area

3 Individuals few or many, collectively covering 25% to 50% of area

4 Plants cover 50% to 75% of area

5 Plant species cover 75% to 100% of area

When translated to percentages, the scale utilized was:

\+ = 1%

1 = 3%

2 = 15%

3 = 37%

4 = 62%

5 = 87%

AREA

Total number of plots = 119

Total number of trees = 476

Total feet of point-to-plant = 6593 feet

Mean distance (d) = $\frac{6593 \text{ft.}}{476}$ = 13.8 feet

Mean area occupied by an individual (d^2) = 191 feet

Number of individuals per acre = $\frac{43{,}450 \text{ ft.}^2}{d^2}$ = 233

NUMBER OF PLOTS PER TRANSECT (without alder break)

G	2	T	5
H	2	U	4
I	3	V	4
J	3	W	4
K	3	X	5
L	3	Y	4
M	4	Z	5
N	7	AA	5
O	7	BB	6
P	8	CC	5
Q	6	DD	5
R	6	EE	4
S	5	FF	4

Plots taken in alder break

N-8 P-9 R-7 T-6 V-5 W-5 Z-6

TREE SPECIES

SPECIES	IMPORTANCE VALUE	RELATIVE DENSITY		RELATIVE FREQUENCY		RELATIVE DOMINANCE	
		#	%	#	%	square inches	%
Th.pl.	114.4	118	24.8	68	57	21378.5	32.6
Ac.ma.	84.5	74	15.5	49	41	18368.9	28
Al.ru.	77.3	109	23	57	48	4151.6	6.3
Ps.me.	57.5	54	11.3	36	30.1	10579.4	16.1
Ts.he.	55.5	56	11.8	41	34.4	6126.5	9.3
Ab.gr.	33.2	32	6.7	26	21.8	3102.7	4.7
Ta.br.	20.9	20	4.2	17	14.3	1591.8	2.4
Co.nu.	6.4	6	1.26	6	5	112.2	.17
Pr.em.	3.3	3	.63	3	2.5	83.9	.13
Ar.me.	2.4	2	.42	2	1.7	148.6	.23
Rh.pu.	2.2	2	.42	2	1.7	16.7	.03

FORMULAS

$$\text{RELATIVE DENSITY} = \frac{\text{\# of individuals of species}}{\text{\# of individuals of all species}} \times 100$$

$$\text{RELATIVE FREQUENCY} = \frac{\text{\# of plots with particular species}}{\text{total \# of plots}} \times 100$$

$$\text{RELATIVE DOMINANCE} = \frac{\text{total basal area of particular species}}{\text{total \# of plots}} \times 100$$

IMPORTANCE VALUE = relative frequency + relative dominance + relative density

$$\text{mean distance (d)} = \frac{\text{total of point-to-plant distances}}{\text{total number of trees}}$$

$$\text{mean area occupied by an individual} = d^2$$

$$\text{\# of individuals per acre} = \frac{43{,}450 \text{ sq.ft.}}{d^2}$$

$$\text{AVERAGE COVERAGE} = \frac{\text{total of individual coverage percentages}}{\text{\# of plots in which individual occurs}}$$

7

FOREST TYPE: THUJA PLICATA
NUMBER OF PLOTS: 73
TOTAL DISTANCE: 4246.3 feet
MEAN DISTANCE: 14.5 feet
DENSITY PER ACRE: 208

SPECIES	IMPORTANCE VALUE	RELATIVE DENSITY		RELATIVE FREQUENCY		RELATIVE DOMINANCE	
		#	%	#	%	square inches	%
Th.pl.	154.1	103	35.2	57	78	19670.9	40.9
Tc.ma.	104.2	57	19.5	36	49.5	16906.3	35.2
Ts.he.	64.7	43	14.7	30	41.2	4205.7	8.8
Al.ru.	56.5	42	14.4	28	38.4	1775.8	3.7
Ab.gr.	36	22	7.6	17	23.3	2410.9	5.1
Ps.ne.	23.5	11	3.8	11	15.2	2192.9	4.5
Ta.br.	17.9	11	3.8	9	12.3	867.6	1.8
Co.nu.	5.2	3	1	3	4.1	61.7	.1

