STERLING WOOD GROUP INC.

Forestry Consultants

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Ministry of Forests
Timber Tenures Section
3rd Floor, 1450 Government Street
Victoria, BC V8W 3E7

Attention: Brad Harris, Senior Tree Farm Licence Forester

Dear Brad,

Please find enclosed one bound copy and one unbound copy of the Timber Supply Analysis report for Tree Farm Licence (TFL) 1. These are submitted on behalf of Skeena Cellulose Inc. .

dated "November 1998"

Yours truly,

Stephen M. Smith, PhD, RPF
President

Enclosure

sfj

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Rec'd Nov. 20/98

TREE FARM LICENCE 1
MANAGEMENT PLAN 9

TFL 1 TIMBER SUPPLY ANALYSIS

November 1998

Sterling Wood Group Inc.
Victoria, BC

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INTRODUCTION

This report describes the timber supply analysis for TFL 1, which is part of the new management plan 9.

There are four main sections in this report:

1. Landbase assumptions
2. Yield assumptions
3. Harvesting assumptions
4. Results.

LANDBASE ASSUMPTIONS

The landbase information came from the new inventory completed by Reid Collins and Associates and Timberline Forest Inventory Consultants in the fall of 1990. Skeena Cellulose Inc. provided several computer files to Sterling Wood Group from which we constructed a computer database.

The 136,830 hectares (including NSR) in table 1 represent the current timber harvesting landbase that results from the BC Ministry of Forests (MoF) estimate of what current management methods might be. Table 1 shows how this landbase was determined.

Table 1: Operable landbase determination for current management methods

Description	Area Schedule A	Area Schedule B	Total Area	Volume Schedule A	Volume Schedule B	Total Volume
Total Landbase	966	609725	610691	138480	84560131	84698611
Non-Forest	109	320946	321055	964	4483549	4484513
Non-Productive Forest	12	17027	17039	0	504468	504468
Total Productive Forest	845	271752	272597	137516	79572114	79709630
Less:						
Inoperable/Inaccessible	133	84302	84435	4881	24377931	24382812
NC (Non Commercial)	13	732	745	0	0	0
Low Site	1	1507	1508	0	154866	154866
Deciduous	23	3542	3564	1231	323818	325049
Non-merchantable	162	6018	6181	31462	1204412	1235874
ESAs	17	15974	15991	2988	6098349	6101336
Alpine Tundra	0	366	366	0	154580	154580
Riparian Reserves	98	9619	9717	22893	3125888	3148782
Specific Geographically Defined Area	0	1434	1434	0	480996	480996
Unclassified Roads, trails and Landings	12	2721	2733	108	11277	11385
NSR	17	2172	2189	0	7076	7076
Wildlife Tree Patch	27	9066	9093	3636	2567592	2571228
Total Current Reduction	505	137452	137956	67199	38506783	38573982
Initial Timber Harvesting Landbase	341	134300	134641	70316	41065331	41135647
Additions:						
NSR	17	2172	2189			
Total Additions	17	2172	2189			
Current Timber Harvesting Landbase	358	136472	136830	70316	41065331	41135647
Future Reductions:						
Future roads, trails, landings	11	6173	6184			
Future Timber Harvesting Landbase	347	130299	130645	70316	41065331	41135647

* Numbers may not add up exactly due to rounding

Table 1 shows the total land area of TFL 1 to be 610,691 hectares. Of this area, 272,597 hectares (44.6%) is productive forest land. Not all the areas of productive forest land are included in the timber harvesting landbase. For example, riparian buffers are withdrawn from harvesting. In total, 49.8% of the total productive forest on TFL 1 is withdrawn from harvesting and 6% of the current timber harvesting landbase older than 35 years (to be used for future roads) must be removed from the future timber harvesting landbase.

Five management zones have been identified on TFL 1. These are wildlife, general, timber production, enhanced timber production, visual and riparian.

These areas are shown in table 2. The additional NSR, 2189 ha was not included in the net area.

Table 2: TFL 1 management zones

Management Zone	Name	Productive Forest	Net
1	Wildlife	64396	17917
2	General	86358	40854
3	Enhanced	74723	53214
4	Visual	34459	17851
5	Riparian	12660	4805
Total*		272597	134641

* Numbers may not add up exactly due to rounding.

YIELD ASSUMPTIONS

The areas in the productive forest were assigned to four productivity classes (one representing the highest productivity). The four productivity classes were defined using site index values as follows:

productivity class	1	site index > 35
	2	site index > 25 and <= 35
	3	site index > 15 and ≤25
	4	site index > 3 and ≤ 15

Site index is an expression of productivity based on the height, at a specific age, of dominant and co-dominant trees in a stand. Productivity site index classes 1-3 were included in the timber harvesting landbase, together with large part of productivity class 4. For these productivity classes, different forest types were identified in table 3. For each forest type, yield tables were prepared which describe the average timber yields expected to be produced at different ages. Two computer models were used to calculate timber yields. The Variable Density Projection (VDYP) system was used to model existing stands. The Table Interpolation Projection System for Yields (TIPSY) was used to model forest stands regenerated after logging. The BC Forest Service maintains both models.

Table 3. Definition of Analysis Units

Analysis Unit	FIZ	Leading Species	Inventory Type Group	Productivity Site Class	Age Range	Net Area (ha)
1	A	Hemlock & Cedar	9 - 17	2	All	119
2	A	Hemlock & Cedar	9 - 17	3	0 - 140	2,108
3	A	Hemlock & Cedar	9 - 17	4	0 - 140	1,120
4	A	Hemlock & Cedar	9 - 17	3	140+	2,883
5	A	Hemlock & Cedar	9 - 17	4	140+	10,278
6	A	Balsam	18 - 20	2	All	177
7	A	Balsam	18 - 20	3	All	543
8	A	Balsam	18 - 20	4	All	854
9	A	Spruce	21 - 26	2	All	398
10	A	Spruce	21 - 26	3,4	All	400
11	A	Cottonwood	35 - 36	1	All	119
12	A	Cottonwood	35 - 36	2	All	591
13	A	Cottonwood	35 - 36	3,4	All	381
14	J	Hemlock & Cedar	9 - 17	2	All	894
15	J	Hemlock & Cedar	9 - 17	3	0 - 140	15,258
16	J	Hemlock & Cedar	9 - 17	4	0 - 140	12,587
17	J	Hemlock & Cedar	9 - 17	3	140+	1,221
18	J	Hemlock & Cedar	9 - 17	3	140+	2,726
19	J	Hemlock & Cedar	9 - 17	4	140+	11,817
20	J	Hemlock & Cedar	9 - 17	4	140+	46,117
21	J	Balsam	18 - 20	2	All	1,202
22	J	Balsam	18 - 20	3	All	5,490
23	J	Balsam	18 - 20	4	All	6,572
24	J	Spruce	21 - 26	1,2	All	855
25	J	Spruce	21 - 26	3	All	1,352
26	J	Spruce	21 - 26	4	All	591
27	J	Lodgepole Pine	28 - 31	3	All	5,838
28	J	Lodgepole Pine	28 - 31	4	All	336
29	J	Cottonwood	35 - 36	1,2	All	808
30	J	Cottonwood	35 - 36	3,4	All	1,010
Total						134,641

We have used the MoF audit plots for TFL 1 to derive a localization factor for VDYP volumes obtained from the inventory polygon attributes. The MoF provided the compiled ground volumes for each polygon sampled in the audit. We added the VDYP volume estimated from the inventory database attributes for each of these polygons. Then we calculated the ratio of ground compiled volume to inventory database volume. For stands 60 years or older this ratio was 0.81. That is, the compiled ground volumes from the MoF audit samples averaged 81% of the inventory database existing mature volumes. For existing stands, this localization factor was applied to existing volume estimates made from the inventory database, by VDYP.

For the yield analysis, existing volumes were obtained from VDYP yield curves for stands up to 60 years old. Beyond 60 years, the yields for existing stands were from adjusted inventory volumes, except for those age classes where no inventory volumes were available. In these cases, the VDYP volume was used in the yield curve. This procedure ensured that the existing timber volumes available to the computer model closely matched those found in the adjusted inventory database.

OLD GROWTH SITE INDEX ADJUSTMENTS

Estimates of site productivity have traditionally been made using site index which is subsequently used to drive growth and yield predictions. The Site Productivity Working Group identified problems with traditional site index curve applications in old growth stands and recommended the initiation of projects to improve them. The objective was to develop adjustments for short-term application in Timber Supply Planning. Subsequently the Ministry of Forests (MoF) derived a set of interim adjustment equations for old growth site indexes, Nussbaum and Nigh (1997) and Site Index Adjustment for Old-growth Coastal Western Hemlock Stands in the Kalum Forest District, Nigh, G. and B. Love, March 3, 1998. They also developed the following application guidelines for Timber Supply Analysis:

1. Adjustment equations apply only to age class 8 and 9 stands following clearcut harvest regeneration.

2. Adjustment of old growth polygons must be applied on a polygon basis before regenerated stand analysis units are formed.

3. The site index of the old growth polygon must be within the range of site index sampled to build the interim adjustment equation.

4. Old growth site index must be:

- derived from the same species as the adjustment equation;
- derived from the same site curves used to develop the adjustment equations, and
- derived from the height and age of the old growth polygon.

In this timber supply analysis, two harvest forecasts were made for the current timber harvesting landbases. The first was using site indexes that are only adjusted for old growth coastal western hemlock (Nigh, G. and B. Love, 1998) and the second is for site indexes that are adjusted for the old growth in all species. The second adjustment used the interim adjustment equations referred to above (Nussbaum and Nigh, 1997 and Nigh, G. and B. Love, 1998), and the adjustments for old growth western hemlock.

For every old growth polygon in the timber harvesting landbase the site index value was adjusted using the MoF interim equations or the formulas for Old-growth Coastal Western Hemlock Stands in the Kalum Forest District. This adjustment was applied after the net down procedure to ensure that the timber harvesting landbase was not changed. This adjustment did not change in any way the existing timber volume assigned to each old growth polygon. In the computer model, after an existing old growth stand was harvested, the new regenerated stand was assigned the adjusted site index. Future regenerated stand volumes were assigned using the adjusted site index.

HARVESTING ASSUMPTIONS

TFL 1 lies inside both the interior and coast zones. Almost all logging is done using the clearcut system. Adjacency and green-up requirements, and stand level and landscape level biodiversity requirements were modeled in the timber supply analysis using the rules shown in tables 4 and 5. Riparian reserve and management zone requirements were also met in the analysis, by using a GIS exercise to record the area of reserve and management zone to be found in each polygon. Riparian reserve areas were allowed to contribute to wildlife tree patches. The details of these allowance for stand level biodiversity are shown in the data package.

