

INTERIOR DOUGLAS FIR (WET BELT)
OPERATIONAL YIELD TABLES

Natural stand established at 2800 stems/hectare
Spaced to 500 stems/ha (good at 20 years; medium at 25 years)
All statistics for stems > 17.5 cm D.B.H.

GOOD SITE				MEDIUM SITE			
TOTAL AGE	VOL m3/ha	DBH (cm)	STEMS per ha	TOTAL AGE	VOL m3/ha	DBH (cm)	STEMS per ha
20	-	-	-	20	-	-	-
30	88	21.0	468	30	-	-	-
40	176	27.4	492	40	58	20.0	15
50	244	29.8	490	50	144	21.4	491
60	326	31.4	490	60	199	22.8	491
70	410	33.4	474	70	232	24.1	491
80	509	35.3	449	80	265	25.5	491
90	556	36.8	440	90	291	26.6	491
100	605	39.2	407	100	326	27.8	491
110	659	41.5	383	110	348	28.9	491
120	690	43.1	369	120	362	30.0	491

Natural stand established at 2800 stems/hectare
Spaced and Fertilized
All statistics for stems > 17.5 cm D.B.H.

GOOD SITE				MEDIUM SITE			
TOTAL	VOL	DBH	STEMS	TOTAL	VOL	DBH	STEMS
20	-	-	-	20	-	-	-
30	105	22.3	440	30	-	-	-
40	202	28.3	495	40	71	20.2	16
50	270	30.4	490	50	170	22.1	500
60	352	32.0	490	60	220	24.2	500
70	436	34.4	460	70	255	25.5	500
80	535	36.3	438	80	290	26.9	490
90	582	37.8	424	90	327	27.9	490
100	631	40.1	397	100	362	29.1	488
110	687	42.5	374	110	386	30.3	488
120	718	44.0	360	120	402	31.4	488

APPENDIX 2

CALCULATION OF NPV'S,
ASSUMPTIONS AND
MODEL FILES

CALCULATION OF NET PRESENT VALUES

The net present values in this report were derived from the Nawitka spreadsheet model which was modified to meet the objectives of this study. The calculation procedure is diagrammed in Figure A, and the microcomputer work screen (or hard copy sheet) as modified is shown on the following page. This sheet documents a net present worth analysis for one situation and indicates the best rotation and whether a control or treated condition has the highest net present value for one sample hectare. For this study, in each situation, a treated condition was compared to a no treatment condition and attention was focused on the difference in NPV between them. A real discount rate of 4% was used and log prices over time were increased at 1% real. The annual carrying cost for one hectare of productive forest land was derived on the basis of annual expenditures made by the Ministry of Forests to manage and protect productive forest land for harvest purposes net of intensive forestry costs including brushing and weeding. The carrying cost for the Coast was estimated to be \$6.50 per ha, and for the Interior \$4.60 per ha.

Figure A

Model

Net Present Value

Calculation

Now (1986)

Future (End of Rotation)

- (1) Final Volume
priced by diameter ---> inflate or not -----> future product value
- (2) Logging cost -----> inflate or not -----> deduct logging cost
- (3) Hauling cost -----> inflate or not -----> deduct hauling cost
- (4) Carrying charges -----> increase at rate ---> deduct carrying charges
chosen
(annuity-future value)
- (5) Investment or
Treatment Cost -----> increase at rate ---> deduct treatment cost
chosen
(compound interest)
- (6) Net Present Value <--- discount at rate <--- Net Future Value
chosen
(compound discount)

Figure B EXAMPLE OF MODEL OUTPUT

FOREST INVESTMENT ANALYSIS

TEST Coast D. fir Natural Stand)
 TREATMENT: Spaced) Investment Being Considered
 SITE: Good)

AGE NOW ----- Rotation Age and Elapsed Years to Harvest Age -----
 15 AGE 50 35 AGE 60 45 AGE 70 55 AGE 80 65 AGE 90 75) Time period investment carried

----- Net Volume/ha (m3) and DBH (cm) at Harvest -----
 VOL DBH VOL DBH VOL DBH VOL DBH VOL DBH
 CONTROL 593 31 722 39 837 43 914 47 989 50) Volumes (m³/ha) and Diameter (cm)
 TREATED 649 40 845 43 1054 49 1176 54 1309 58) at harvest

LOGGING CHANCE (1-4) 2)
 HAULING SCHEDULE 1. 0)*
 & DISTANCE (KM) 2. 40)
 3. 0)
 SPECIES: COAST D.FIR % 1) This stand priced as all D.fir
 COAST HEM/BAL 0 (see Wood Value File)
 INT W.SPRUCE 0
 INTERIOR L.PINE 0
 WET BELT D.FIR 0

ANNUAL COST 6.50)**
 DISCOUNT RATE (REAL) 0.04
 REAL PRICE INCREASE 0.010
 TREATMENT COST 575) Cost of investment