PLOTS INCLUDED

BB-3 Z-4 Q-3 T-4 S-3 P-5 S-1 P-5 AA-4 U-4 R-6 N-7 P-8
P-4 M-4 U-1 Q-4 M-3 U-2 V-4 U-3 Q-5 N-3 EE-4 Y-3 Y-2 N-4
R-4 X-1 P-6 R-5 DD-3 O-6 V-2 L-3 DD-4 N-6 L-2 K-3 S-5
X-4 Z-5 O-5 FF-4 X-3 I-3 J-2 S-4 V-1 W-2 W-3 T-3 Z-3
AA-5 CC-4 CC-3 CC-5 P-2 N-1 W-4 N-5 Y-4 P-7 V-3 N-2 Q-2
T-2 DD-5 T-1 Q-6 BB-4 P-3 J-3

THUJA PLICATA FOREST
UNDERSTORY

SPECIES	NUMBER OF PLOTS IN WHICH OCCURS	AVERAGE COVERAGE(%)	FREQUENCY (%)
moss	64	19	87.6
Po.mu.	55	35.1	75.5
Ac.ma.	51	4	70
Ru.vi.	45	7.3	61.7
Ga.sh.	25	17.1	34.3
Be.ne.	22	12.3	30.2
Ru.pa.	15	17.3	20.6
Ga.sp.	15	3	20.6
Va.pa.	13	12.4	17.8
Tr.la.	13	5.3	17.8
Tr.ov.	11	1	15.1
Th.pl.	10	12.2	13.7
Ro.gy.	10	10.3	13.7
grass	9	11.3	12.3
Ts.he.	7	10.7	9.6
Va.ov.	6	1.3	8.2
Ad.bi.	6	1	8.2
Vi sp	5	1.4	6.8
Ab.gr.	4	37.2	5.5
Os.ce.	4	13.5	5.5
Li.bo.	4	8	5.5
At.fi-fe.	4	5	5.5
Rh.pu.	4	2.5	5.5
Co.co.	4	1.7	5.5
Al.ru.	4	1.8	5.5
Lo.ci.	4	1.7	5.5
Mo.si.	4	1.5	5.5
Vi.gl.	3	1.5	4.1
Ru.sp.	3	14	4.1
Ac.tr.	3	3	4.1
Pt.aq.	2	6.3	2.7
Ho.di.	2	20	2.7
Sa.ra.	2	9	2.7
U#14	2	9	2.7
Sm.se.	2	2	2.7
U#16	2	2	2.7
Co.nu.	2	1	2.7
Po.vu.	1	1	1.4
Ta.br.	1	62	1.4
Ra.sp.	1	3	1.4
Op.ho.	1	3	1.4
U#15	1	3	1.4
Di.fo.	1	1	1.4
Eq.sp	1	1	1.4
Le.nu.	1	1	1.4
mushroom	1	1	1.4
Ne.pa.	1	1	1.4
Ri.sa.	1	1	1.4
Se.sp.	1	1	1.4
U#8	1		

FOREST TYPE: ALNUS RUBRA
NUMBER OF PLOTS: 24
TOTAL DISTANCE: 1054.4 feet
MEAN DISTANCE: 11 feet
DENSITY PER ACRE: 359.1

CIES	IMPORTANCE VALUE	RELATIVE DENSITY		RELATIVE FREQUENCY		RELATIVE DOMINANCE	
		#	%	#	%	square inches	%
ru.	174.7	54	57.4	21	87.5	1859.8	29.8
ma.	55	12	12.5	8	33.3	582.4	9.2
pl.	50.5	8	8.3	7	29.2	814.5	13
he.	50	8	8.3	6	25	1042.4	16.7
me.	35.6	4	4.2	4	16.7	918.7	14.7
br.	30	4	4.2	4	16.7	569.4	9.1
gr.	27.7	4	4.2	4	16.7	428.6	6.8
em.	5.3	1	1.1	1	4.2	23.8	0
au.	5.3	1	1.1	1	4.2	15	0

