ENIYUD COMMUNITY FOREST
TIMBER SUPPLY ANALYSIS

PROPOSED BOUNDARY
WILLIAMS LAKE TSA

Prepared for:

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Reference: BC 0407 502

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January 18, 2008

BC0407502

Attention: Phil Theriault

Reference: *Eniyud Community Forest Analysis of Proposed Boundary*

Please accept this report for the proposed Eniyud Community Forest Timber Supply Analysis. Please call if you have any questions of comments related to the document or any other aspect of the analysis.

Yours truly,
TIMBERLINE NATURAL RESOURCE GROUP LTD.

Kelly Sherman, R.P.F
Resource Analyst

EXECUTIVE SUMMARY

The Ministry of Forests and Range has invited the Alexis Creek Indian Band and the Tatla Resource Association to jointly apply for a Probationary Community Forest Agreement for up to 40,000 cubic meters of allowable annual cut. Tsi Del Del Enterprises Ltd. has contracted Timberline Natural Resource Group Ltd. to carry out a timber supply analysis on the proposed Community Forest. In parallel Timberline carried out an analysis for the Southern Interior Forest Region to determine if the community forest boundary is reasonable to support an annual harvest of 40,000m^3. The main difference in this analysis is that the land base objectives used are the retention percentages determined in the West Chilcoltin Demonstration Project (2004), whereas the Southern Interior Forest Region analysis used Timber Supply Review assumptions.

The analysis procedure involves:

1. Reviewing analysis assumptions to assess what applies to the proposed community forest;
2. Acquiring applicable datasets:
    a. Vegetation Resource Inventory,
    b. Timber Harvest Landbase coverage,
    c. Western Chilcoltin Demonstration retention zones
    d. BEC coverage, and
    e. Proposed boundary.
3. Building analysis files and establishing a base case analysis scenario;
4. Running sensitivity analysis.

Table 1 shows that the total area of the community forest is 115,070 ha of which 89,449 ha is considered productive land base, of which 44,048 ha belongs to the timber harvest land base.

Table 1: Area Summary for Williams Lake TSA and the proposed community forest

	Gross Area (ha)	Productive Area (ha)	THLB (ha)
William Lake TSA	4,904,558	3,145,826	2,096,251
Proposed CF	115,070	89,449	44,048
% of TSA	2.30%	2.80%	2.10%

The harvest level offered by the Minister of Forest and Range is 40,000 m³/year. The proposed community forest area is able to maintain the harvest level of 40,000 m³/year for 140 years before stepping down to a long term harvest level of 23,000 m³/year. Figure 1 shows the harvest level and growing stock throughout a 250 year planning horizon.

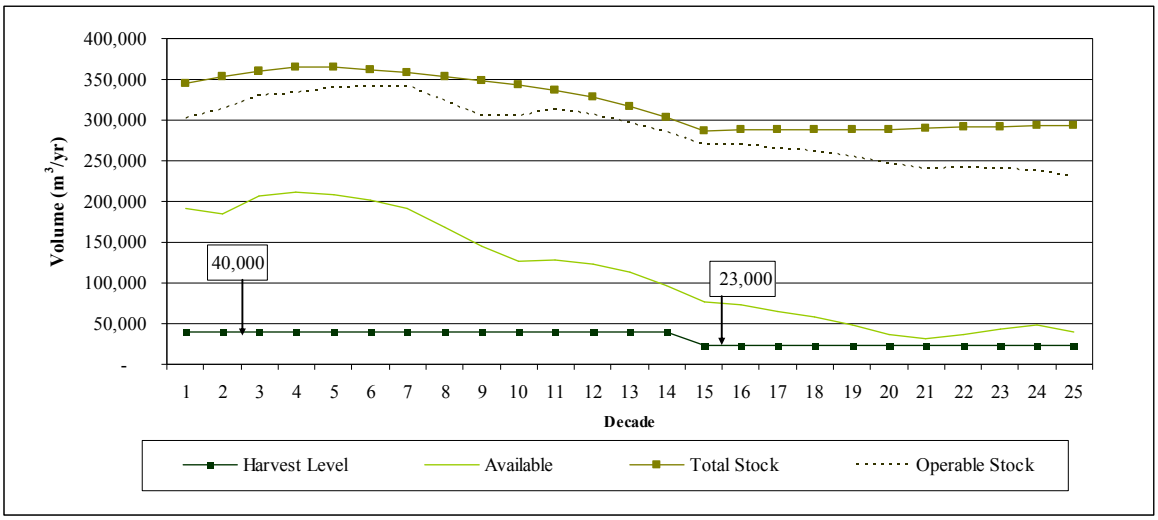

Figure 1: Base case harvest level, total stock, operable stock and available stock

An analysis scenario was run to test the impact of the mountain pine beetle on all lodgepole pine leading stands and the lodgepole pine component of other (mixed species) stands (for more detail see section 7.2). The analysis showed the community forest would have a harvest level of 8,000 m³/year beginning 10 years from now and then in 80 years the harvest level could step up to 41,000 m³/year (Figure 2).

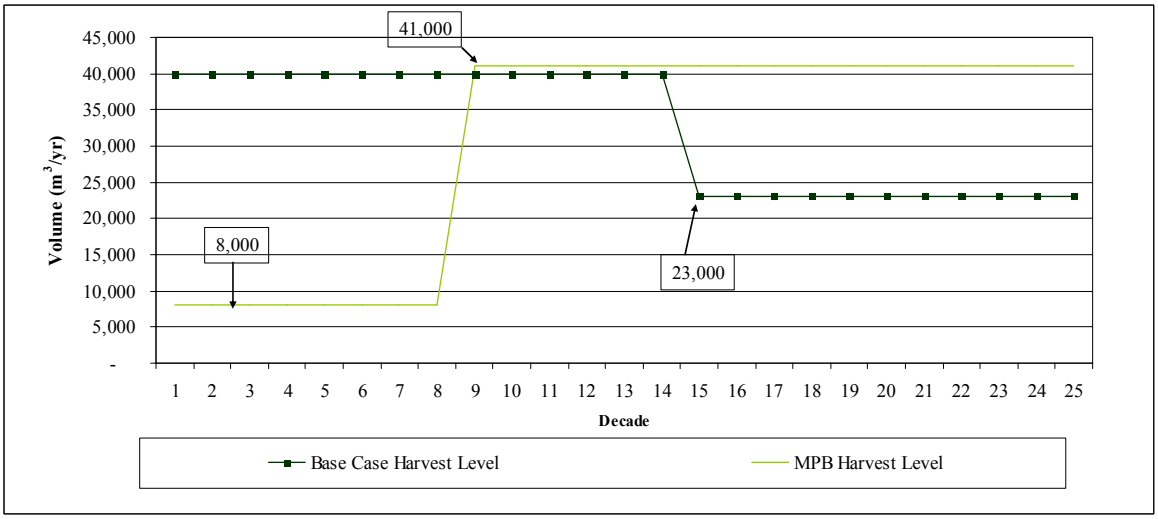

Figure 2: Mountain pine beetle modeled harvest levels

Sensitivity analysis provides a measure of the upper and lower bounds of the base case harvest forecast and reflects the uncertainty of assumptions made in the base case. Sensitivities were carried out to test the impact of changing the natural stand yield tables ± 10 % and by turning off the management policies. Figure 3 shows the impact on timber supply when the management policies are turned off.

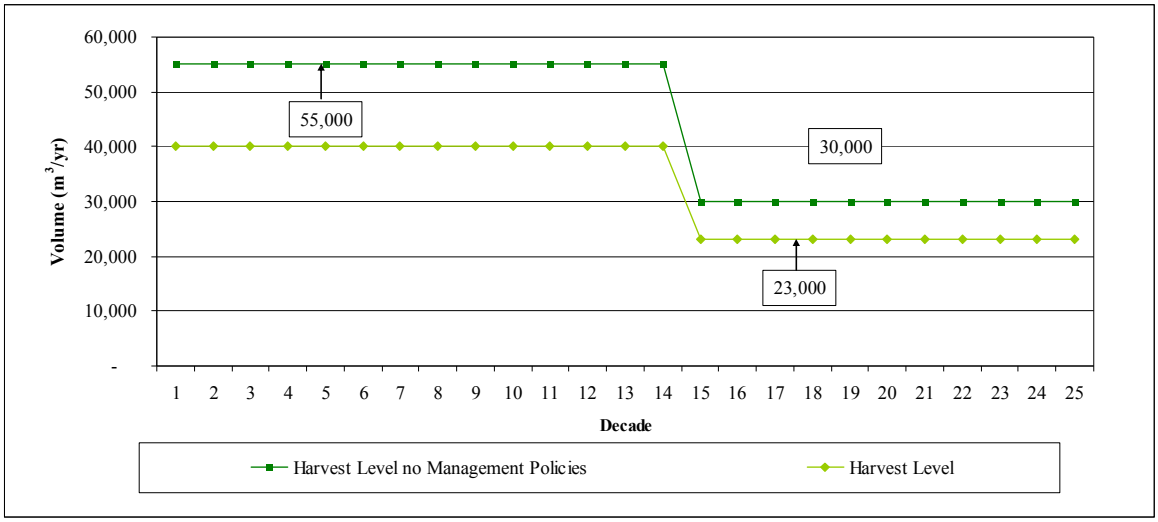

Figure 3: Harvest levels with management policies turned off

The proposed boundary appears to be of a reasonable size and timber composition to support a community forest with an annual harvest of 40,000m³/year. The greatest risk to the community forest is that it is likely to be heavily impacted by the mountain pine beetle.