Table 4. Area Percentage for Old Growth Seral Stage

GROUP NO	Resource Plan Units	ZONE	NDT	Old Minimum %	Old Minimum Age
1	Beaver / Mayo	CWH	2	9.4	250
2	Beaver / Mayo	MH	1	19.9	250
3	Clore	CWH	2	9.4	250
4	Clore	ESSF	2	9.4	250
5	Clore	MH	1	19.9	250
6	Headley / Hoodoo	CWH	2	9.4	250
7	Headley / Hoodoo	ICH	2	9.4	250
8	Headley / Hoodoo	MH	1	19.9	250
9	Ishkheenickh	CWH	1	13.6	250
10	Ishkheenickh	CWH	2	9.4	250
11	Ishkheenickh	MH	1	19.9	250
12	Kiteen	CWH	2	9.4	250
13	Kiteen	ESSF	1	19.9	250
14	Kiteen	MH	1	19.9	250
15	Kitnayakwa	CWH	2	9.4	250
16	Kitnayakwa	ESSF	2	9.4	250
17	Kitnayakwa	MH	1	19.9	250
18	Laval Lake	CWH	2	9.4	250
19	Laval Lake	ICH	2	9.4	250
20	Laval Lake	MH	1	19.9	250
21	Lower Nass	CWH	2	9.4	250
22	Lower Nass	ICH	2	9.4	250
23	Lower Nass	MH	1	19.9	250
24	Cedar / Meadow	CWH	2	9.4	250
25	Cedar / Meadow	MH	1	19.9	250
26	Nogold	CWH	2	9.4	250
27	Nogold	ESSF	1	19.9	250
28	Nogold	MH	1	19.9	250
29	South Kalum	CWH	2	9.4	250
30	South Kalum	MH	1	19.9	250
31	West Copper	CWH	2	9.4	250
32	West Copper	MH	1	19.9	250
33	Whitebottom / Dane	CWH	1	13.6	250
34	Whitebottom / Dane	CWH	2	9.4	250
35	Whitebottom / Dane	MH	1	19.9	250

Table 4 was created by assuming an area distribution rule of 45 % for both low (L) and intermediate (I) Biodiversity Emphasis Area (BEA) and 10 % for high (H) BEA.

RESULTS

Harvest forecasts were made for the following landbases:

- gross productive landbase;
- net timber harvesting landbase; and

For the above landbases, the maximum even flow harvest AAC were calculated. In addition, step down harvests were calculated beginning with the present allowable cut of 720,000 cubic metres per year. In these cases the step down in any one decade was restricted to a maximum of ten percent of the previous decade's harvest level. Sensitivity analyses around the maximum even flow levels for the current timber harvesting landbase were also conducted. Table 5 shows the complete set of 26 harvest forecasts.

In the analysis so far, 26 different computer harvest forecasts have been made. These are listed in table 5.

Table 5: The complete set of harvest forecasts
(OGSI adjusted for all species except for #'s 22 & 28)

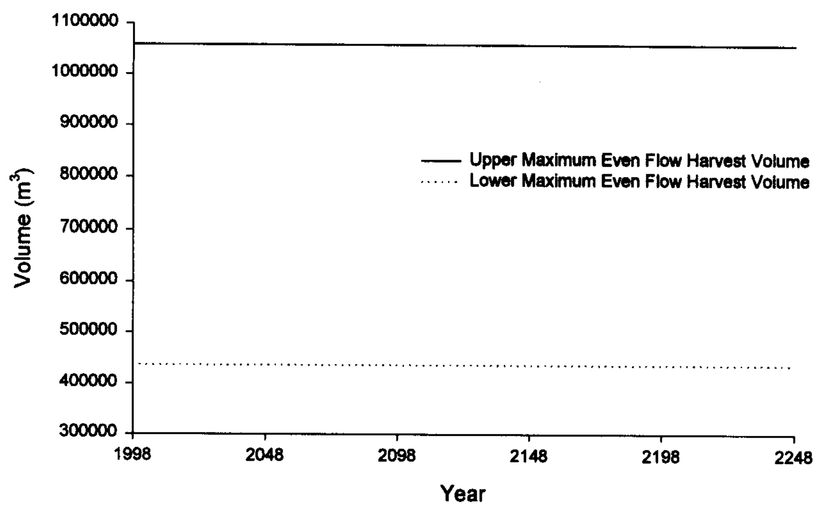
Landbase	Run #	Harvest forecast
Gross productive	1	constrained maximum even flow
	2	unconstrained maximum even flow
Current	3	maximum even flow
	4	existing stand volume +20%
	5	existing stand volume +10%
	6	existing stand volume -10%
	7	regenerated stand volume +10%
	8	regenerated stand volume -10%
	9	cover constraint old growth area percentages +10%
	10	cover constraint green-up area percentages +10%
	11	cover constraint old growth area percentages -10%
	12	cover constraint green-up area percentages -10%
	13	green-up heights +2 meters
	14	green-up heights -2 meters
	15	no cover constraints
	16	minimum harvest age +10 years
	17	minimum harvest age -10 years
	18	landbase increased by 10%
	19	landbase decreased by 10%
	20	no wildlife tree patches
	21	initial harvest targets in first 2 decades followed by step down
	22	old growth site index adjusted for AU= 4, 5, 17, 19 only(even flow)
	23	existing stand volume +20%; stepdown
	24	no cover constriants; stepdown
	25	visual zone cover constraints same as general zone; stepdown
	26	old growth site index adjusted for AU's = 4, 5, 17, 19 only; stepdown

In table 5 run numbers 4-22 are sensitivity analyses about run number 3. Run numbers 24-25 are sensitivity analyses about run number 3. Except for run numbers 2 and 15, every run in table 5 applied the cover constraints and biodiversity modeling described previously in the section entitled 'Harvesting Assumptions'.

THE FEASIBLE RANGE OF HARVESTS

In the even flow computer runs listed in table 6 run number 2 has the highest even flow value at 1,058,897 cubic meters per year (net non-recoverable losses) and run number 22 has the lowest at 465,660 cubic meters. The feasible range of even flow harvests lies between these two. Figure 1 illustrates the feasible range.

Figure 1: Feasible range of even flow harvests



As figure 1 shows, there is a very wide range of choices available in setting the rate of harvest for TFL 1. Each choice is supported by a different landbase for timber production and a different set of assumptions.

THE GROSS PRODUCTIVE LANDBASE

The gross productive landbase includes all the land under continuous forest cover plus recently logged land. When no cover constraints are applied to this landbase, the even flow harvest is 1,058,897 cubic meters per year. This number represents a theoretical maximum harvest schedule. Using the present ideas about cover constraints (green-up and adjacency) and biodiversity that are dictated by the Ministry of Forests, the result for gross productive landbase became 956,402 cubic meters per year.

For the gross productive landbase, these results show that cover constraints reduce the even flow annual harvest by about 11% (956,402 cubic meters versus 1,058,897 cubic meters).

THE CURRENT LANDBASE

The current landbase includes the land on which logging can take place, after removals from the timber harvesting landbase have been made for inoperable areas, non-commercial cover, low sites, deciduous areas, non-merchantable areas, environmentally sensitive areas, alpine tundra, riparian reserves and management zones, specific geographically defined area, unclassified roads, trails and landings, wildlife tree patches, and not sufficiently restocked areas.

Under the green-up, adjacency and biodiversity rules applied in this analysis, the maximum even flow harvest on the current landbase was calculated to be 540,788 cubic meters per year, net non-recoverable losses. The present allowable harvest rate is 720,000 cubic metres per year.

To provide a different perspective another projected harvest pattern, different from the even flow harvest, was investigated for the currently operable landbase. This harvest pattern began with an initial harvest target for the first 20 years, of 720,000 followed by a step down in harvest levels to a long run harvest level. For the currently operable landbase the annual harvest rate for the next 20 years can be maintained at 720,000 cubic meters before stepping down to a level of 510,888 and then climbing back up to 512,299 cubic meters. Figure 2 shows both harvest patterns, the even flow and the step down harvest.

Figure 2: Comparison of annual even flow harvest and step down harvest in current landbase

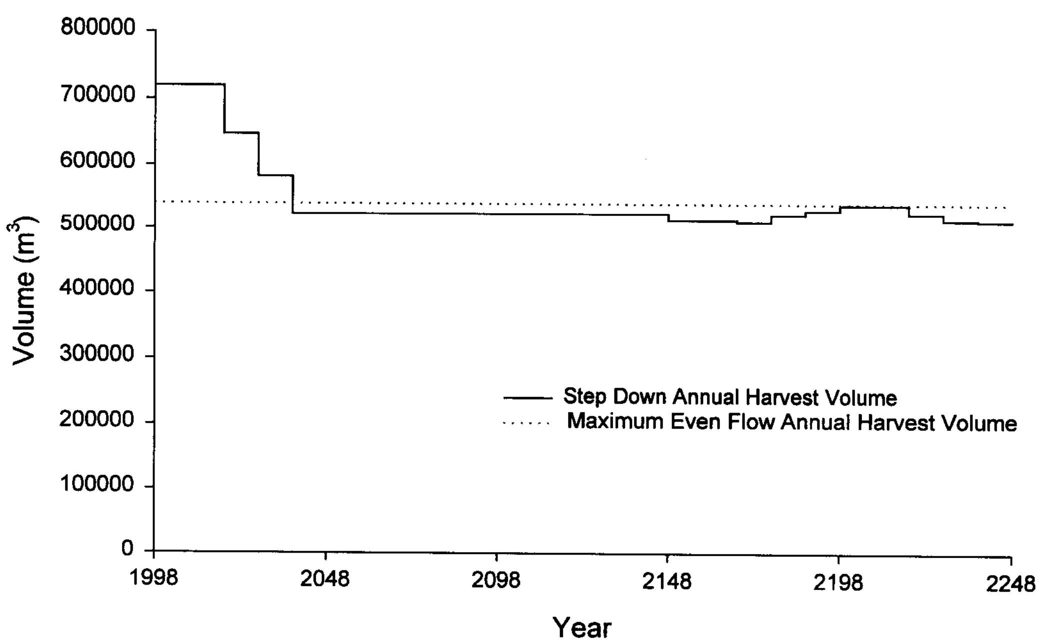


Table 6: shows the data used to produce figure 2.

Table 6: Two different harvest patterns for current landbase

	Annual Harvest (cubic meters)	
Decade	Even flow	Step down
1	540,788	720,000
2	540,788	720,000
3	540,788	647,550
4	540,788	582,345
5	540,788	523,660
6	540,788	523,660
7	540,788	523,660
8	540,788	523,660
9	540,788	523,660
10	540,788	523,660
11	540,788	523,660
12	540,788	523,660
13	540,788	523,660
14	540,788	523,660
15	540,788	523,660
16	540,788	513,660
17	540,788	513,660
18	540,788	510,888
19	540,788	521,845
20	540,788	529,199
21	540,788	539,199
22	540,788	539,199
23	540,788	523,660
24	540,788	513,660
25	540,788	512,294
250 Year Total	**13,519,700**	**13,647,419**

Over the 250-year period the step down harvest pattern produces more timber. The difference (127,719 cubic meters) represents an average of 511 cubic meters per year.

Standing Reserves of Green Timber

The trees that are not harvested are continually growing and provide standing reserves of green timber. Figures 3 and 4 provide information on these timber reserves.