TS INCLUDED
BB-6 FF-3 R-3 R-1 CC-2 G-2 M-1 BB-5 EE-2 S-2 O-7 X-2
M-2 Z-2 AA-2 DD-2 R-2 EE-3 AA-3 X-5 O-1 DD-1 FF-2 BB-2

9

ALNUS RUBRA FOREST
UNDERSTORY

SPECIES	NUMBER OF PLOTS IN WHICH OCCURS	AVERAGE COVERAGE (%)	FREQUENCY (%)
Po.mu.	21	31.8	87.5
moss	19	13	79.5
Ru.vi.	18	12.3	75
Ac.ma.	14	5	58.3
Ga.sh.	10	20.2	41.5
Be.ne.	10	9.6	41.5
Ru.sp.	9	15.2	37.5
Ru.pa.	8	14.3	33.3
Tr.la.	6	1.3	25
Ga.sp.	5	5	20.8
grass	5	1.4	20.8
Ts.he.	4	41	16.7
Th.pl.	4	9	16.7
Ro.gy.	4	6	16.7
Li.bo.	4	2.5	16.7
Tr.ov.	4	2.5	16.7
Sa.ra.	3	11	12.5
Ad.bi.	3	3	12.5
Ps.me.	3	2.3	12.5
Sm.se.	3	1.7	12.5
Va.ov.	2	20	8.3
At.fi-fe.	2	19	8.3
Ab.gr.	2	9	8.3
Ho.di.	2	9	8.3
Pt.aq.	2	8	8.3
U#1	2	8	8.3
Co.co.	2	3	8.3
Ne.pa.	2	3	8.3
Mo.si.	2	2	8.3
Ri.sa.	2	2	8.3
Vi sp	2	2	8.3
Ta.br.	1	62	33
Va.pa.	1	37	4.2
U#17	1	15	4.2
U#18	1	3	4.2
Al.ru.	1	1	4.2
As.sa.	1	1	4.2
U#16	1	1	4.2

FOREST TYPE: PSEUDOTSUGA MENZIESII
NUMBER OF PLOTS: 22
TOTAL DISTANCE: 1229.3 feet
MEAN DISTANCE: 13.9 feet
DENSITY PER ACRE: 224

SPECIES	IMPORTANCE VALUE	RELATIVE DENSITY		RELATIVE FREQUENCY		RELATIVE DOMINANCE	
		#	%	#	%	Square inches	%
Ps.me.	211.3	39	44.5	21	95.5	7467.8	71.3
Al.ru.	53.4	13	14.8	8	35.6	316	3.0
Th.pl.	38	6	6.8	5	22.7	893.1	8.5
Ts.he.	36.7	6	6.8	5	22.7	878.4	7.2
Ab.gr.	32	6	6.8	5	22.7	263.2	2.5
Ac.ma.	31	5	5.7	5	22.7	277.7	2.6
Ta.br.	25.4	5	5.7	4	18.2	154.8	1.5
Ar.me.	12.8	2	2.3	2	9.1	148.6	1.4
Pr.em.	11.9	2	2.3	2	9.1	60.1	.5
Co.nu.	11.7	2	2.3	2	9.1	35.5	.3
Rh.pu.	11.6	2	2.3	2	9.1	16.7	.2