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1.0 INTRODUCTION

The Ministry of Forests and Range (MOFR) has invited the Alexis Creek Indian Band and the Tatla Resource Association to jointly apply for a Probationary Community Forest Agreement (PCFA). The PCFA invitation is for an allowable annual cut (AAC) of up to 40,000 m^3. The two organizations have named their proposed community forest the Eniyud Community Forest.

Tsi Del Del Enterprises Ltd. (Tsi Del Del) has contracted Timberline Natural Resource Group Ltd. (Timberline) to carry out a timber supply analysis for the proposed community forest (CF). In parallel Timberline carried out an analysis for the Southern Interior Forest Region (SIFR) to determine if the CF boundary is reasonable to support an annual harvest of 40,000m^3. The main difference in this analysis is that the land base objectives are the retention percentages determined in the West Chilcoltin Demonstration Project (2004), whereas the SIFR analysis used Timber Supply Review 2 (TSR 2) assumptions.

The analysis procedure involves:

1. Reviewing analysis assumptions to assess what applies to the proposed CF;
2. Acquiring applicable datasets:
    a. Vegetation Resource Inventory,
    b. THLB (Timber Harvesting Land Base) coverage,
    c. Visual Coverage,
    d. MDWR coverage,
    e. BEC coverage, and
    f. Proposed boundary.
3. Building analysis files and establishing a base case analysis scenario;
4. Running sensitivity analysis.

This report includes a brief analysis report similar to that of a TSR and contains further information in Appendix A.

2.0 GENERAL DESCRIPTION OF PROPOSED AREA

The proposed Eniyud CF falls entirely within the Williams Lake Timber Supply Area (TSA) and is administered by the Williams Lake Forest District. Figure 2.1 shows a map of the Williams Lake TSA, while Figure 2.2 displays the proposed CF.

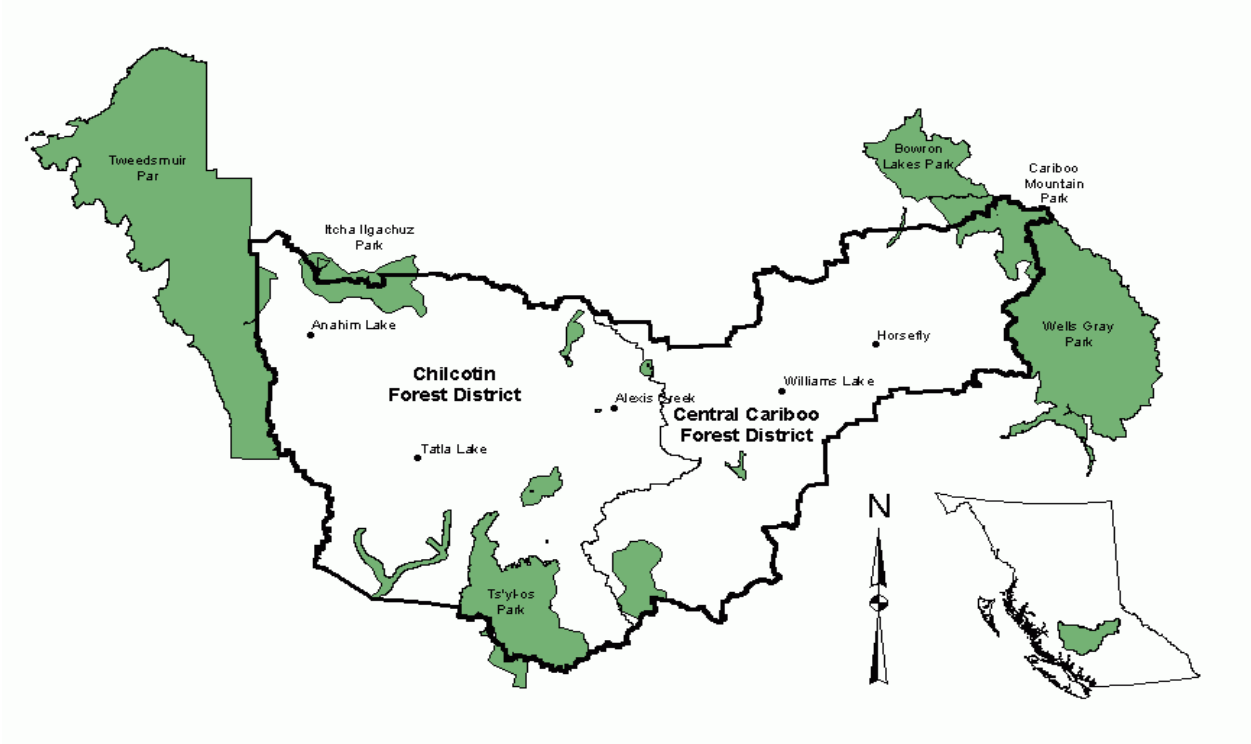

Figure 2.1: Map of Williams Lake TSA

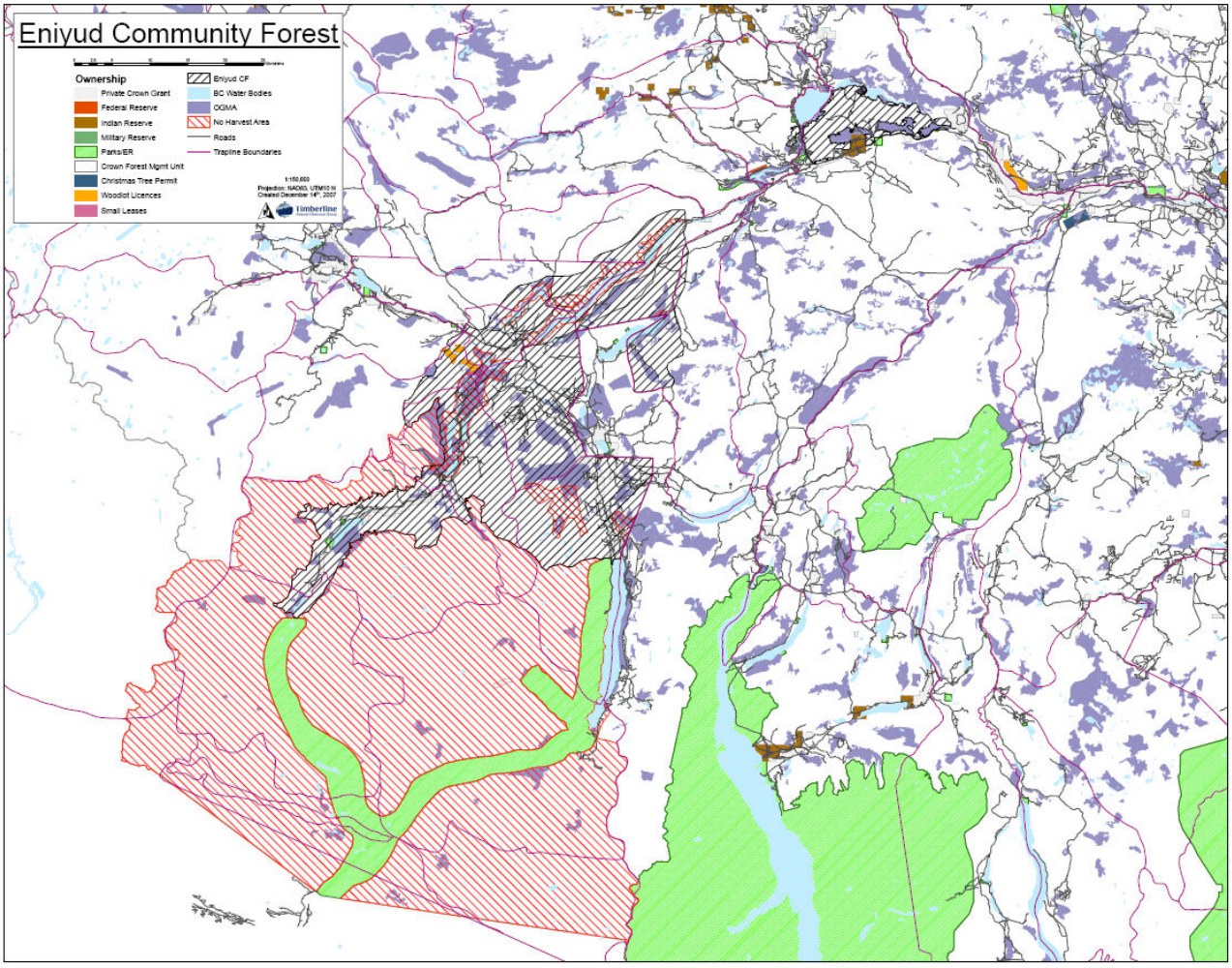

Figure 2.2: Map of Eniyud Community Forest

3.0 LAND BASE DESCRIPTION

The productive forest within the CF is defined as crown land with the productive capacity to grow trees. This productive area is identified using the Vegetation Resource Inventory (VRI) data. Figure 3.1 shows the productive and non-productive forest within the proposed CF boundary. The gross area is 115,070 ha of which 89,449 ha is productive. Only the productive area is included in the timber supply analysis. Area excluded from the analysis would include such land classifications as ice, rock, wetlands and other areas deemed unable to grow viable stands of timber.