Figure 3: Current land base even flow harvest, projected total and merchantable timber supplies

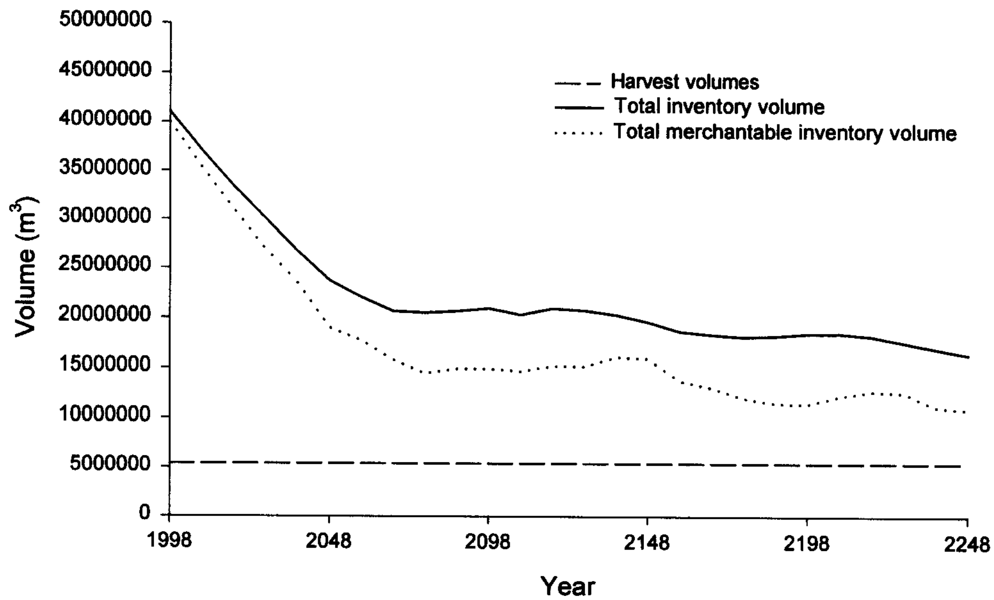
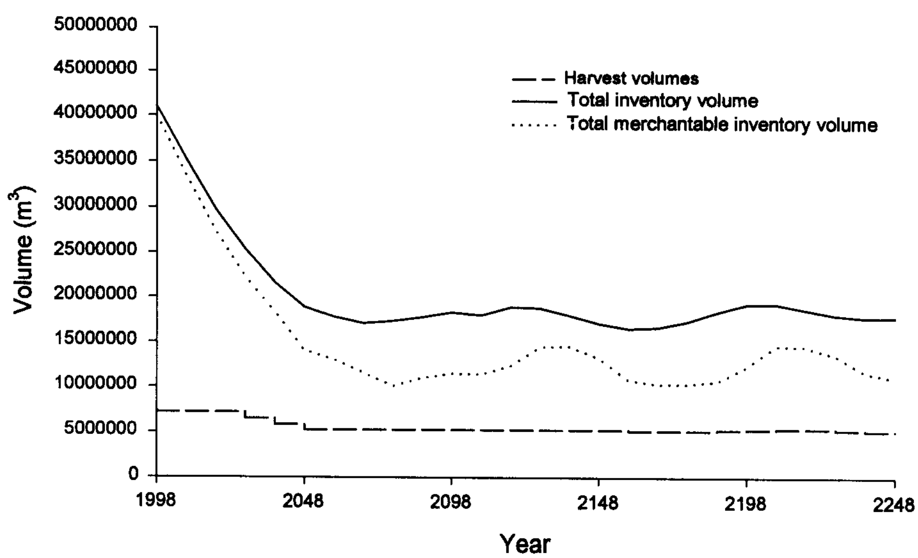


Figure 4: Current land base step down harvest, projected total and merchantable timber supplies



The top line in the graphs in figure 3 and 4 shows the standing volume of timber at any time in the timber harvesting landbase for all age classes. This volume includes timber not yet ready for harvest and harvestable timber. The middle line shows the volume of standing timber at any time which has reached a harvestable condition according to the rules given in the data package. Both of these lines show timber volumes that have not yet been harvested. The bottom line shows the total volume of timber harvested in each decade.

Figures 3 and 4 allow the calculation of projected standing harvestable timber reserves at any time over the 250-year horizon. This can be done as follows:

1. Read the standing merchantable timber volume from the middle line.
2. Read the total ten-year harvest form the bottom line and divide by ten to get the annual harvest.
3. Divide the number obtained in (1) by that obtained in (2) to calculate the merchantable timber reserve expressed in years of harvest.

To give an example from figure 4, the lowest standing volume of merchantable timber occurs at year 2078, and is about 10 million cubic meters. In this decade, the annual harvest rate including NRL's is 523,660 cubic meters per year. Therefore, the level of harvestable timber reserves in the step down harvest schedule never drops below 19 years of harvest. At this point, projected standing harvestable timber reserves equal about 19 years of harvests. These reserves are the direct effect of MoF harvest flow and cover constraint policies.

Distribution of Seral Stages

Biological diversity (biodiversity) is the diversity of plants, animals and other living organisms. In BC, there is a theory that contains four principles:

1. That maintaining all native species and ecological processes is the best kind of biological diversity that we can have.
2. That all native species and ecological processes are more likely to be maintained if managed forests are made to resemble the pre-European contact forests created by fire, wind, insects, disease and burning by aboriginal peoples.
3. That we can find out what the pre-European contact forests looked like.
4. That applying principle number (2) is a good thing.

There is no intrinsic reason why any of principles one to four should be accepted. In fact, each principle can be reasonably questioned. Furthermore, it appears that visions of pre-European contact forests are being used as the goal, even when evidence is available that a different forest structure actually existed in pre-European times. There is also evidence that ancient forest structures underwent significant changes as climate changed. In that case, which pre-European forest structure should be chosen as the politically correct goal?

The landscape units used in this analysis were based on SCI's Resource Planning Units because the MoF landscape units were not fully determined at the time of analysis.

Our task in this report is to try to conform with the MoF interpretation of guidelines laid out in a government book entitled "Forest Practices Code of British Columbia, Biodiversity Guidebook."

The fashion is to specify required forest age class minimum area percentages for the old seral stages. These requirements are given in the biodiversity guidebook according to resource planning unit, natural disturbance type, biogeoclimatic zone, biodiversity emphasis and age.

Natural disturbance type (NDT) classifies a landscape unit according to how frequently forest stands were destroyed and replaced by nature or aboriginal actions prior to European contact. The period between these events represents the stand life-span or rotation. For example, NDT 1 is a label for ecosystems with rare stand initiating events. The guidebook defines rare as equal to a rotation of 250 years for coastal western hemlock (CWH) and Interior cedar/hemlock (ICH) biogeoclimatic zones, and 350 years for the Engelmann spruce/subalpine fir (ESSF) and mountain hemlock (MH) biogeoclimatic zones.

Biodiversity emphasis is a label for the amount of modification allowable by modern society from the hypothetical pre-European state that can occur without increasing the guidebook authors' perceived risk of losing native species. A label of low biodiversity emphasis is seen as being riskier than one of high biodiversity emphasis because the low emphasis allows more modification. More modification usually produces a more diverse range of forest conditions which, according to the guidebook, results in a less diverse range of native species.

Three seral stages are defined in the Biodiversity Guidebook as early, mature and old. The cut-off ages for each stage differ for each natural disturbance type and biogeoclimatic zone. Then, with each seral stage different required minimum percentages are specified by biodiversity emphasis label.

In TFL 1 there are thirteen resource planning/landscape units, four biogeoclimatic zones and two natural disturbance types. Table 4 shows the old growth preservation requirements used in the timber supply analysis.

Figures 5 - 9 show the results for the current landbase, even flow harvest. For each landscape unit there is a graph showing the proportion of old growth in the TFL gross productive forest landbase. Figures 10 - 14 show the same thing for the step down harvest from the current landbase.

These graphs show that, when a landscape unit begins with old growth areas above the minimum requirement, they never fall below it. Two landscape units currently have less old growth than the minimum requirement. The computer model recruits new areas so that both landscape units eventually exceed the minimum old growth requirements.

Figure 5: Even flow harvest, percentages of old seral stages in the current landbase

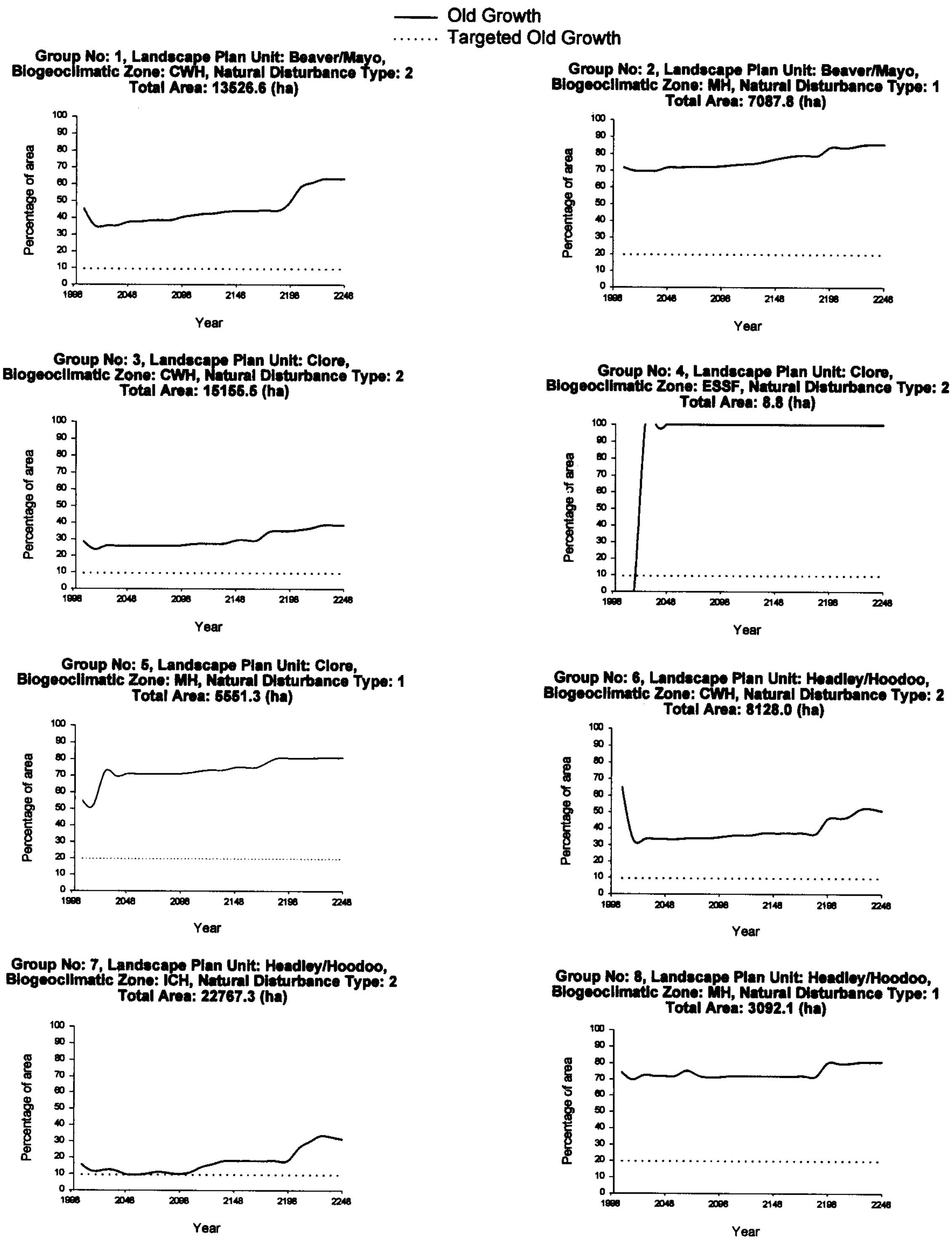


Figure 6: Even flow harvest, percentages of old seral stages in the current landbase