PLOTS INCLUDED

G-1 H-1 I-1 I-2 J-1 K-1 K-2 L-1 O-2 O-3 O-4 P-1

Q-1 H-2 W-1 Z-1 AA-1 Y-1 BB-1 CC-1 EE-1 FF-1

PSEUDOTSUGA MENZIESII FOREST UNDERSTORY

SPECIES	NUMBER OF PLOTS IN WHICH OCCURS	AVERAGE COVERAGE(%)	FREQUENCY(%)
moss	21	29	95.5
Ga.sh.	20	49.4	91
Lo.ci.	14	8.4	63.7
Ru.vi.	14	6.6	63.7
Be.ne.	12	19	54.5
Li.bo.	10	26.1	45.5
Po.mu.	7	9.6	31.8
Tr.la.	6	6.2	27.2
Ac.ma.	6	1.7	27.2
grass	6	4.5	27.2
Ro.gy.	5	11.4	22.7
Ga.sp.	4	3	18.2
Ru.pa.	4	2	18.2
Ho.di.	4	1.8	18.2
Pt.aq.	4	1.5	18.2
Vi sp	4	1.5	18.2
Co.co.	3	34	13.6
Ab.gr.	3	11	13.6
Th.pl.	2	26	9.1
Co.nu.	2	20	9.1
Ps.me.	2	9	9.1
Ch.um.	2	3	9.1
Ts.he.	2	3	9.1
Ru.sp.	2	2	9.1
Va.pa.	2	2	9.1
Vi.gl.	2	2	9.1
Go.ob.	1	15	4.6
Va.ov.	1	15	4.6
Ar.me.	1	3	4.6
Sm.se.	1	3	4.6
Ad.bi.	1	1	4.6
Di.fo.	1	1	4.6
Ta.br.	1	1	4.6
Tr.ov.	1	1	4.6
U#16	1	1	4.5
U#19	1	1	4.6

key to Latin abbreviations 12

Ab gr	Abies grandis	Grand fir
Ac ma	Acer macrophyllum	Big-leaf maple
Ac tr	Achlys triphylla	Vanilla leaf
Ad bi	Adenocaulon bicolor	Pathfinder
Al ru	Alnus rubra	Red alder
Ar me	Arbutus menziesii	Madrone
As ca	Asarum caudatum	Wild ginger
At fi-fe	Athyrium felix-femina	Lady fern
Be ne	Berberis nervosum	Mountain oregon grape
Ch um	Chimphilla umbellata	Pipsissewa
Co co	Corylus cornuta	Hazel nut
Co nu	Cornus nuttallii	Dogwood
Di fo	Dicentra formosa	Bleeding heart
Eq sp	Equisetum species	a Horsetail
Ga sp	Gallium species	a Bedstraw
Ga sh	Gaultheria shallon	Salal
Go ob	Goodyera oblongifolia	Rattlesnake plantain
Ho di	Holodiscus discolor	Ocean spray
Le nu	Leontodon nudicaulis	Hawkbit
Li bo	Linnaea borealis	Twinflower
Lo ci	Lonicera ciliosa	Climbing honeysuckle
Mo si	Montia sibirica	Candy flower
Ne pa	Nemophilia parviflora	Wood nemophilia
Op ho	Oplopanax horridum	Devil's club
Os ce	Osmaronia cerasiformis	Indian plum
Po mu	Polystitchum munitum	Sword fern
Po vu	Polypodium vulgare	Licorice fern
Pr em	Prunus emarginata	Bitter cherry
Ps me	Pseudotsuga menziesii	Douglas fir
Pt aq	Pteridium aquilium	Bracken fern
Ra sp	Ranunculus species	a Buttercup
Ri sa	Ribes sanguinem	Red-flowering currant
Ro gy	Rosa gymnocarpa	Woods rose
Rh pu	Rahmnus purshiana	Cascara
Ru pa	Rubus parviflorus	Thimbleberry
sp	spectabilis	Salmonberry
vi	vitiflius	Blackberry
Sa ra	Sambucus racemosa	Red elderberry
Se sp	Senecio species	a Senecio
Sm so	Smilacina sessilifolia	False Solomon's seal