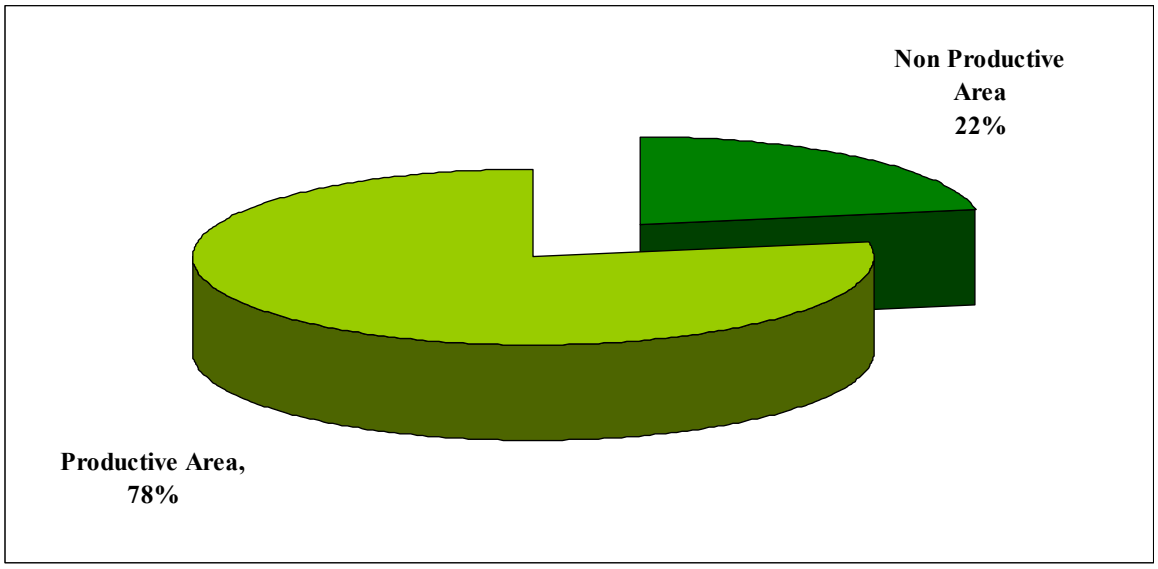

Figure 3.1: Land base description Eniyud Community Forest

The productive land base is further classified into areas that are unlikely to be harvested and areas likely to be harvested, or the timber harvesting land base (THLB). The THLB was identified using the land base classification coverage provided by the MOFR. Table 3.1 shows the THLB area in the proposed CF. The gross area is 2.3% of the TSA, and actual harvestable area is 2.1% of the TSAs THLB.

Table 3.1: Area summary for Williams Lake TSA and Proposed CF

	Gross Area (ha)	Productive Area (ha)	THLB (ha)
William Lake TSA	4,904,558	3,145,826	2,096,251
Proposed CF	115,070	89,449	44,048
CF % of TSA	2.30%	2.80%	2.10%

4.0 INFORMATION PREPARATION

Figure 4.1 shows the distribution of Biogeoclimatic (BEC) zones in the proposed CF. As shown in the figure the leading BEC zone is the dry cold Sub-Boreal, Pine, Spruce BEC type (symbolized as SBPSxc).

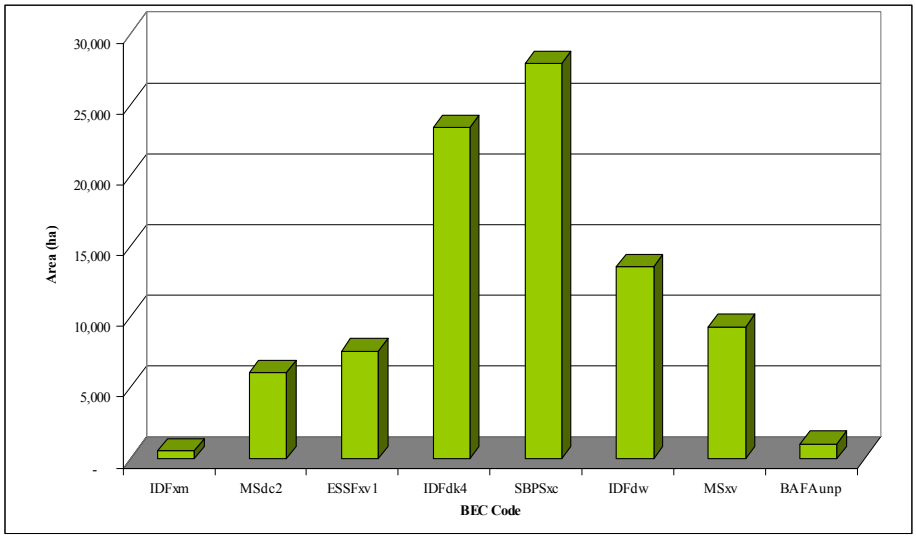

Figure 4.1: Distribution of BEC zones in Eniyud CF

Figure 4.2 shows the distributions of leading species in the Eniyud CF.

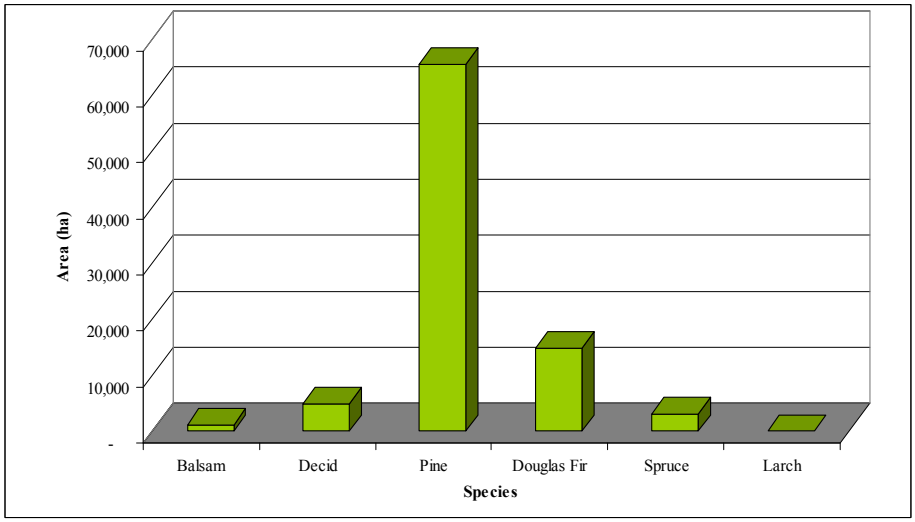

Figure 4.2: Species composition Eniyud CF

Figure 4.3 displays the distribution of site index values over the proposed CF land base stratified by THLB and non-THLB.