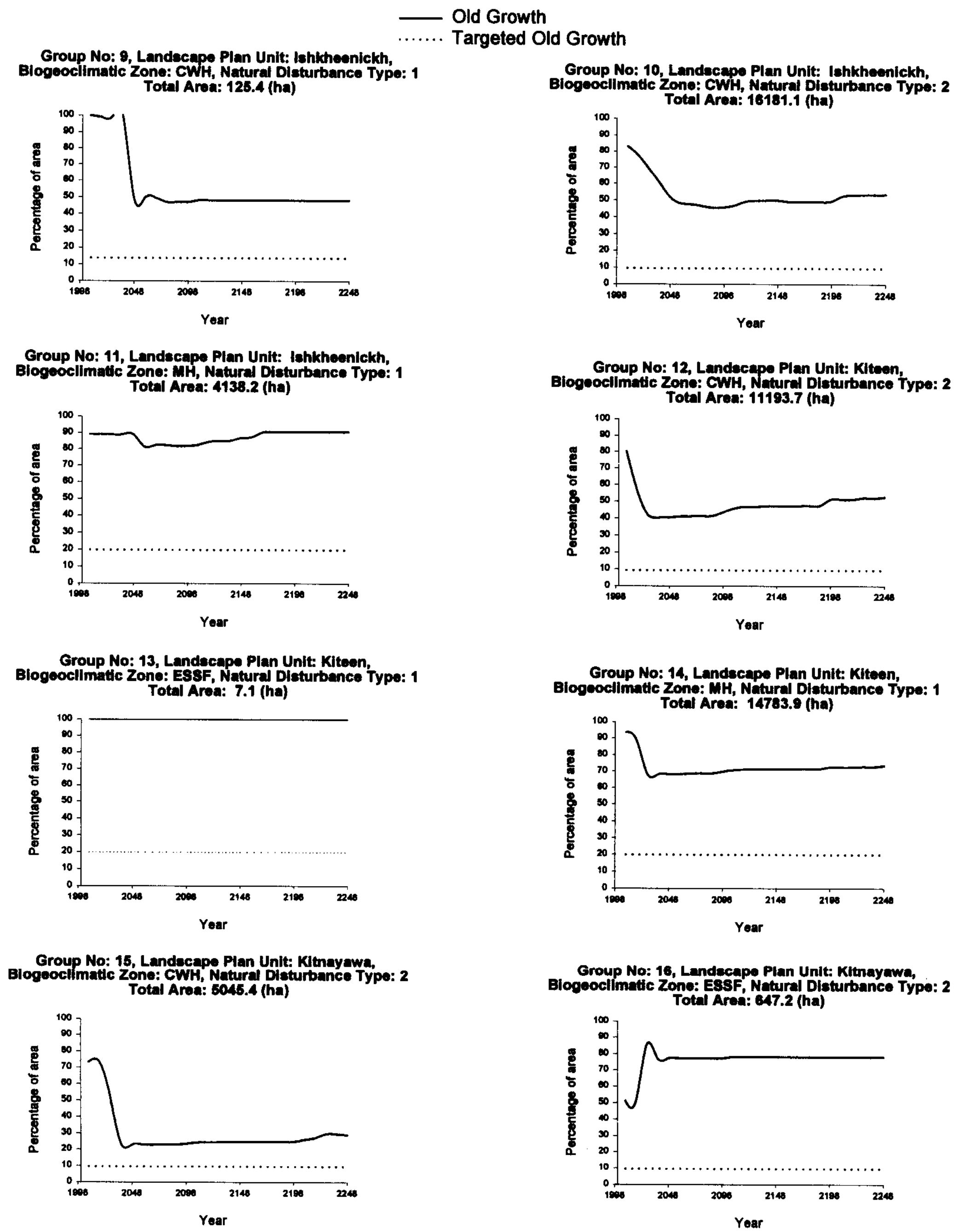


Figure 7: Percentages of old seral stages in the current productive landbase

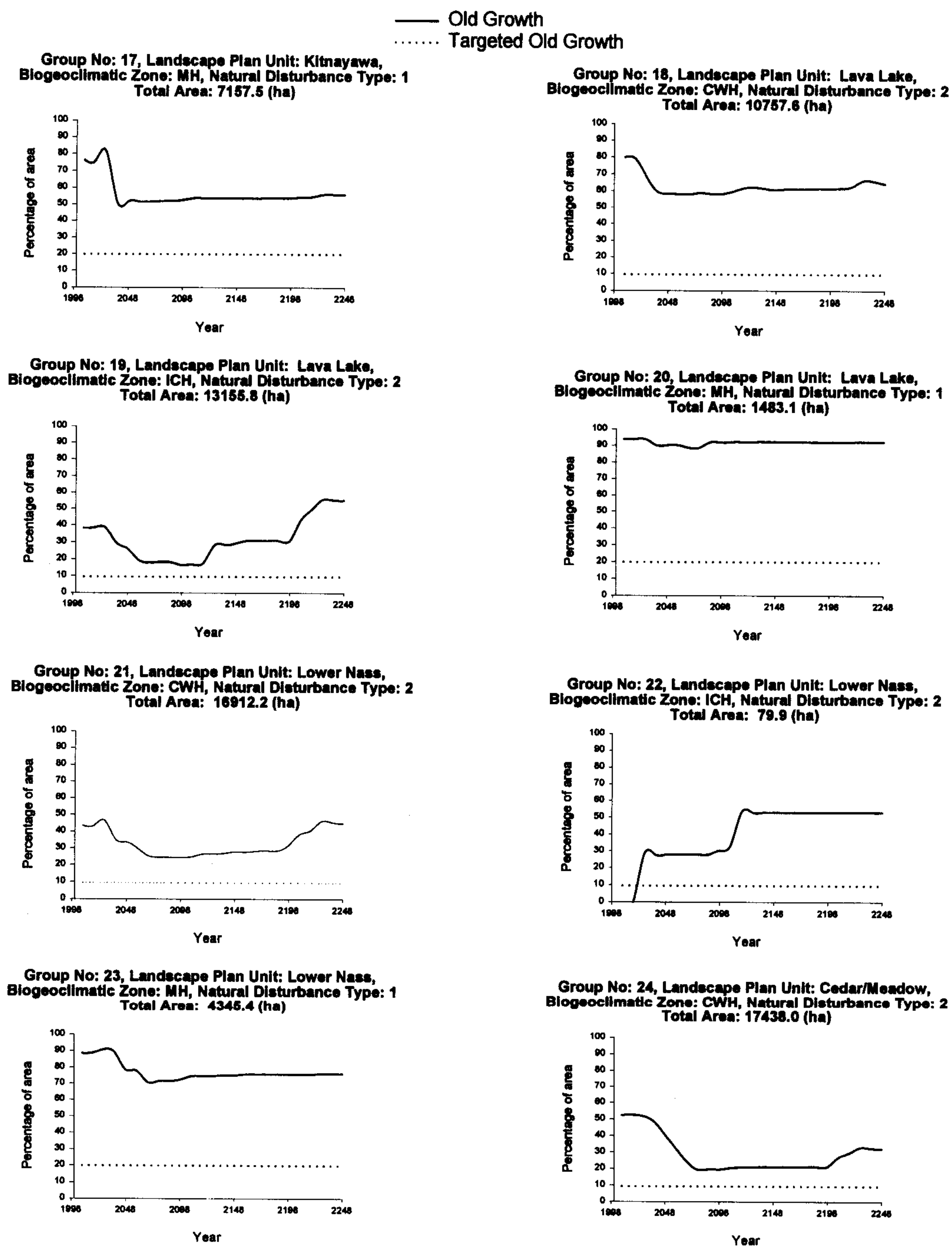
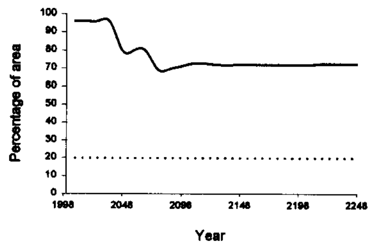


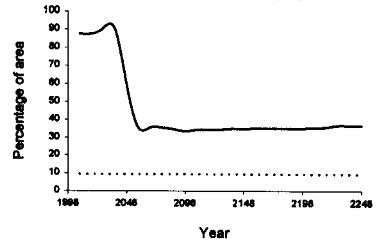
Figure 8: Percentages of old seral stages in the current productive landbase

—— Old Growth
······ Targeted Old Growth

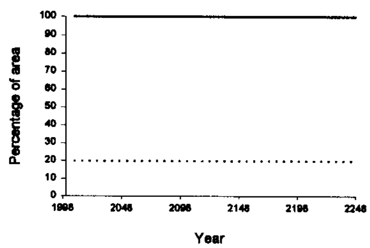
**Group No: 25, Landscape Plan Unit: Cedar/Meadow,
Biogeoclimatic Zone: MH, Natural Disturbance Type: 1
Total Area: 2280.4 (ha)**



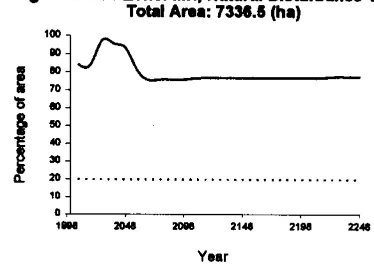
**Group No: 26, Landscape Plan Unit: Nogold,
Biogeoclimatic Zone: CWH, Natural Disturbance Type: 2
Total Area: 15948.0 (ha)**



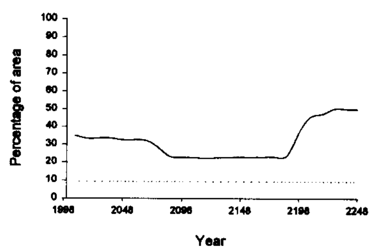
**Group No: 27, Landscape Plan Unit: Nogold,
Biogeoclimatic Zone: ESSF, Natural Disturbance Type: 1
Total Area: 57.8 (ha)**



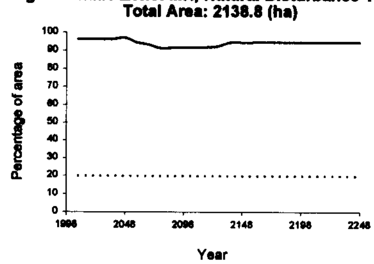
**Group No: 28, Landscape Plan Unit: Nogold,
Biogeoclimatic Zone: MH, Natural Disturbance Type: 1
Total Area: 7336.5 (ha)**



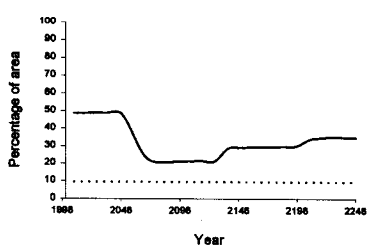
**Group No: 29, Landscape Plan Unit: South Kalum,
Biogeoclimatic Zone: CWH, Natural Disturbance Type: 2
Total Area: 15346.1 (ha)**



**Group No: 30, Landscape Plan Unit: South Kalum,
Biogeoclimatic Zone: MH, Natural Disturbance Type: 1
Total Area: 2138.8 (ha)**



**Group No: 31, Landscape Plan Unit: West Copper,
Biogeoclimatic Zone: CWH, Natural Disturbance Type: 2
Total Area: 13778.6 (ha)**



**Group No: 32, Landscape Plan Unit: West Copper,
Biogeoclimatic Zone: MH, Natural Disturbance Type: 1
Total Area: 3825.8 (ha)**

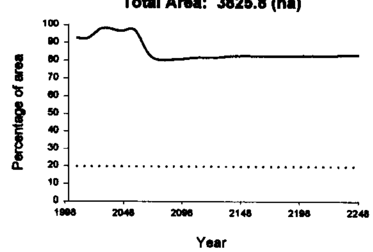
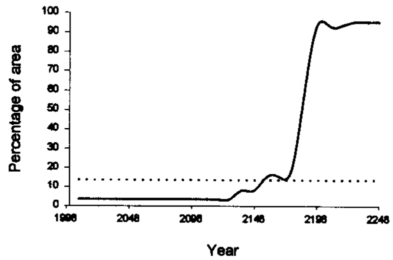


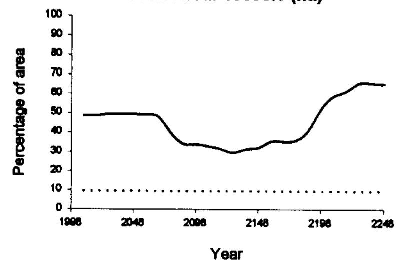
Figure 9: Percentages of old seral stages in the current productive landbase

—— Old Growth
······· Targeted Old Growth

Group No: 33, Landscape Plan Unit: Whitebottom/Dane, Biogeoclimatic Zone: CWH, Natural Disturbance Type: 1 Total Area: 598.9 (ha)