Ta br	Taxus brevifolia	Western yew
Th pl	Thuja plicata	Western red cedar
Tr la	Trientalis latifolia	Starflower
Tr ov	Trillium ovatum	Trillium
Ts he	Tsuga heterophylla	Western hemlock
Va pa	Vaccinium parviflorum	Red huckleberry
Va ov	Vaccinium ovatum	Evergreen huckleberry
Vi gl	Viola glabella	Woods violet
Vi sp	Vicia species	a Vetch

FOREST TYPES ~~DISCUSSION~~

(1) Determination

The explanation of forest-typing procedure and the description of the forest types are subjective, and many different forest groupings are valid. For example, in our groupings, if Acer macrophyllum was included in the Alnus rubra forest (Franklin/Dyrness refer to hardwoods in the Tsuga heterophylla climax as being uncommon except in recently disturbed sites) ratherthan in the Thuja plicata forest type, the Alnus rubra group would then be the dominating forest type; the Thuja plicata would appear far less important and the areas shown on the map would be completely rearranged.

(2) From the compilation of the quantitative data - especially the importance values for each tree species - several homogenous groupings were considered in the characterization process. Each of these groupings might be defined by one or more species. Finally, the groupings are indicated on the map as covering a continuous area though there is information only for the four trees nearest each plot along the transects. These areas are seldom homogenous; this is evident from the breakdown of the importance value figures for the different forest types into species-specific importance values. When the four trees in a plot are different species or when it is difficult to determine which species dominates (i.e., two Alnus rubra and two Acer macrophyllum, or two Pseudotsuga menziesii, one Tsuga heterophylla and one Thuja plicata), the data sheets are utilized to determine in which forest type the plot belongs. Recorded comments are helpful in understanding what the surrounding area was like, as is understory data. Most often, it is the

In the case of Acer macrophyllum, whose age and high importance value are puzzling (as will be explained), we resorted to pointing out the Acer macrophyllum trees within the Thuja plicata grouping by using a separate color on the map (a brown X). This color represents plots containing at least two large trees of that species.

Tsuga heterophylla and Abies grandis were included in the Thuja plicata type along with the Acer macrophyllum. Pseudotsuga menziesii has its own forest types as does Alnus rubra. The other species encountered - Arbutus menziesii, Cornuta nuttallii, Rhamnus purshiana, Prunus emarginata, Taxus brevifolia - were then included subordinate to the strongest forest type in the plot. The Arbutus menziesii show very little in the data sheets; it is found all along the sea cliffs and on the beach, seeming to need a combination of sun and shade. Taxus brevifolia, whose presence was given particular attention and recorded in the comments on the plot sheets, does not seem to occur in any special area or in a special relation to other species, being scattered throughout. They are slow growing trees, and by their size, appear to be very old. They did often occur in groups of three to five with the smaller ones close to each other. Although the initial intent was to distinguish between male and female yew - the tree is dioecious - as a point of interest, this was oftentimes impossible due to branch height or lack of blooms.

Alnus rubra Forest

Thuja plicata

-etc.

DISCUSSION

5 Our discussion of the land studied is based on a combination of information provided by our data and on conjectures originating from reading and observations made while collecting the data. The Forest Service Research Research Paper, Vegetation of Oregon and Washington by Franklin and Dyrness, helped to provide a basic knowledge towards which observations and data were applied. Discussion with Al Wiedemann has been a great aid. In their paper, Franklin and Dyrness characterize the area of Puget Sound as part of a Tsuga heterophylla zone, named for the potential climx species. As a result of logging and fire, Pseudotsuga menziesii is the seral climax on much of this region. Given this general information, vague common knowledge of logging done in the mid-nineteenth century and in the 1940's or 1950's, and the high incidence of Pseudotsuga menziesii that is visible when walking along the beach, it could be expected that our study would find a predominately Pseudotsuga menziesii forest type. The Pseudotsuga menziesii has turned up significantly only in a narrow belt along the top of the cliffs, heading inland for not more than three hundred feet where it blends into a zone of Thuja plicata, young, infrequent Tsuga heterophylla and scattered groupings of Abies grandis.