HARV AGE 50 60 70 80 90

 (NPV)
 CONTROL 3501 4530 4862 4762 4373) Net Present Values per ha.
 TREATED 4814 5765 7204 7055 6461) Positive values indicate more than
 4% real on investment. Shows
 variation by rotation

TREATMENT VALUE: (7204-4862 = 2342)

* See columns in logging and hauling cost files
 ** Annual cost of carrying one ha of productive second growth land

TREATMENT COST FILES

TYPE OF TREATMENT	COAST		INTERIOR	
	-----\$/hectare-----			
	Av.	Range	Av.	Range
Brushing and Weeding:				
Mechanical	360	250-380	340	245-390
Chemical	340	225-360	225	170-350
Conifer Release	340	300-450	330*	250-400*
Fertilization	225	200-230	215	190-220

REGION/TYPE	JUVENILE SPACING		
	-----\$/hectare-----		
	Easy	Average	Difficult
S. Coast - D. fir	475	575	650
- Hemlock	550	650	750
N. Coast - Hemlock	650	700	800
Interior - D. fir (Wet Belt)	415	500	575
- White spruce**	400	500	600
- L. Pine	220	425	800

* Limited data; based partly on trials

** Limited data; few operational projects

Sources: Derived from data in recent Annual Reports of the Ministry of Forests and Nawitka Consultant's file data.

COAST WOOD VALUE FILE
by diameter and species

AVG DIA. (cm)	D.FIR Value per m3 in dollars at mill	HEM/BAL Value per m3 in dollars at mill
16	24.00	26.50
18	26.00	27.50
20	28.00	28.50
22	29.00	28.75
24	30.50	29.00
26	31.25	29.00
28	32.00	30.00
30	33.00	30.50
32	34.00	31.00
34	35.00	31.25
36	36.00	31.75
38	37.50	32.75
40	39.25	33.75
42	41.50	35.25
44	43.50	36.25
46	45.75	37.50
48	48.50	39.00
50	51.00	40.00
52	53.00	41.00
54	55.00	42.00
56	56.75	42.75
58	58.75	43.50
60	61.00	44.50
62	63.00	45.25
64	64.00	46.00

Sources: Values derived from Vancouver Log Market Prices; and
Nawitka Consultant's file data.

INTERIOR WOOD VALUE FILE
by diameter and species

AVG DIA (cm)	WET BELT D.FIR	L.PINE	W.SPRUCE
	Value per m3 in dollars at mill		
16	29.00	24.00	28.00
18	30.00	25.00	29.00
20	30.50	25.50	29.50
22	31.00	26.00	30.00
24	31.50	26.50	30.50
26	32.00	27.00	31.00
28	32.50	28.00	31.25
30	33.00	29.00	31.75
32	34.00	30.00	32.00
34	34.75	30.50	32.25
36	35.75	31.00	32.75
38	37.00	31.50	33.00
40	38.50	32.00	33.50
42	40.00	32.50	34.00
44	41.00	33.00	35.00
46	42.00	33.00	36.50
48	43.50	33.00	38.00
50	45.00	33.00	40.00
52	46.00	n.a.	42.00
54	47.00	n.a.	42.00
56	48.00	n.a.	42.00
58	48.00	n.a.	42.00
60	48.00	n.a.	42.00

Note: Fir and W. spruce stands over 45 cm (18") owe a significant part of the increase in value to a component of peeler logs

Sources: Values derived from Vancouver Log Market Prices; Madison's Canadian Lumber Directory Prices; Statistics Canada, Variable Costs for Interior B.C. Lumber Mills, and Nawitka Consultant's file data.

LOGGING COSTS

(Cost of felling and bucking, yarding, and contracting overhead)

AVG DIA (cm)	1	2	3	4
	-----\$/m3-----			
16	20.00	38.90	44.90	12.00
18	18.50	33.90	39.90	11.00
20	17.00	27.40	31.90	10.00
22	16.00	24.40	27.90	9.50
24	15.00	20.90	23.90	9.00
26	14.00	18.40	20.90	8.50
28	13.50	17.90	19.40	8.50
30	13.00	16.40	17.90	8.50
32	12.75	15.90	16.90	8.25
34	12.50	15.40	16.40	8.25
36	12.50	14.90	15.90	8.25
38	12.25	14.40	15.40	8.25
40	12.25	13.90	15.15	8.25
42	12.00	13.65	14.90	8.00
44	12.00	13.40	14.65	8.00
46	11.75	13.15	14.40	8.00
48	11.75	12.90	13.90	8.00
50	11.50	12.65	13.65	8.00
52	11.50	12.40	13.40	8.00
54	11.25	12.15	13.15	8.00
56	11.25	11.90	12.90	8.00
58	11.00	11.65	12.65	8.00
60	11.00	11.65	12.65	8.00

-
- 1 - Coast: Valley bottoms, little slope, fairly even terrain; may be skidder logged or some grapple yarded
 - 2 - Coast: Valley sides, combination of slope and terrain medium; would likely be grapple or some high-lead.
 - 3 - Coast: Valley sides, combination of slope and terrain difficult; some grapple but mainly high-lead.
 - 4 - Interior: Average conditions - skidder logging.