Group No: 34, Landscape Plan Unit: Whitebottom/Dane, Biogeoclimatic Zone: CWH, Natural Disturbance Type: 2 Total Area: 10696.0 (ha)



Group No: 35, Landscape Plan Unit: Whitebottom/Dane, Biogeoclimatic Zone: MH, Natural Disturbance Type: 1 Total Area: 1482.1 (ha)

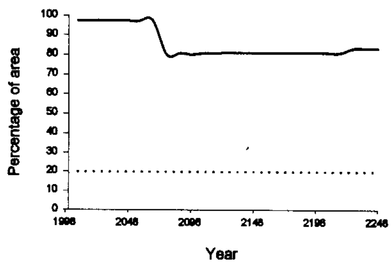


Figure 10: Percentages of old seral stages in the current productive landbase

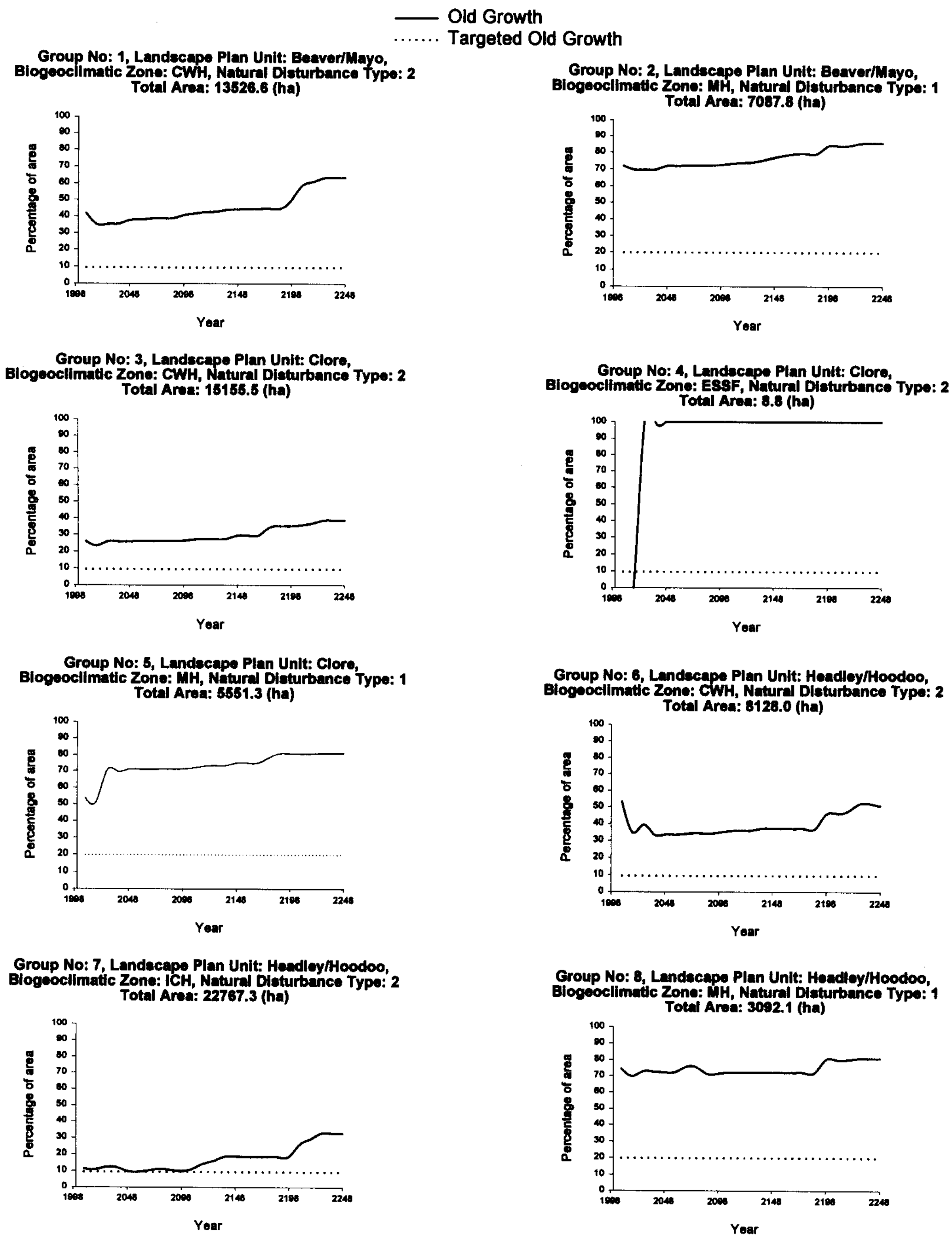


Figure 11: Percentages of old seral stages and mature plus old seral stages in the current productive landbase