6 There are many reasons for the inclusion of Thuja plicata, Tsuga heterophylla, Abies grandis and Acer macrophyllum in the Thuja plicata forest type. Thuja plicata is the species with the highest importance value. Franklin and Dyrness tell about its presence in the Tsuga heterophylla zone: "On the wet to very wet sites, Thuja plicata will certainly be a part of any climax forest; size-class analyses do not support climax status for this species on modal or dry sites, however, even though many ecologists have hypothesized a Tsuga-Thuja climax for most of the

region. The tendency for Thuja plicata to be part of the mixed stands, successionally intermediate between the pioneer Pseudotsuga menziesii forests and the Tsuga heterophylla forest, has perhaps misled some ecologists in interpreting its successional role." (page 65) The moderately heavy rainfall of the Olympia area, the size/age of the Thuja plicata trees, the fact that the Thuja plicata is shade tolerant, the presence of seedlings, the infrequent occurrence of Tsuga heterophylla, and the longevity of the species (1000+ years) are all factors helping to designate a Thuja plicata forest mixed with Tsuga heterophylla as the seral climax for this area. This sere is a potentially long one due to the longevity of Thuja plicata and its ability to reproduce in its own shade.[1]

The Alnus rubra can also be considered a seral forest type. It is a short-lived species (100 years) and is quick to take over disturbed forest land where there is a lot of available light. Franklin/Dyrness describe the replacement of Alnus rubra stands by other trees as a slow process. The Alnus rubra tends to shade and crowd out coniferous succession. Alnus rubra is a hydrophyll; on the study land, it is often found in the valleys, which are moist and are taking over what appear by their narrowness, length and orientation to be old cuts (logging access).

The great importance value of Acer macrophyllum remains puzzling. Although it has a lower relative density and frequency than the other high importance species, it does have a higher relative dominance. This large basal area is not accounted for by the Franklin/Dyrness figures

---

[1] Typical ages, corresponding diameters and references to shade tolerance are taken from Franklin/Dyrness, page 48, table 3.

SUBSTRATE

~~DISCUSSION~~ LOGGING

which give the typical diameter and age of Acer macrophyllum as 20 inches, 300+ years. Three diameter size groups can be defined from the data collected on Acer macrophyllum: 3.5" to 5.8", 6.1" to 19" and 20" to 50.7", all containing twenty-five individuals. These groupings indicate that there is a wide age variance among the Acer macrophyllum on the study land, and that some have assumed unusual size and age.[2] Franklin/Dyrness have only this to say about hardwoods in the Tsuga heterophylla zone: "Hardwoods are not common in forests of the Tsuga heterophylla land, and except on recently disturbed sites or specialized habitats (eg. riparian), are almost always subordinate." (p85) They then refer to Alnus rubra, Acer macrophyllum and a species of Chinquapin as the most widespread of the hardwoods in the Tsuga heterophylla zone. The Acer macrophyllum is shade tolerant. On the survey land, it is found growing in groups or appears to border small open areas, often around the land being taken over by Alnus rubra. The larger ones are also found in combination with, or as another tree in that grouping. The smaller ones are more often found in combination with Alnus rubra. The trees (Ac. ma.) are not a forest type because it is the size of the individuals which gives the Acer macrophyllum the high importance value. This high importance value therefore seems to be a function of the relative longevity of a few individuals and the fact that it is not a commercially desirable species. Because it was left in the logging times, it has come to have a greater importance value relative to the other trees - which are periodically cut for their timber - than it would otherwise have. These mix factors might be all the more reason for giving the tree a type of its own, or perhaps for including it with Alnus rubra. Putting it with the Thuja plicata grouping was the decision made here.