Source: Based on Nawitka Consultant's file data

TRANSPORTATION COST SCHEDULE

DIST Km	1 -----	2 (\$/m3) -----	3 -----
0-5	10.15	5.90	4.80
6-10	10.55	6.30	5.15
11-15	10.90	6.65	5.50
16-20	11.25	7.00	5.80
21-25	11.55	7.30	6.05
26-30	11.85	7.60	6.35
31-35	12.15	7.90	6.65
36-40	12.45	8.20	6.95
41-45	12.75	8.50	7.25
46-50	13.05	8.80	7.55
51-55	13.35	9.10	7.85
56-60	13.65	9.40	8.15
61-65	13.90	9.65	8.45
66-70	14.15	9.90	8.70
71-75	14.40	10.15	8.95
76-80	14.60	10.40	9.20
81-85	n.a.	10.60	9.45
86-90	n.a.	10.80	9.65
91-95	n.a.	11.00	9.85
96-100	n.a.	11.20	10.05
101-105	n.a.	n.a.	10.25
106-109	n.a.	n.a.	10.45
110-115	n.a.	n.a.	10.60
116-119	n.a.	n.a.	10.75
120-125	n.a.	n.a.	10.90
126-130	n.a.	n.a.	11.05
131-135	n.a.	n.a.	11.20
136-140	n.a.	n.a.	11.35

- 1 - Coast: Some off highway, to salt water dump and then to mill by water. Includes loading, road maintenance, sorting and/or booming, towing or barging, and contracting overhead.
- 2 - Coast: Some off highway, wood taken directly to mill. Includes loading, road maintenance and contracting overhead.
- 3 - Interior: Good grade and road, significant portion highway. Includes loading, road maintenance and contracting overhead.

Source: Based on Nawitka Consultant's file data

APPENDIX 3

ROTATION SCHEDULES

ROTATION AGE AND DIAMETER, SELECTED REGIMES, B.C. COAST*

Species and Regime		Diameter Entered in cm for Rotation Age (years)			
		70	80	90	100
DOUGLAS FIR, NATURAL STAND					
Good Site	Untreated	43	--	--	--
	Spaced	49	--	--	--
	Spaced & Fertilized	49	--	--	--
Medium Site	Untreated	--	--	38	--
	Spaced	--	41	--	--
	Spaced & Fertilized	--	42	--	--
DOUGLAS FIR PLANTED STAND					
Good Site	Untreated	47	--	--	--
	Spaced & Fertilized	51	--	--	--
Medium Site	Untreated	--	39	--	--
	Spaced & Fertilized	40	--	--	--
HEMLOCK/BALSAM, NATURAL STAND					
Good Site	Untreated	42	--	--	--
	Spaced	43	--	--	--
Medium Site	Untreated	--	--	38	--
	Spaced	--	38	--	--
HEMLOCK, NATURAL SITE					
Good Site	Untreated	--	44	--	--
	Spaced	43	--	--	--
Medium Site	Untreated	--	--	--	38
	Spaced	--	38	--	--

* Based on average treatment costs; minimum merchantable stand diameter taken as 38 cm.

ROTATION AGE AND DIAMETER, SELECTED REGIMES, INTERIOR B.C.*

Species and Regime		Diameter Entered in cm for Rotation Age (years)					
		70	80	90	100	110	120
WHITE SPRUCE, NATURAL STAND							
Good Site	Untreated	--	--	28	--	--	--
	Spaced	--	--	41	--	--	--
Medium Site	Untreated	--	--	--	--	--	28
	Spaced	--	--	--	36	--	--
WHITE SPRUCE, PLANTED STAND							
Good Site	Untreated	--	33	--	--	--	--
	Spaced	--	--	41	--	--	--
Medium Site	Untreated	--	29	--	--	--	--
	Spaced	--	--	--	36	--	--
LODGEPOLE PINE, NATURAL STAND							
Good Site	Untreated	23	--	--	--	--	--
	Spaced	--	28	--	--	--	--
Medium Site	Untreated	--	--	--	--	22	--
	Spaced	--	22	--	--	--	--
WET BELT DOUGLAS FIR, NATURAL STAND							
Good Site	Untreated	29	--	--	--	--	--
	Spaced	33	--	--	--	--	--
	Spaced & Fertilized	34	--	--	--	--	--
Medium Site	Untreated	--	--	--	--	--	25
	Spaced	--	26	--	--	--	--
	Spaced & Fertilized	25	--	--	--	--	--

* Based on average treatment costs; minimum merchantable stand diameter, W spruce 28 cm; L. pine 22 cm, D. fir (wet belt) 25 cm.