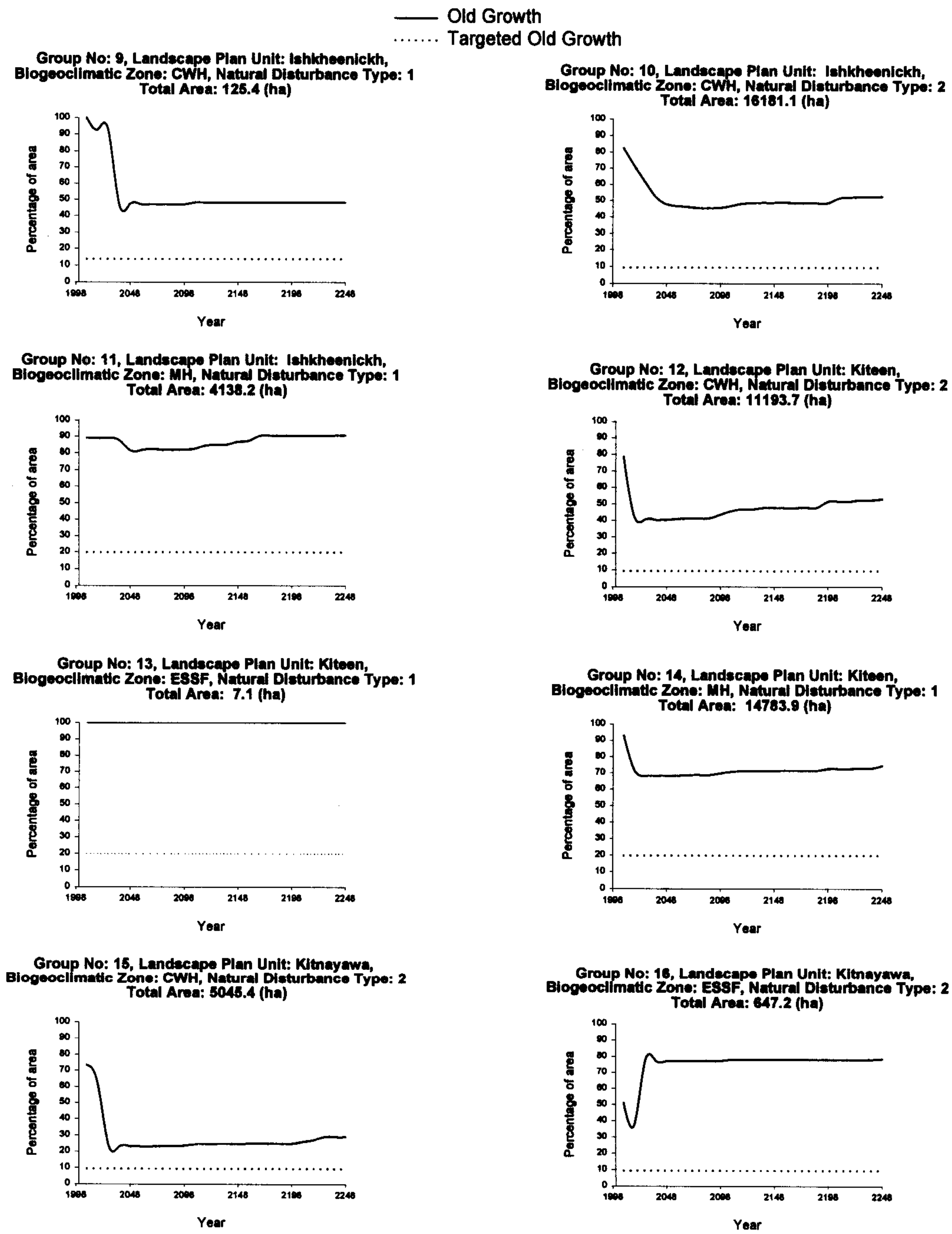


Figure 12: Percentages of old seral stages in the current productive landbase

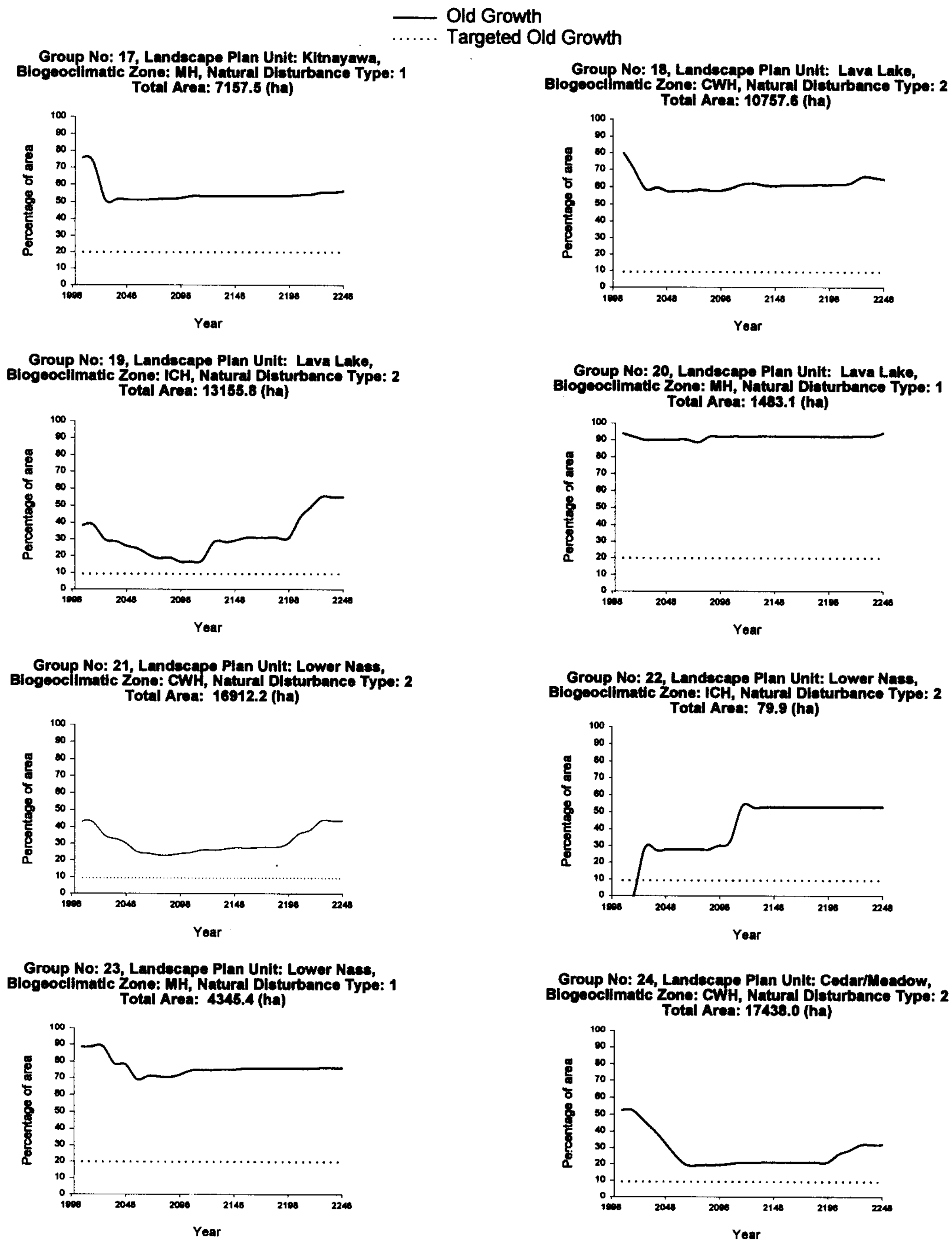


Figure 13: Percentages of old seral stages in the current productive landbase

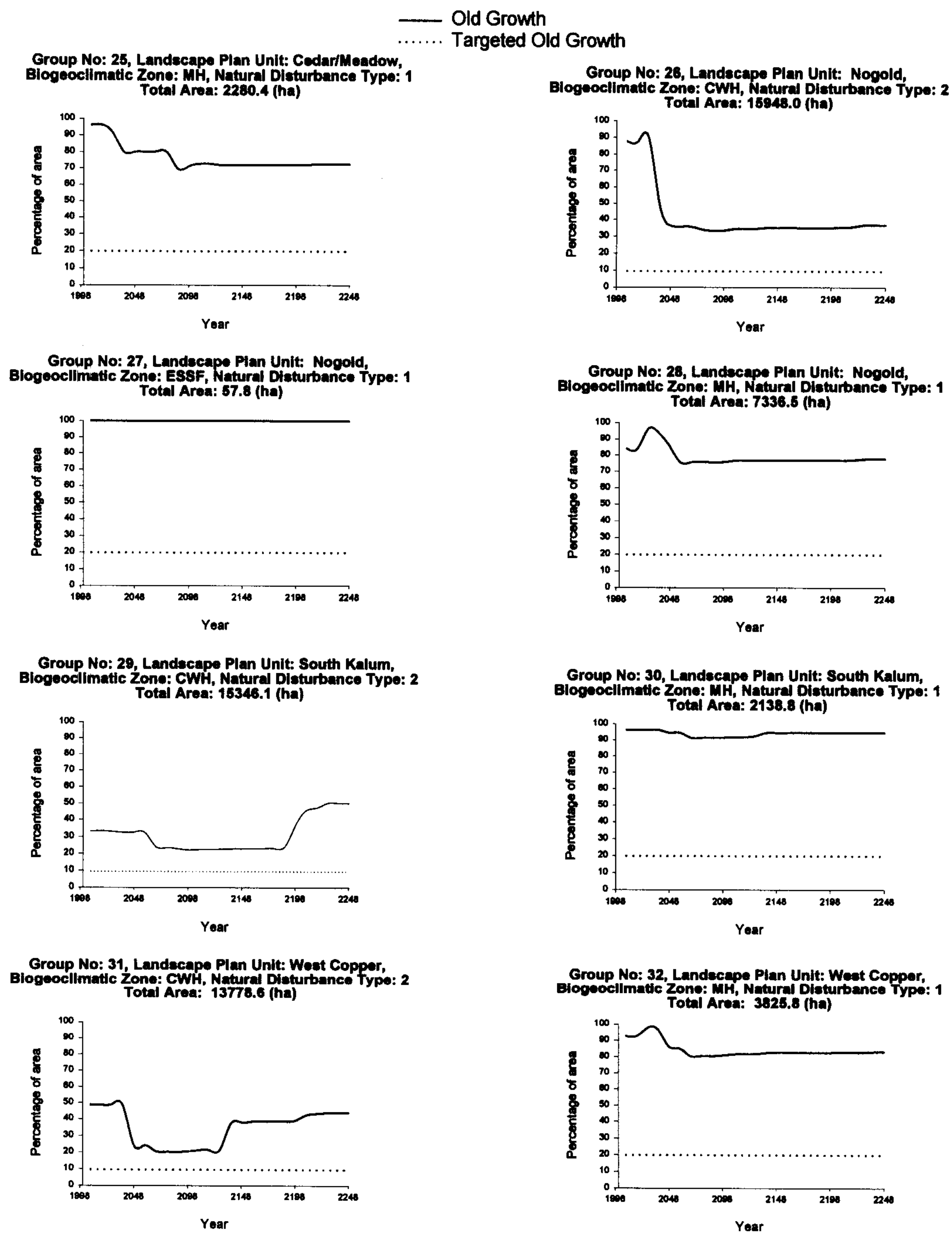
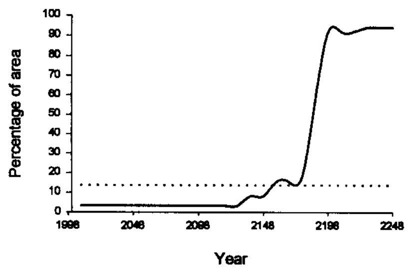


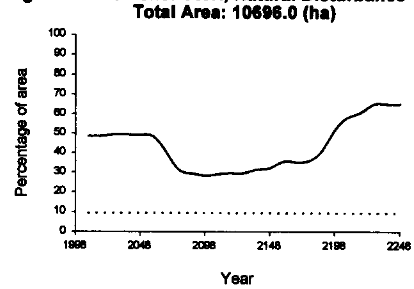
Figure 14: Percentages of old seral stages in the current productive landbase

—— Old Growth
······· Targeted Old Growth

Group No: 33, Landscape Plan Unit: Whitebottom/Dane, Biogeoclimatic Zone: CWH, Natural Disturbance Type: 1 Total Area: 598.9 (ha)



Group No: 34, Landscape Plan Unit: Whitebottom/Dane, Biogeoclimatic Zone: CWH, Natural Disturbance Type: 2 Total Area: 10696.0 (ha)



Group No: 35, Landscape Plan Unit: Whitebottom/Dane, Biogeoclimatic Zone: MH, Natural Disturbance Type: 1 Total Area: 1482.1 (ha)

Green-up Constraints

In the computer model, green-up and adjacency constraints are modelled as follows:

1. a green-up period after logging is defined during which time the new replacement stands are expected to reach a specified height.

2. a maximum allowable area is defined for replacement stands which are below the green-up height specified in (1) above.

The allowable area, expressed as a percentage, implies a specific multipass logging system. The green up period is the time between passes. A green-up period of 15 years with a four pass logging system implies a 60 year period in which to harvest presently mature timber.

Maximum age or green-up constraints were first expressed in terms of the net landbase and then equivalent constraints were calculated for and applied to the gross productive landbase. The maximum age cover constraints and equivalent green-up heights are shown in table 7.

Table 7. Area Percentage for Green-up

GROUP NO	SWG MGMT ZONE	VQO	Green-up Height (meters)	Productive Landbase Green-up Area %	Current Landbase Green-up Area %
36	Enhance		3	34	25
37	General		3	35	17
38	Riparian		5	24	10
39	Visual	P	5	15	9
40	Visual	PR	5	15	9
41	Visual	R	5	5	3
42	Wildlife		5	25	7

Figure 15 shows the actual compared with the maximum allowable areas less than green-up age produced by the computer model during the even flow harvest run for the current landbase. Figure 16 shows the same information for the stepdown harvest. In figures 15 and 16, the dotted line in each graph shows the maximum allowable percentage for each area. The solid line in each graph shows the actual area in the computer model. The maximum allowable area can only be exceeded if the initial area happens to be above that allowed in the future. In figures 15 and 16 logging in five of the areas produces the maximum allowable area below green-up age. These zones contain uncut merchantable timber which is not available due to cover constraints. In the enhanced and general management zones logging does not produce the maximum allowable area below green-up. These latter two zones have long periods where all the merchantable timber has been harvested by the computer model, but there is not enough merchantable timber available to harvest up to the maximum allowed by the cover constraints.

Figure 15: Percentages of below green-up age areas for even flow harvest

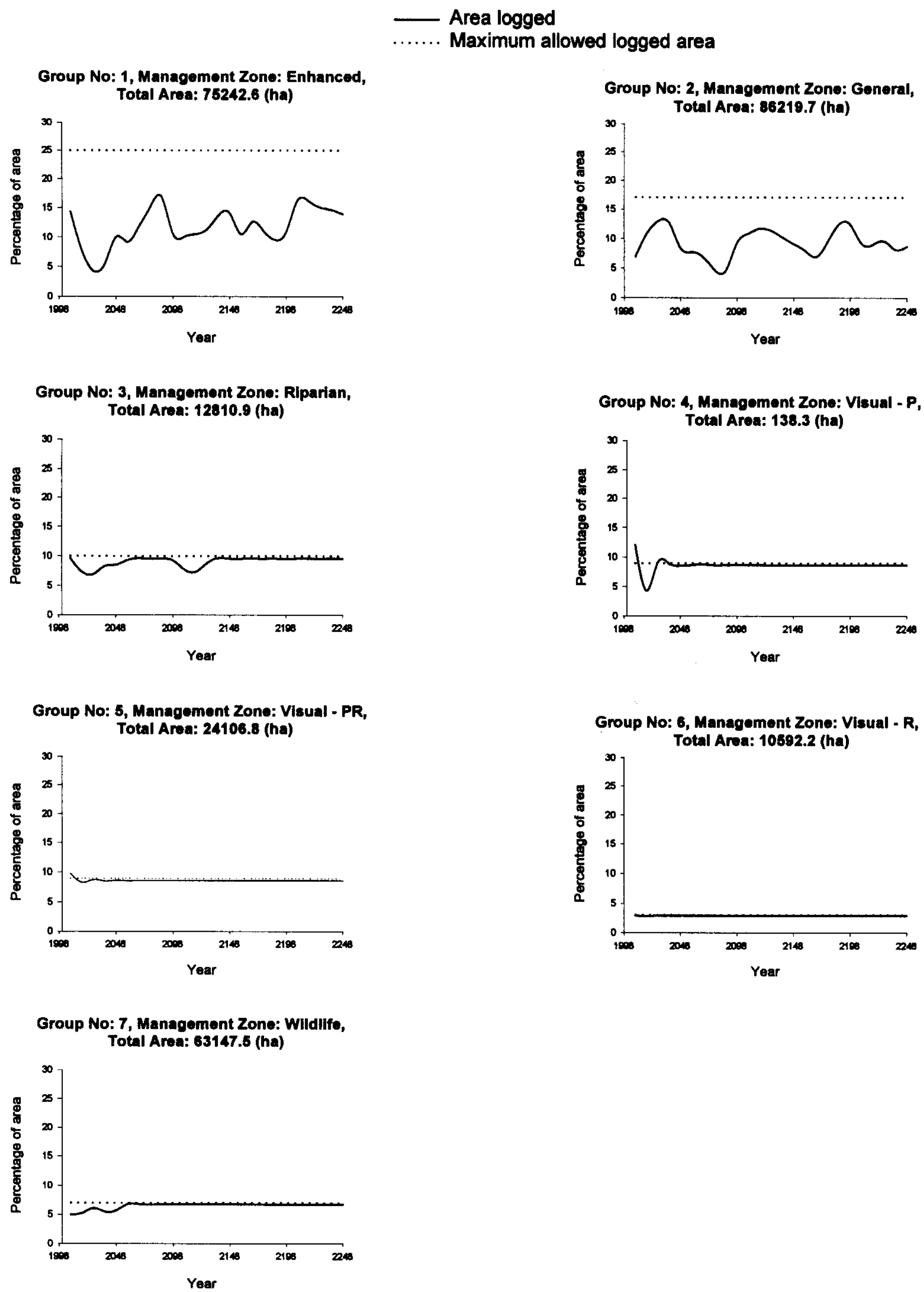
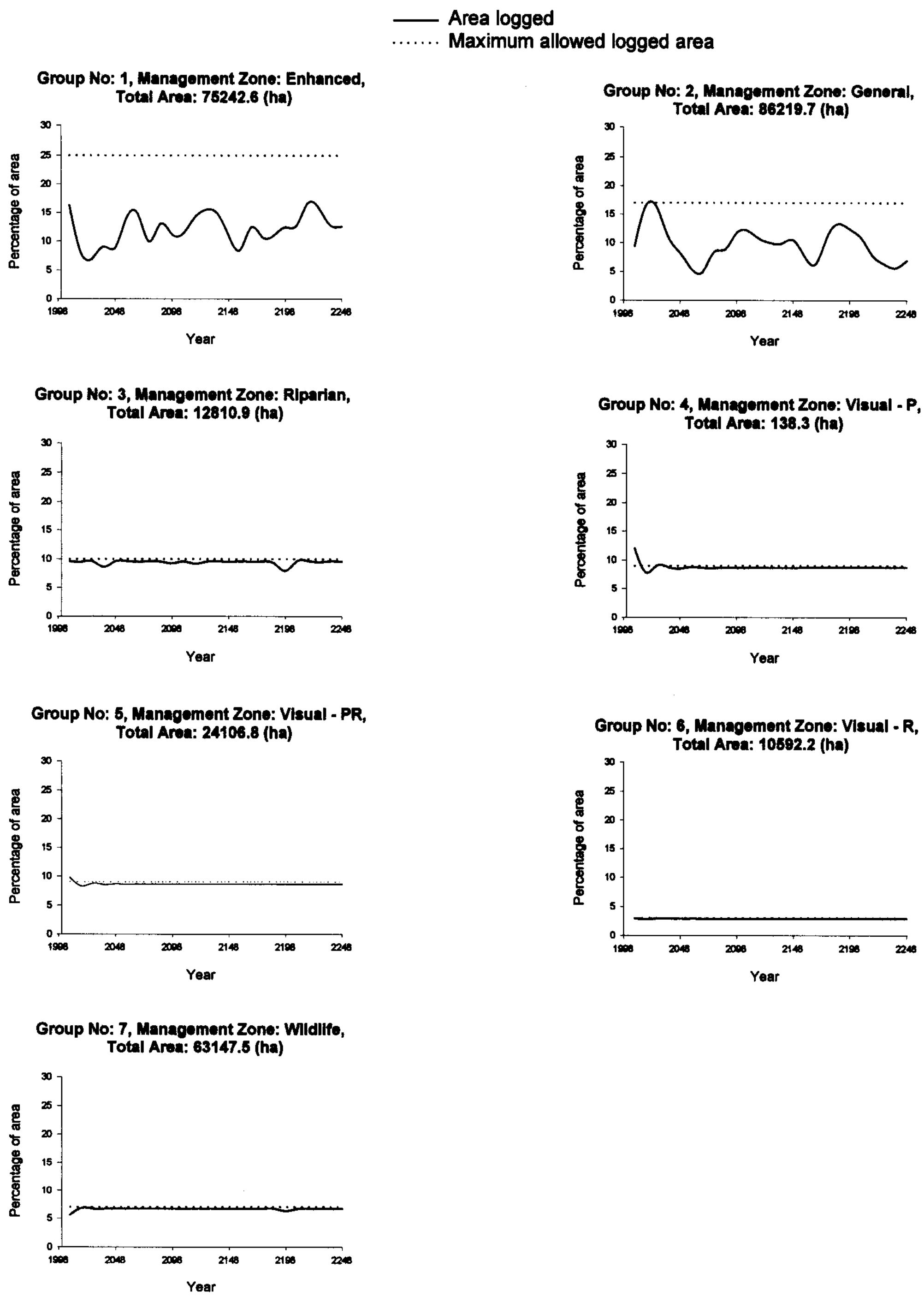