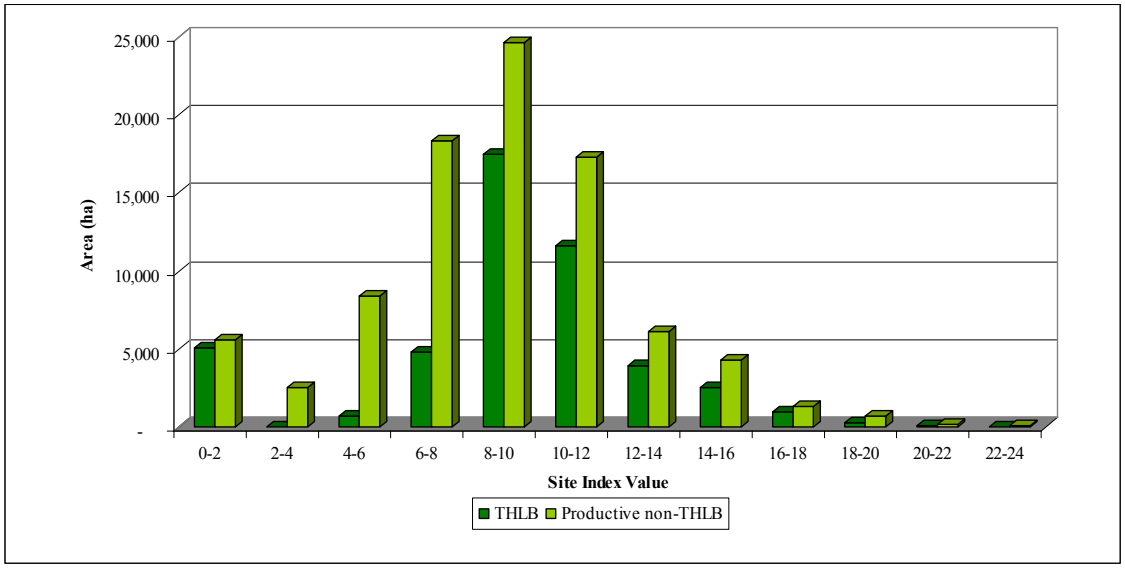

Figure 4.3: Distribution of site index values for Eniyud CF

Age class distributions for the proposed Eniyud CF can be seen in Figure 4.4. One notable characteristic is the high percentage of THLB which is of age class 0 (15%). This value suggests that there has been significant recent harvesting or natural disturbances with in the CF.

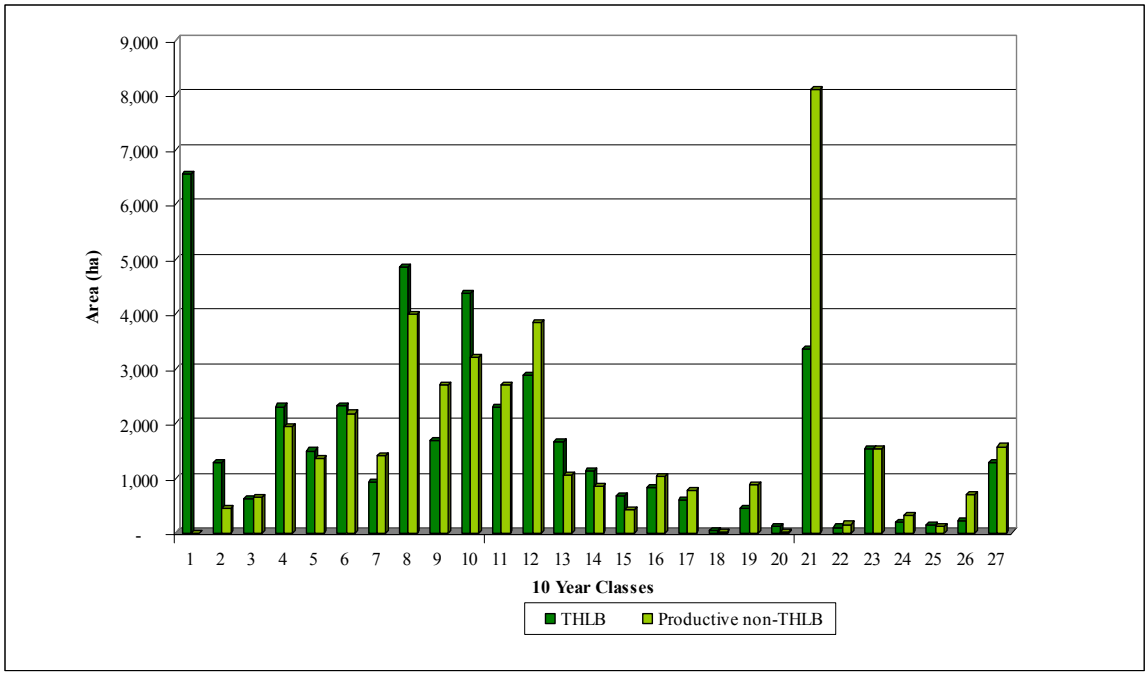

Figure 4.4: Distribution of age class for Eniyud CF

5.0 RESOURCE MANAGEMENT ZONES

To facilitate the application of management criteria for the CF, multiple retention and disturbance zones were used. The majority of the land base fell under the policies set forth by the West Chilcoltin Demonstration Project (87%). The remainder of the land base was modeled using TSR visuals, seral stage, mule deer winter range and integrated resource management zones. Table 5.1 displays the amount of total area and THLB area affected by each management policy. For more information on the nature of each policy, please refer to Appendix C.

Table 5.1: Management zone area summaries

Management Zone	THLB Area (ha)	Non THLB Productive (ha)	Total productive (ha)
Visuals	143	37	180
Seral Stage	7,056	1,297	8,353
Mule Deer Winter Range	7,492	6,081	13,573
Integrated Resource Management	4,403	N/A	4,403
Community Forest Management Zones	36,992	40,668	77,660

Table 5.2 shows a breakdown of the CF management zones, which were determined in the West Chilcoltin Demo Project.

Table 5.2: Retention zones from West Chilcoltin Demonstration Project

Policy Name	Percent Retention over given age	Productive	THLB
conventional15	15>%140	14,409	9,206
modified10	10>%140	24,235	10,808
modified15	15>%140	10,706	4,545
modified20	20>%140	2,072	1,026
modified22	22>%140	10,773	4,713
modified25	25>%140	2,230	1,337
modified80	80>%140	3,985	1,501
no_harvest	100>%140	9,249	3,858
Total		**77,660**	**36,992**

6.0 TIMBER SUPPLY ANALYSIS

This section presents the base case harvest flow profile established through analysis of timber supply.

6.1 Base Case

The base case analysis was prepared using CASH6.2m. The analysis reflects following management criteria, and harvest flow objectives:

- Maintain the allotted harvest level of 40,000 m³/ha as long as possible;
- Decreases in periodic harvest rates no greater then 10%;
- Achieve a sustainable long term harvest level for the remainder of the planning horizon.

Figure 6.1 shows the resultant base case harvest level as well as the total stock, operable stock and available stock over 250 years. As depicted the base case harvest level can sustain the proposed harvest level of 40,000 m³/yr for 140 years followed by a reduction to 23,000 m³/yr for the remainder of the planning horizon. As seen in Figure 6.1 a generalized downward trend can be noted in the operable stock as well as the available timber and total stock over the initial 120 years, however this trend flattens out over the long term (after 140 years).

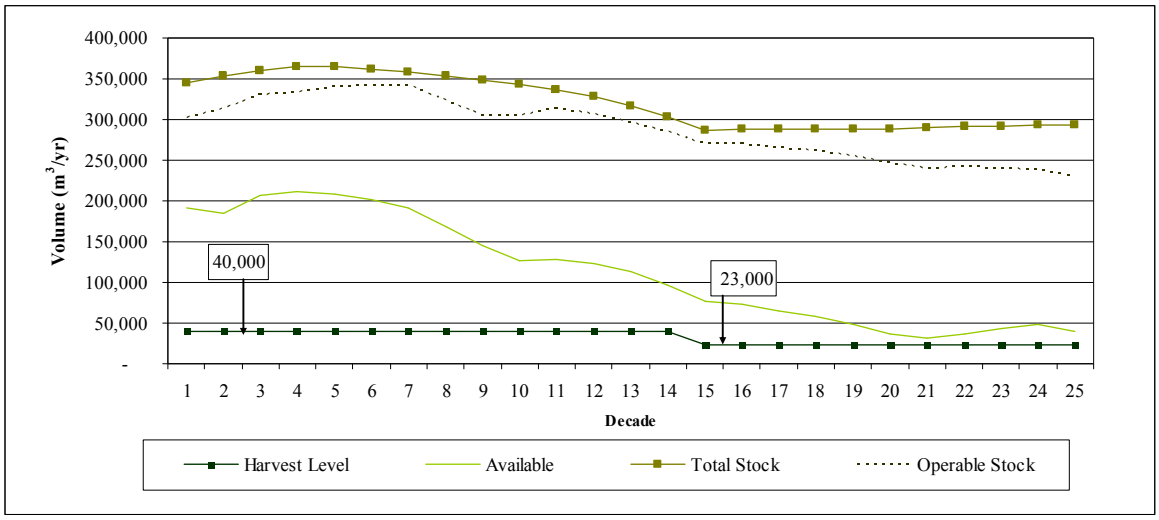

Figure 6.1: Base case harvest level, total stock, operable stock and available stock

When selecting a harvest level there are many alternative harvest levels that can be selected. Figure 6.2 shows the harvest levels for:

1. Maximum harvest in the first decade followed by 10 percent reductions per year until a sustainable long term harvest level is met; and
2. Maximum even flow harvest level.