Figure 16: Percentages of below green-up age areas for step down harvest



SENSITIVITY ANALYSES

Sensitivity analyses were carried out on the gross productive and current landbases. Sensitivity analysis is a way to see how sensitive the harvest schedule is to assumptions about landbase, forest yield and other assumptions which affect the projected harvest levels.

Table 8 below summarizes the sensitivity analysis results done for even flow harvest schedules.

Table 9 summarizes sensitivity analyses done for step down harvest schedules.

Table 8: Current landbase even flow sensitivity analysis results
(net non-recoverable losses)

Description	Even flow harvest m3/year	% difference from base run
Base case	540,788	
Yield Tables		
Existing Stand Volume + 20 %	595,948	10.2
Existing Stand Volume + 10 %	569,402	5.3
Existing Stand Volume - 10 %	527,650	-2.4
Regenerated Stand Volume + 10 %	556,335	2.9
Regenerated Stand Volume - 10 %	465,660	-13.9
Cover Constraints		
Old Growth Seral Stage Area + 10 %	543,807	0.5
Old Growth Seral Stage Area - 10 %	543,043	0.4
Green-up Area + 10 %	553,978	2.4
Green-up Area - 10 %	534,314	-1.2
Green-up Heights + 2 meters	523,799	3.14
Green-up Heights - 2 meters	567,434	4.9
No Cover Constraints	587,146	8.6
No Visual Zone	562,101	3.9
Minimum Harvest Age		
Minimum Harvest Age + 10 years	542,700	-0.3
Minimum Harvest Age - 10 years	543,004	-0.4
Landbase		
Current Landbase Increased by 10 %	592,083	9.5
Current Landbase Decreased by 10 %	496,637	-8.2
No Wildlife Tree Patches	585,307	8.2
Gross Productive (GP) Landbase	956,402	76.9
No Cover Constraint GP Landbase	1,058,897	95.8
Old Growth Site Index		
SI Adjusted only for AU 4,5,17,19	470,445	-13.0

Table 8 shows that the even flow harvest on the current landbase is most sensitive to:

- changes in existing stand volume estimates,
- changes to the landbase,
- changes to green-up and adjacency constraints.

It is important to understand that the results in table 8 show that the cover constraints reduce the even flow harvest by 8.6% on the current landbase. A previous computer model run on the gross landbase showed an 11% reduction due to cover constraints.

Step Down Sensitivity Analysis

Several sensitivity analyses were run using 'step down' harvest schedules instead of even flow schedules. Table 9 shows the results.

Table 9: Current Landbase step down sensitivity analysis results
(net non-recoverable losses)

Description	First 20 Years	Average for 20 - 100 Years	Average for 100 - 250 Years
Base case	720,000	546,482	522,371
Existing volumes +20%	720,000	598,646	564,387
Regenerated volumes -20%	720,000	469,696	442,681
No visual zone	720,000	590,496	523,660
SI adjusted for AU's 4, 5, 17, 19	720,000	495,647	446,356

Table 10 shows the harvest by decade for each result in table 9.

Table 10: Decadal harvests for each result shown in table 9

Decade	Base Case	Existing Vols +20%	Regen Vols -20%	No visual	SI adjusted AU's 4, 5, 17, 19
1	720,000	720,000	720,000	720,000	720,000
2	720,000	720,000	720,000	720,000	720,000
3	647,550	647,550	643,050	647,550	647,550
4	582,345	647,550	577,845	582,345	582,345
5	523,660	582,345	519,160	582,345	523,660
6	523,660	582,345	466,344	582,345	470,844
7	523,660	582,345	418,809	582,345	470,844
8	523,660	582,345	418,809	582,345	423,310
9	523,660	582,345	376,028	582,345	423,310
10	523,660	582,345	337,525	582,345	423,310
11	523,660	582,345	337,525	523,660	423,310
12	523,660	582,345	363,822	523,660	423,310
13	523,660	582,345	584,450	523,660	423,310
14	523,660	582,345	623,050	523,660	423,310
15	523,660	582,345	643,050	523,660	423,310
16	513,660	582,345	643,050	523,660	423,310
17	513,660	582,345	643,050	523,660	423,310
18	510,888	582,345	643,050	523,660	423,310
19	521,845	552,345	643,050	523,660	523,660
20	529,199	552,345	376,028	523,660	523,660
21	539,199	532,345	376,028	523,660	470,844
22	539,199	523,660	376,028	523,660	470,844
23	523,660	523,660	356,028	523,660	423,310
24	513,660	523,660	337,525	523,660	423,310
25	512,294	550,352	352,343	523,660	473,227

Figures 17 and 18 graph the results shown in table 10.

Figure 17: Step down sensitivity runs for basecase and no visual zone

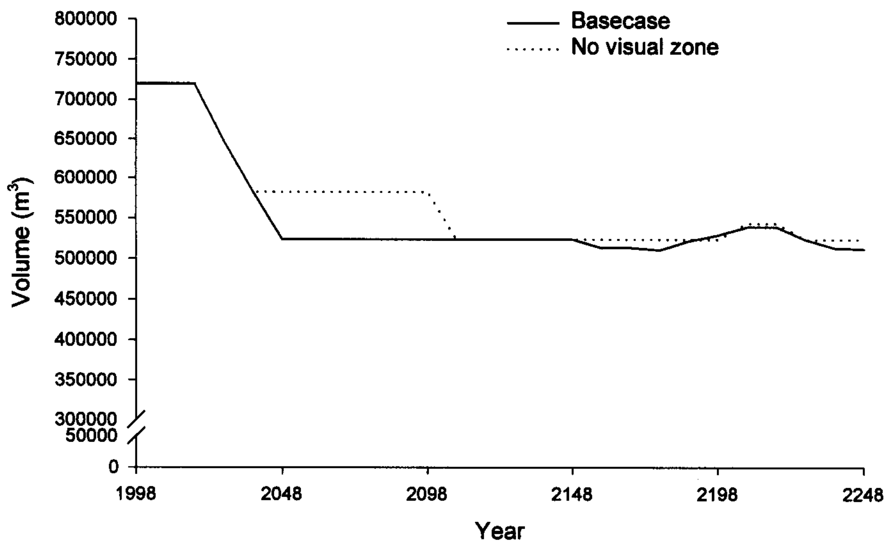
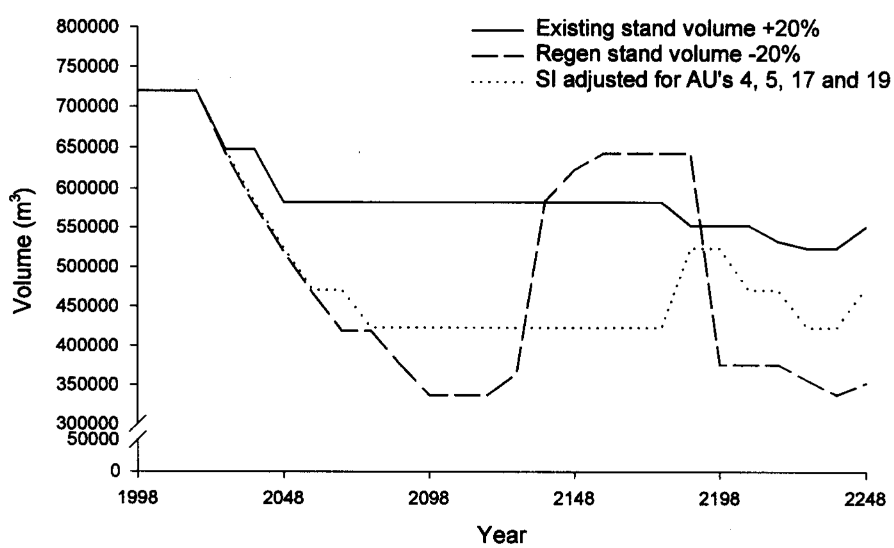


Figure 18: Step down sensitivity runs for existing stand volume + 20%, regen volume - 20%, and SI adjusted for AU's 4, 5, 17 and 19



NISGA'A LAND CLAIM

A significant portion of TFL 1 has been subject to land claim negotiations between the Nisga'a, British Columbia and Canada. An Agreement-in-Principle (AIP) was signed by the three parties February 15, 1996. The AIP formed the basis upon which a final treaty has been negotiated. The final treaty was initialed by the three parties August 4, 1998. Upon ratification, the treaty will come to being.

The treaty area encompasses 193,000 ha. Of this, 87,000 ha lies within the boundaries of TFL 1 and contains 51,000 ha of productive forest land. The area impacted by the treaty extends from the Ishkheenickh in the south to the Hoodoo mainline in the north and from the Nass River in the west to a negotiated boundary in the east.

The final treaty provides for a five year transition period beginning once it is ratified. During this period, jurisdiction over the treaty lands is passed from the provincial government to the Nisga'a. Skeena Cellulose Inc. will still be responsible to carry out forest management activities including road construction, timber harvesting, and silviculture. Initially, these activities will be subject to provincial legislation, however this will change as the final treaty is implemented.

To determine the impact of the treaty on TFL 1, SCI had to calculate the long term productivity of the land. The company did so by identifying the gross productive landbase and assigning accurate site indices.

Site index was calculated for each analysis unit. For this process, the true productivity of the total land base could not be measured until all the overmature polygons had been harvested and replaced with vibrant, second growth stands. The recently approved process to determine site index was applied to hemlock leading stands in the CWH. For other stands in the ICH zone, interim site index adjustments developed by the MoF were applied. For the 6,200 hectares of cottonwood leading stands in the Nass lowlands, the results of a 1990 Reid Collins report 'Black Cottonwood: Yield and Volume in Natural Forests in the Skeena Valley, BC' were adapted.

Using these processes the maximum potential fibre productivity for the treaty lands was estimated to be 282,000 cubic metres per year, an average of 5.5 cubic metres per hectare per year.

ADDITIONAL RESULTS

This section displays additional results, from the timber supply analysis, base run even flow harvests for the current landbase. The figures presented are:

Figure 19: Average rotation age over time.
Figure 20: Distribution of rotation ages over time.
Figure 21: Area harvested over time.
Figure 22: Volume per hectare harvested over time.

Figure 19: Average rotation age over time
Harvested Average Age Per Decade in the Current
Landbase of TFL 1

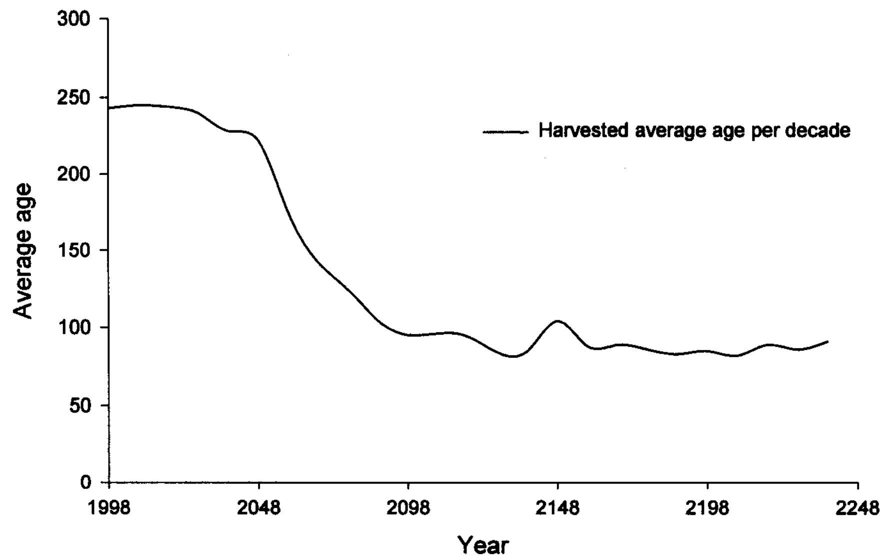
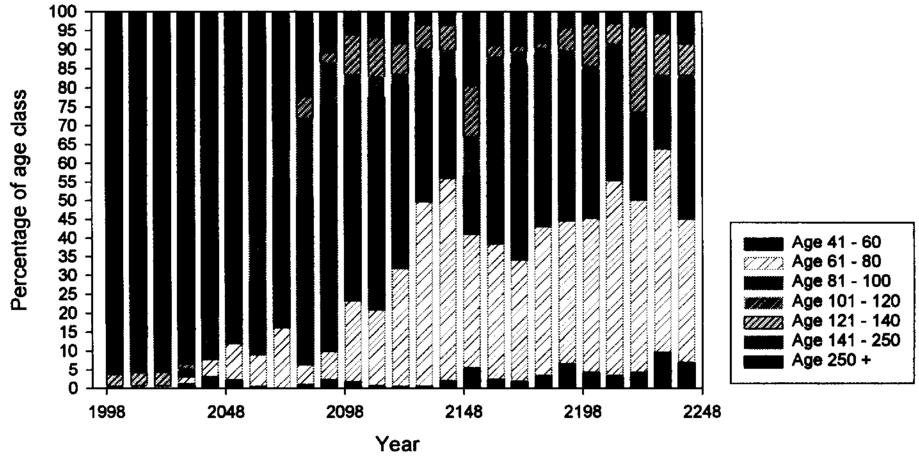


Figure 20: Distribution of Rotation ages over time
Harvested Age Class Distribution by Decade
in the Current Landbase of TFL 1



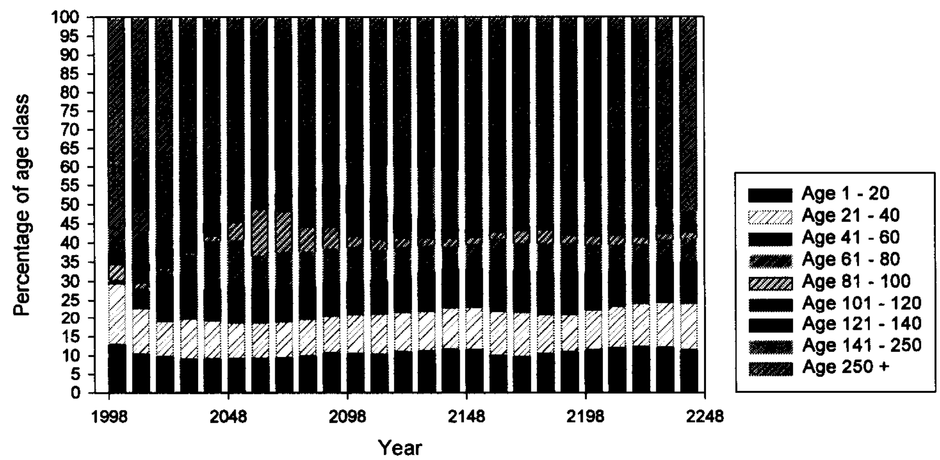


Figure 21: Area harvested over time
Total Harvested Area Per Decade in the
Current Landbase of TFL 1

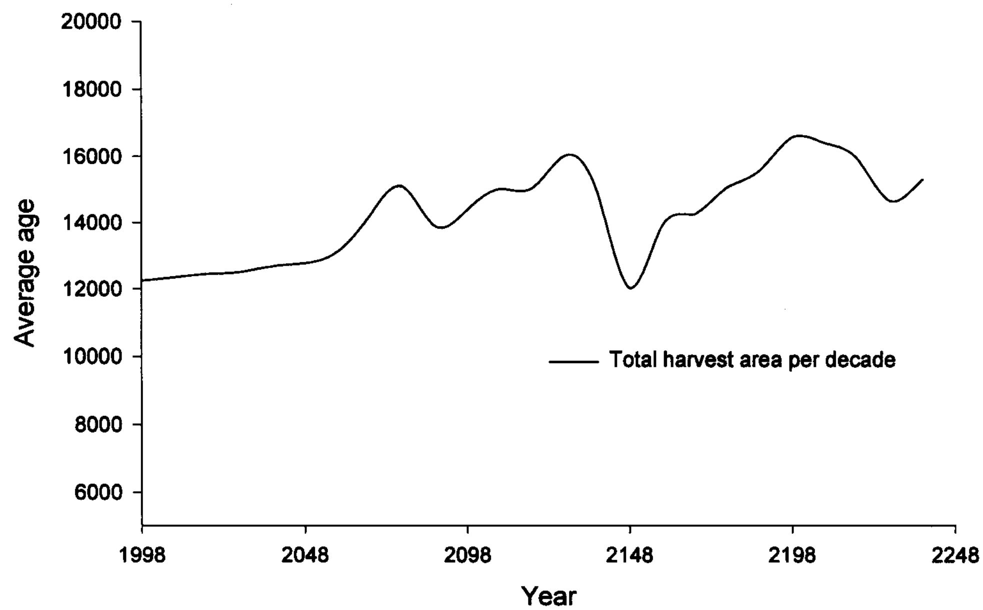
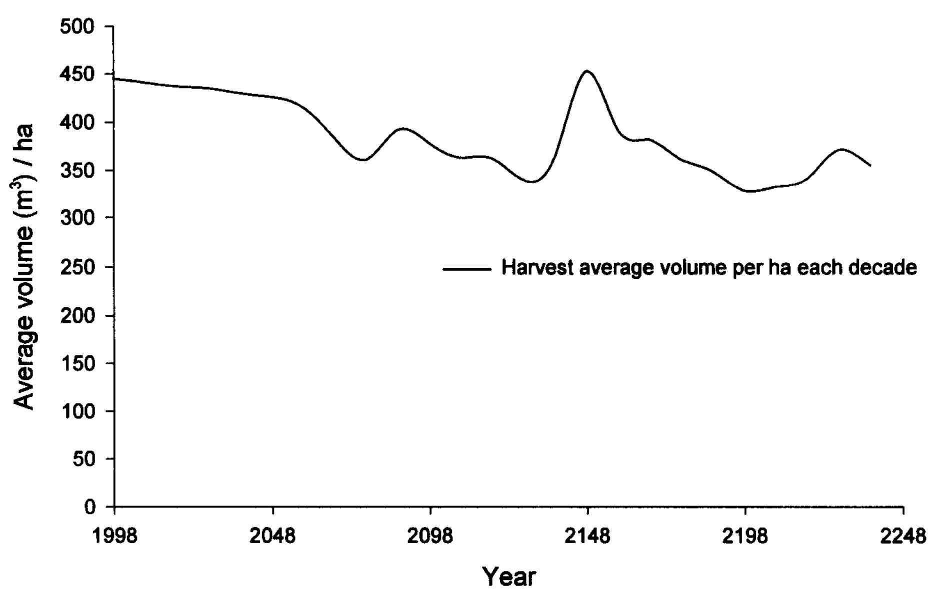


Figure 22: Volume per hectare harvested over time
Harvested Average Volume Per Ha Each Decade
in the Current Landbase of TFL 1



SUMMARY

This analysis shows the biological potential wood fibre harvest from TFL 1 is about 1,000,000 cubic metres per year, from the gross productive forest area. After landbase netdowns the current net timber harvesting landbase is reduced to one half the productive forest area. The even flow harvest from the net timber harvesting landbase is about 541,000 cubic metres.

On the net timber harvesting landbase, the current AAC of 720,000 cubic metres can be maintained for 20 years before stepping down to long run levels. For the base case the long run level is about 522,000 cubic metres per year. A harvest level of about 590,000 cubic metres per year can be maintained from 20 -100 years from now if visual zone cover constraints are relaxed to equal general zone constraints. In this case, the long run harvest level after 100 years is about 524,000 cubic metres.

All these results depend on old growth site index adjustments for most analysis units. When old growth site index adjustments are made for the CWH biogeoclimatic zone only, the long run harvest level drops to about 446,000 cubic metres, from 720,000 cubic metres in the first two decades.

In every stepdown schedule and sensitivity run, the present AAC level of 720,000 cubic metres can be maintained for 20 years. This agrees with the approved TFL 1 20 year plan. The recommended harvest level for TFL 1 in the next five year period is 720,000 cubic metres per year.