The maximum short term harvest level is 60,000 m³/yr followed by progressive ten percent step downs to a long term harvest of 23,000 m³/yr. The maximum even flow harvest level is 35,000 m³/yr.

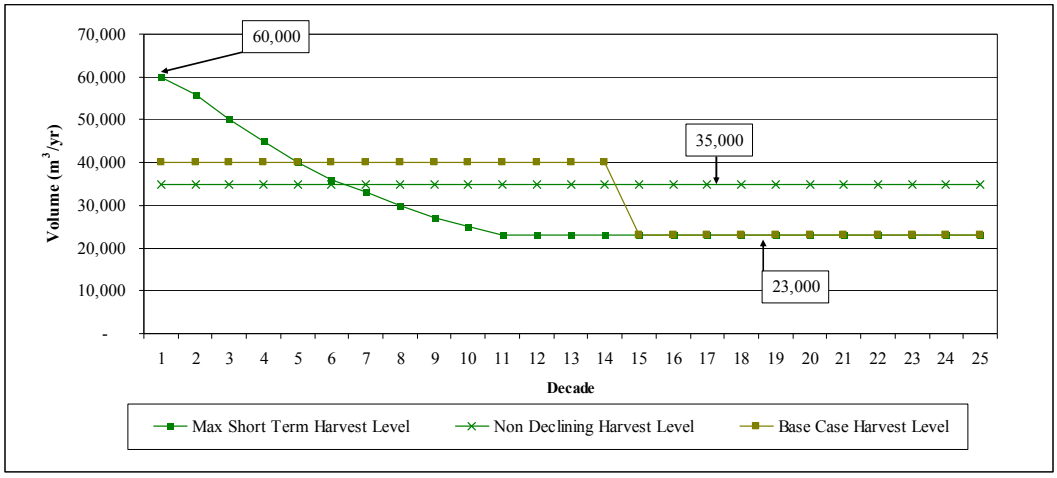

Figure 6.2: Alternative Harvest Levels

Figure 6.3 shows the amount of harvest coming from natural and managed stands throughout the planning horizon. In this scenario, the shift from natural to managed timber takes place around the 12th decade.

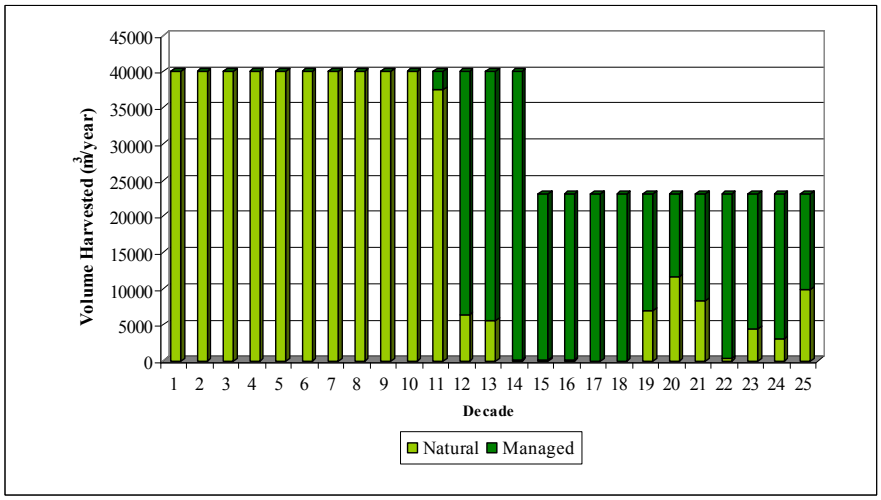

Figure 6.3: Natural to managed timber source transition

Figure 6.4 through 6.7 display the distribution of values for: volume per hectare (m^3/ha), harvest age (year) and average area harvested (ha) throughout the 250 year horizon.

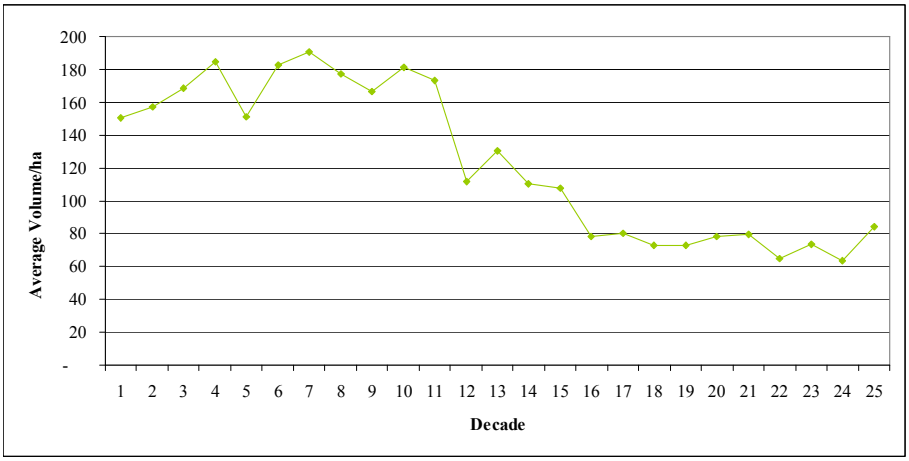

Figure 6.4: Average volume per hectare – Base case

As seen in Figure 6.4 and 6.5 the average volume per hectare (m^3)and average area harvested (ha) have an inverse relationship.

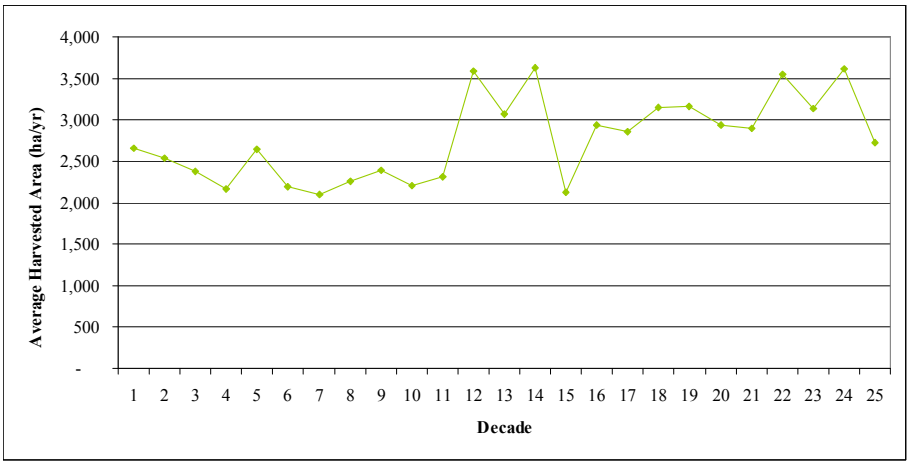

Figure 6.5: Harvested area – Base case

The average age of the harvested timber (in years), as shown in Figure 6.6, has a considerable level of fluctuation over the entire planning horizon and displays a generalized downward trend. Of particular significance is the drop in average harvest age that occurs at the transition from natural to managed timber sources (between decades 12 and 13).

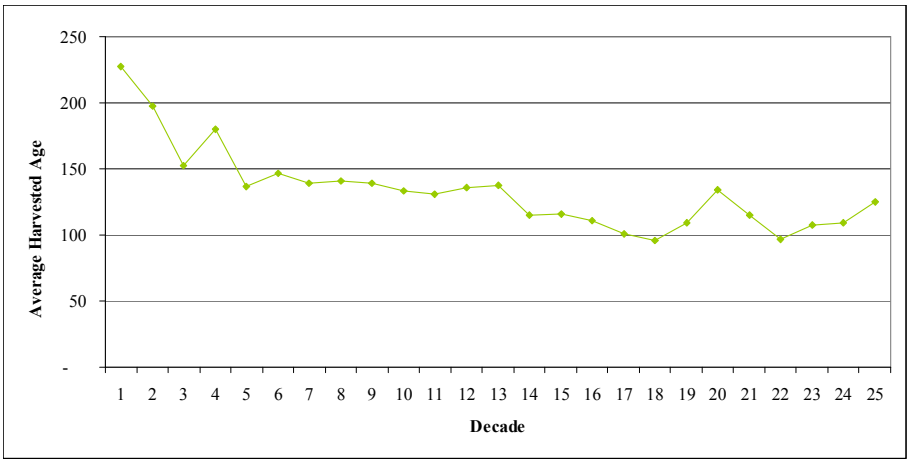

Figure 6.6: Average harvested age – Base Case

Harvest levels by species composition are displayed in Figure 6.7. The harvest levels for each species do not change significantly over the entire horizon, with lodgepole pine and interior Douglas-fir being the primary harvest species. This harvest profile is consistent with the BEC zones and species composition for the Eniyud CF (See Figure 4.1 Figure 4.2)

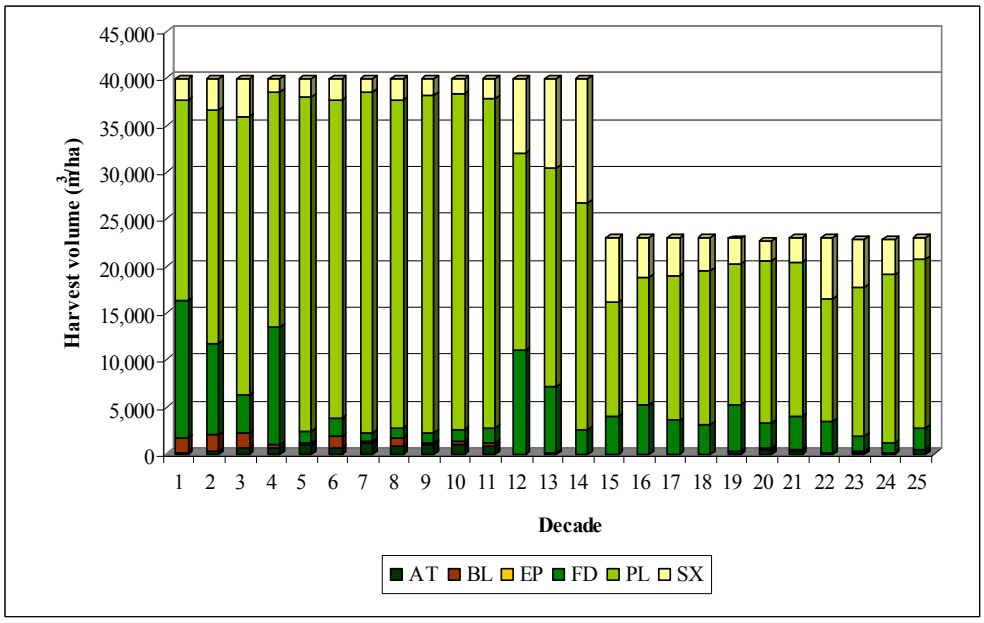

Figure 6.7: Harvested Species – Base case

7.0 SENSITIVITY ANALYSIS

Sensitivity analysis provides a measure of the upper and lower bounds of the base case harvest forecast and reflects the uncertainty of assumptions made in the base case. By developing and testing a number of sensitivity issues, it is possible to determine which variables have the most impact on the results.

To allow meaningful comparison between sensitivity analyses, each sensitivity is built on the base case with only the evaluated assumption being altered. All other assumptions remain unchanged. New harvest levels were defined, adhering to the flow policy described earlier.

7.1 Natural Stand Yields ± 10%

All natural stand yields (created using VDYP (version 6.6d)) were increased and decreased, respectively, by 10%. The short term is most effected by the alteration of current natural stands (analysis units 1-16),. Figure 7.1 shows that there a noticeable change in harvestable timber levels over the initial 100 years when the natural stand yields are adjusted by 10%.

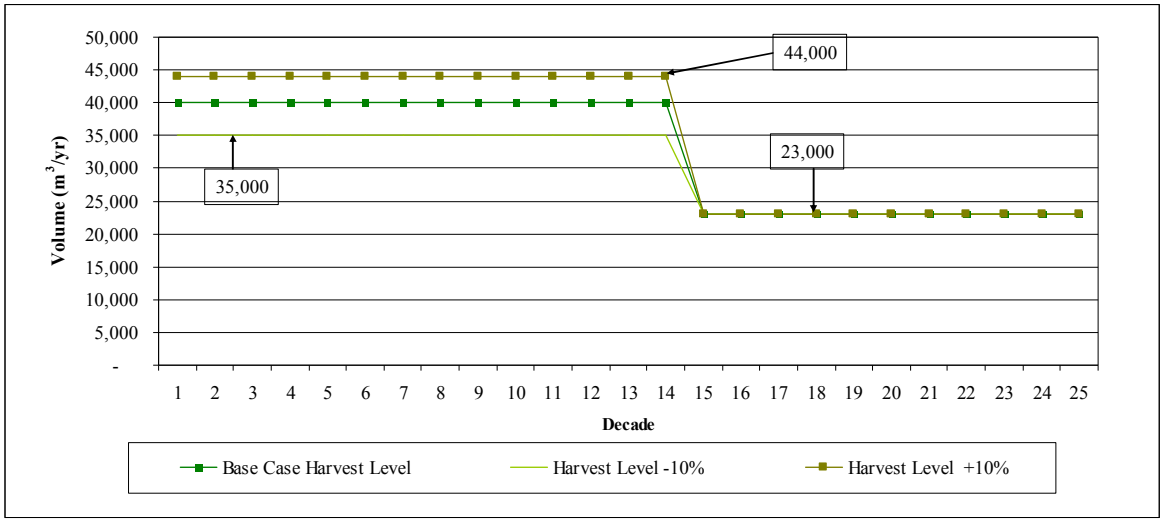

Figure 7.1: Natural stand yields ± 10% - harvest levels

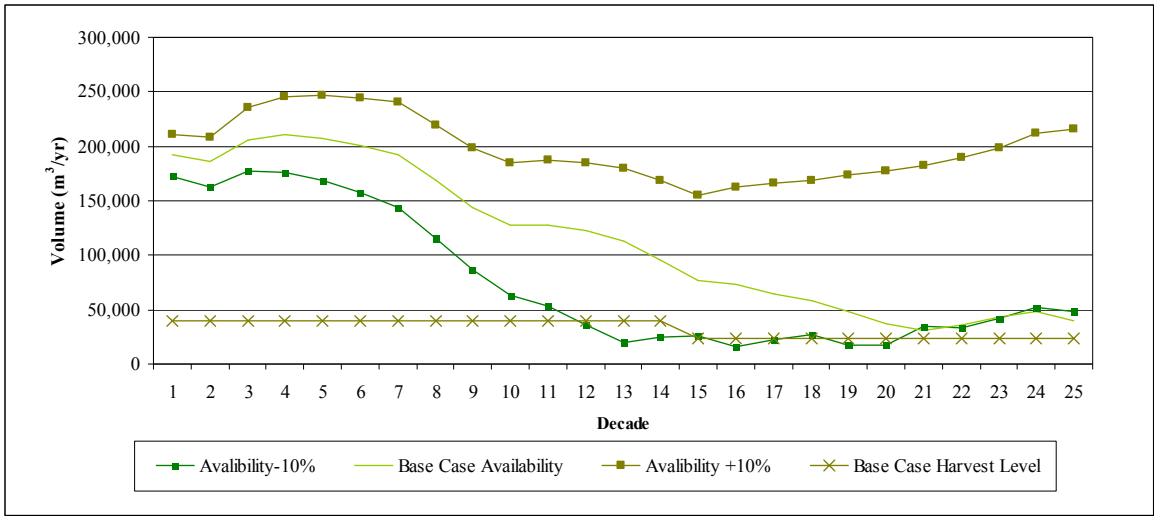

Figure 7.2: Natural stand yields ± 10% - timber availabilities

7.2 Mountain Pine Beetle

This scenario models the impact of mountain pine beetle (MPB). The scenario was modelled starting after the MPB epidemic has run its course, which was assumed to be in ten years from present. The modelling involved:

1. Setting non-lodgepole pine leading stands to an age of 10 years older than the current age;
2. Set lodgepole pine leading stands over the age 30 to age 0; and
3. Reduce the volume in of non-lodgepole pine leading stands by 50% of the lodgepole pine percentage – for example, .if a stand is comprised of 24% lodgepole pine it would have a 12% volume (m^3) reduction).

Figure 7.3 displays the change in harvestable volume (m^3) as a result of MPB infestation. The harvest level for the first 10 years is not modelled, but is assumed to come from the mature lodgepole pine volume and the non lodgepole pine component of lodgepole pine leading stands. The post MPB harvest level is reduced to 8,000m^3/year for 80 years, which is when the current MPB affected stands are harvestable once again.

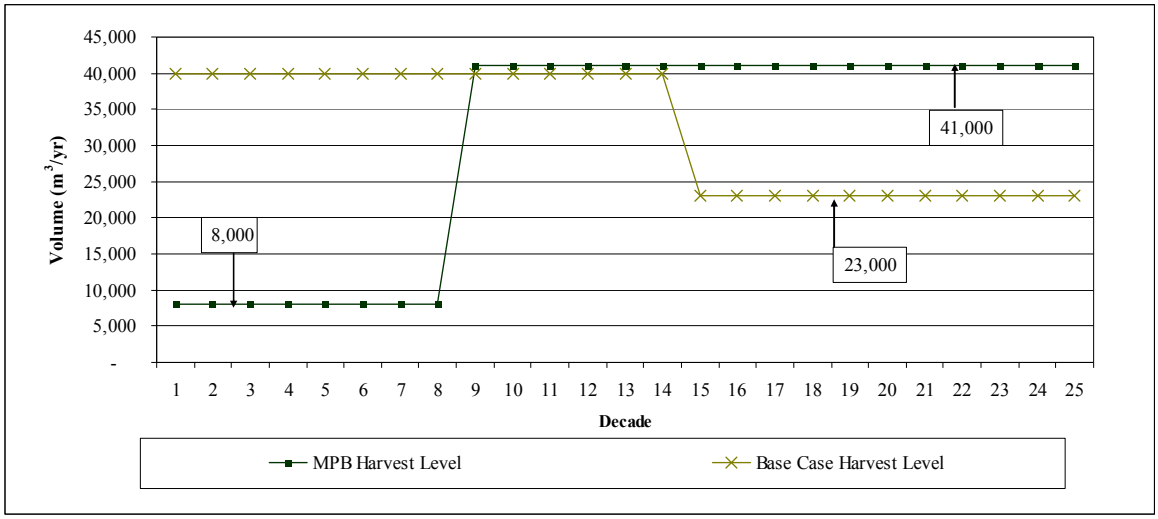

Figure 7.3: Harvest Level with Pine Beetle

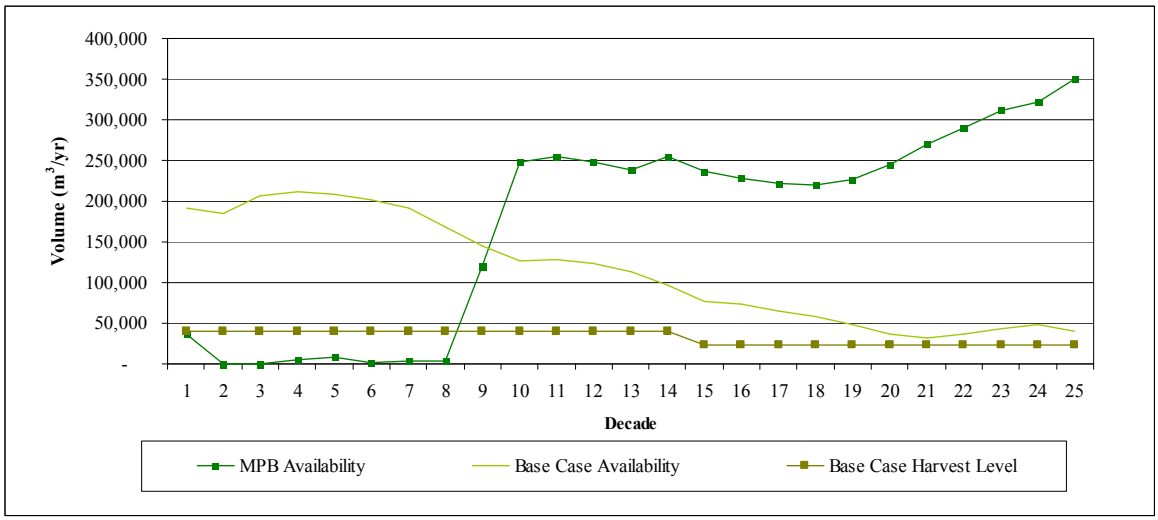

Figure 7.4: Pine Beetle modeled timber availability

7.3 Management Policy Turned Off

In order to determine the effects of the management policy used in this analysis the policy was turned off and the model was rerun. Figure 7.5 displays the effects that the policy has on potential harvest levels while Figure 7.6 shows the effects that the policy has on timber availability. In both cases turning off the management policy lead to increases in harvestable volume and timber availability, over the short term and long term planning horizons.

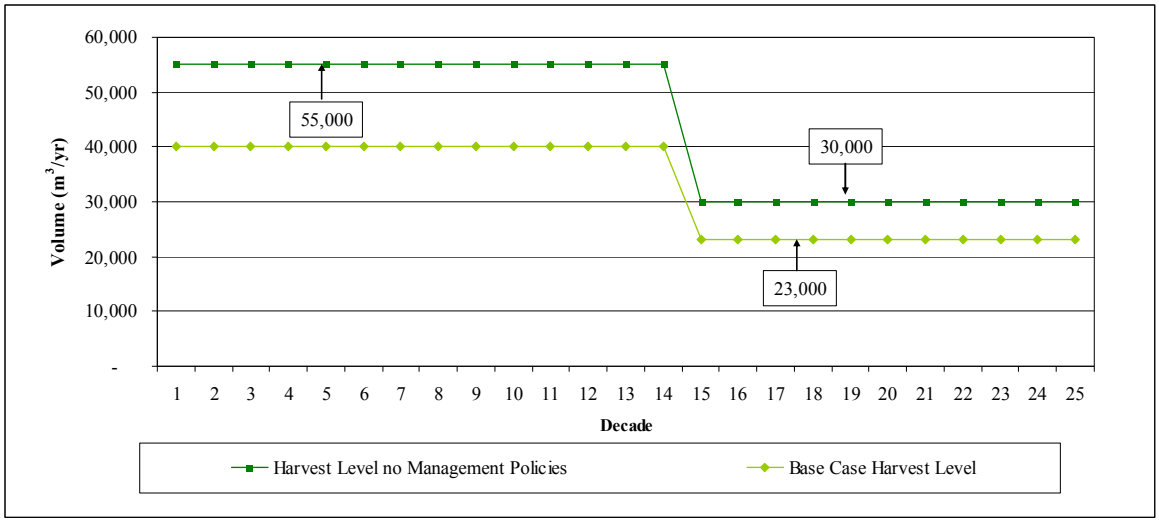

Figure 7.5: Harvest levels with management policies turned off

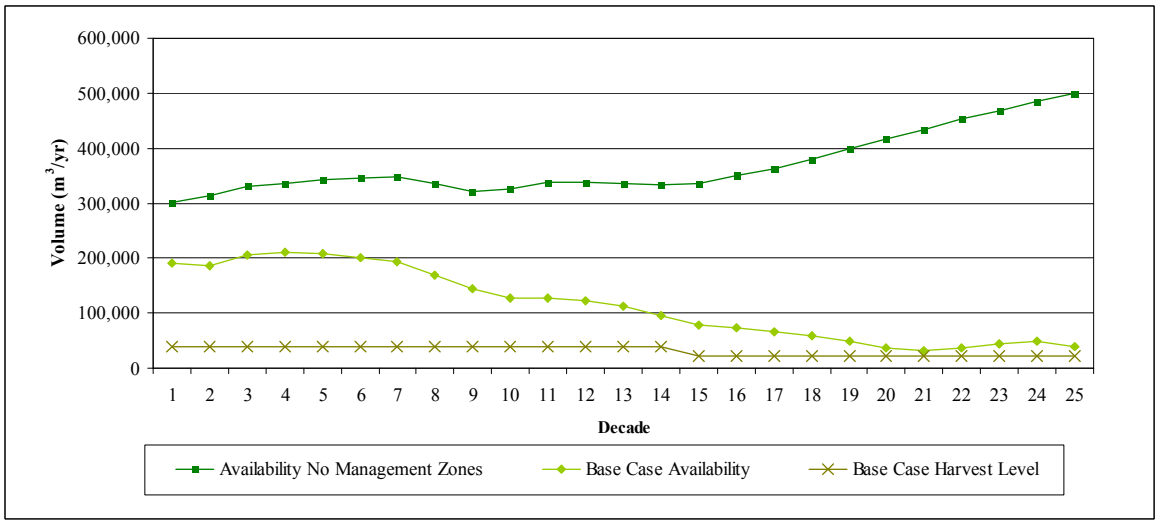

Figure 7.6: Availability with management policies turned off

8.0 DISCUSSION

The proposed CF modeled using the West Chilcoltin Demonstration Project resource management objectives shows that the area is reasonable to achieve a harvest level of 40,000m^3/year for an extended period of time. The greatest risk is that the MPB could affect a large portion of the CF and reduce harvest dramatically, which is similar to the remainder of the TSA.

9.0 REFERENCES

Government of British Columbia: Ministry of Forests, Timber supply Branch. 2001. *TIMBER SUPPLY REVIEW, Williams Lake Timber Supply Area Analysis Report*. British Columbia Ministry of Forests 595 Pandora Avenue Victoria B.C.

Government of British Columbia; Ministry of Forests, Forest Development, 1998. *Procedures for Factoring Visual Resources into timber Supply Analyses.*

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Province of British Columbia, 1995. *Forest Practices Code of British Columbia Biodiversity Guidebook.* Canadian Cataloguing in Publication Data.

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APPENDIX A
LANDSCAPE DETERMINATION

A.1 Timber Harvesting Land Base Determination

Table A.1 presents the productive and THLB land base for the Eniyud CF. This data is a derivative of the land base classification data used to classify the Williams Lake TSA and was produced by the BC MOFR.

Table A.1: Land base classification for Eniyud CF

Land Base Classification	Area (ha)
Total Community Forest Land Base	115,070
Productive Land Base	89,449
Timber Harvest Land Base	44,048

APPENDIX B
GROWTH AND YIELD

B.1 NATURAL STAND YIELDS

Natural stand and yield tables were developed for each forest cover polygon with an inventory greater the 25 years of age. Yield tables were developed for each polygon using the forest cover attributes as inputs into the Batch Variable Density Yield Projection (VDYP) (version 6.6d). The yield tables were area weight averaged for each analysis unit to create one natural stand yield table (NSYT) for each analysis unit (AU). Table B.1 shows the area, average inventory site index and average species composition for each natural AU.

Table B:1 Natural stand characteristics (VDYP input)

AU	THLB	Description	crown closure	SI	Species Composition									
1	14,828	SBPS-PL(others)	44	9.75	PL	90	SX	7	AT	2	FD	1		
2	851	SBPS-FD	34	11.23	FD	87	PL	12	SX	1				
3	5,894	MS-PL(others)	63	9.57	PL	83	SX	11	BL	4	FD	1		
4	182	MS-FD	38	12.35	FD	85	PL	15	BL	1				
5	10,253	IDF-AT(others)	48	10.08	PL	93	AT	3	FD	2	SX	1	BL	1
6	2,437	IDF-FD	37	11.5	FD	87	PL	11						
7	475	IDF-S(Others)	44	9.7	SX	72	PL	15	AT	9	BL	3	FD	1
8	1,559	ESSF-PL	52	8.1	PL	86	SX	10	BL	3				
9	2	ESSF-FD	56	7.5	FD	60	PL	37	SX	3				
10	53	ESSF-S(other)	48	6.75	SX	58	PL	26	BL	16				
11	10	SBPS-FD	39	9.5	FD	100								
12	7	SBPS-PL(other)	64	16.67	PL	100								
13	204	MS-FD(high)	45	13.24	FD	91	PL	8	SX	1				
14	550	MS-PL(other_high)	49	12.27	PL	75	SX	17	FD	6	AT	1		
15	3,724	IDF-PL(other_high)	49	9.4	PL	90	FD	4	AT	3	SX	3		
16	3,018	IDF-FD(high)	44	11.28	FD	89	PL	10						

B.2 MANAGED STAND YIELD TABLES

Existing immature as well as future managed stands had identical yield tables. Tables were developed using the Batch Table Interpolation Program for Managed Stand Yield Tables (TIPSY) (version 3.0a). Table B.2 shows the area, site index, and species composition for managed stands.

Table B2: Managed stand characteristics (TIPSY input)

AU	THLB	Description	SI	Species Composition					
101	14,828	SBPS-PL(others)	10	Pli	50	Fdi	30	Sw	20
102	851	SBPS-FD	12	Pli	50	Fdi	30	Sw	20
103	5,894	MS-PL(others)	10	Pli	80	Sw	20		
104	182	MS-FD	12	Pli	80	Sw	20		
105	10,253	IDF-AT(others)	11	Pli	80	Fdi	10	Sw	10
106	2,437	IDF-FD	12	Pli	80	Fdi	10	Sw	10
107	475	IDF-S(Others)	10	Sw	80	Pli	20		
108	1,559	ESSF-PL	10	Pli	80	Sw	20		
109	2	ESSF-FD	15	Pli	50	Fdi	30	Sw	20
110	53	ESSF-S(other)	8	Sw	80	Pli	20		
111	10	SBPS-FD	9	Pli	50	Fdi	30	Sw	20
112	7	SBPS-PL(other)	11	Pli	90	Sw	10		
113	204	MS-FD(high)	13	Pli	50	Fdi	30	Sw	20
114	550	MS-PL(other_high)	12	Pli	80	Sw	20		
115	3,724	IDF-PL(other_high)	10	Pli	80	Fdi	10	Sw	10
116	3,018	IDF-FD(high)	12	Pli	80	Fdi	10	Sw	10

APPENDIX C
RESOURCES MANAGEMENT ZONES

This section examines how the model addressed non timber resource requirements.

C1 COMMUNITY FOREST MANAGEMENT ZONES

Table C1 displays the management objectives which were specific to the CF.

Table C.1: Community forest management policies and attributes

Policy Name	Percent Retention over given age	Productive	THLB
conventional15	15>%140	14,409	9,206
modified10	10>%140	24,235	10,808
modified15	15>%140	10,706	4,545
modified20	20>%140	2,072	1,026
modified22	22>%140	10,773	4,713
modified25	25>%140	2,230	1,337
modified80	80>%140	3,985	1,501
no_harvest	100>%140	9,249	3,858
Total		**77,660**	**36,992**

C2 BIODIVERSITY RETENTION POLICIES

Biodiversity requirements were modeled based on seral stage objectives which were obtained from the *British Columbia Biodiversity Guidebook* Areas were selected based on landscape unit name, BEC zone and bio emphasis. Table C 2 displays the landscape units as well as the percent retention and area associated with each individual biodiversity zone

Table C 2: Biodiversity management objective

Policy Name	Biodiversity Emphasis	Percent Retention over given age	Productive	THLB
Sisters-IDFxm	Intermediate	11%>250	260	233
Sisters-IDFdk4	Intermediate	11%>250	423	357
Pyper-IDFxm	Low	11%>250	262	204
Eniyud-SBPSxc	Low	7%>140	739	606
Eniyud-IDFdk4	Low	11%>250	50	24
Puntzi-IDFdk4	Low	11%>250	4,105	3,336
Pyper-IDFdk4	Low	11%>250	2,515	2,295
Total			**8,353**	**7,056**

C3 VISUAL QUALITY OBJECTIVES

Visual Quality Objectives (VQO'S) were identified using the "Visual" data layer provided in the source data and by implementing the same strategy used in the 2002 TSR 2 process. As in the TSR 2, areas determined to be visually sensitive (meeting the visual classification of M, P, R, PR) were assigned a maximum allowable disturbance level for forest under a specific green up height. As done in the TSR 2 green up height was set to 3 meters while the maximum allowable disturbance was set to 15 %.Table C3 displays the policies associated with visual retention as well as the amount of affected land.

Table C3: Visual quality objectives

Policy Name	Percent Retention Over 3m	Productive	THLB
Pyper-PR	15%>3m	56	46
Pyper-R	15%>3m	0	0
Eniyud-M	15%>3m	8	0
Puntzi-PR	15%>3m	22	18
Puntzi-R	15%>3m	4	4
Eniyud-R	15%>3m	89	75
Total		**180**	**143**

C4 INTEGRATED RESOURCE MANAGEMENT

Modeled based on the TSR 2, IRM zones were determined by locating area that was within the THLB and unaffected by the above management strategies. Again policies were differentiated by landscape unit name and BEC zone. Maximum allowable disturbance under green up height and green up height were both taken from the TSR 2 and were 30% and 3m respectively. Table C4 displays the policies attributes pertaining to each IRM zone.

Table C4: Integrated resource management zones

Policy Name	Percent Retention Over 3m	Productive	THLB
Puntzi-IDFdk4	30%>3m	2,893	2,893
Eniyud-IDFdk4	30%>3m	24	24
Sisters-IDFxm	30%>3m	0	0
Sisters-IDFdk4	30%>3m	300	300
Pyper-IDFdk4	30%>3m	655	655
Eniyud-SBPSxc	30%>3m	530	530
Total		**4,403**	**4,403**

C5 MULE DEER WINTER RANGE

Mule deer winter range (MDWR) modeling was also done as in an effort to mimic the methodology followed out in the TSR 2.Using MDWR data areas which were areas designated as having "high" levels of MDWR habitat were selected and their minimum harvest ages as well as regeneration ages were modified. C5 displays the landscape units that have "high" MDWR classification and presents the modified minimum harvest age and regeneration age applied to each unit.

Table C5: Mule deer winter range policies

AU	THLB	Policy Name	Min Harvest Age	Post Harvest Alternative stand Type	Regen Delay	Regen Age	% Regen To Alternative
113	204	MS-FD(high)	240	115	2	140	100
114	550	MS-PL(other_high)	210	116	4	140	100
115	3,724	IDF-PL(other_high)	250	117	4	140	100
116	3,018	IDF-FD(high)	270	118	4	140	100
Total	**7,671**						