

**Coastal Small Tenures
Timber Supply Analysis**

**Port Alberni Community Forest Agreement
Arrowsmith TSA**

Timber Supply Analysis Report

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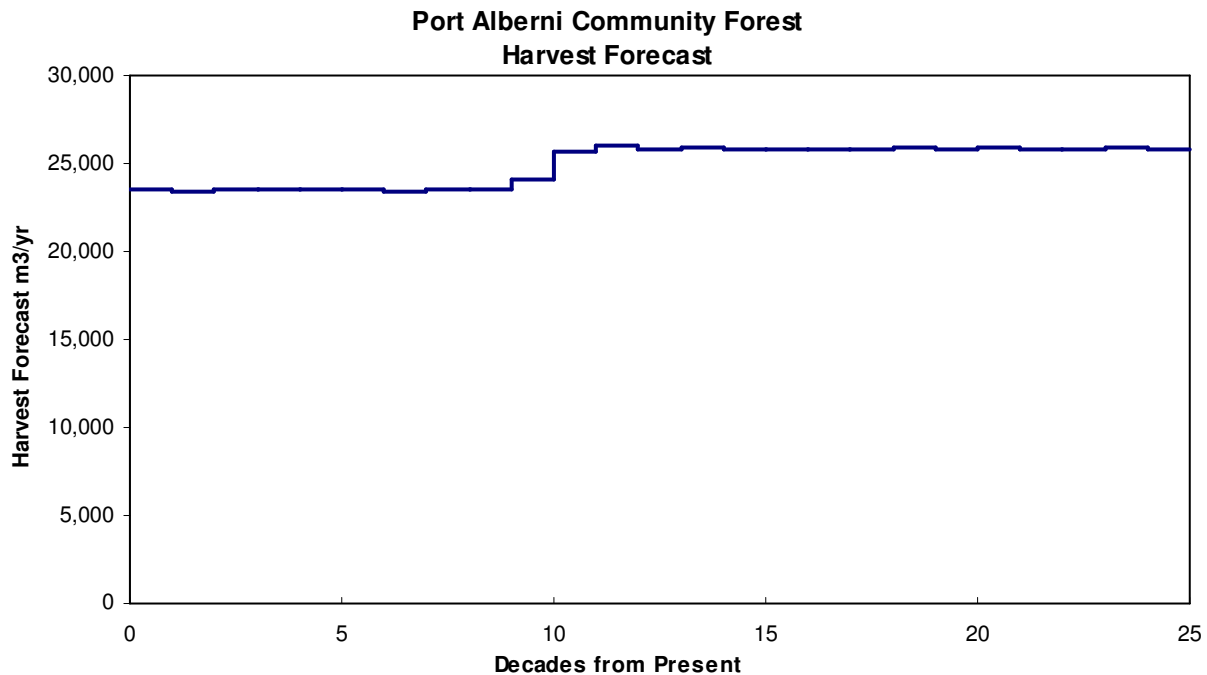
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Executive Summary

This report provides a timber supply forecast for the proposed Port Alberni Community Forest Agreement (CFA) area located near the community of Port Alberni on Vancouver Island. The total size of the proposed CFA area is 8,206.5 ha, of which 6,928.0 ha (84%) is eligible crown forested land base (CFLB), and 4,364.7 ha (53%) is considered timber harvesting land base (THLB).

Timber supply was modeled spatially over 250 years using Weyerhaeuser's TFL 44 Management Plan (June 2002) assumptions to define the THLB and Arrowsmith TSAs TSR2 assumptions to define growth and yield, and management assumptions/strategies. The figure below illustrates the projected harvest flow over time and shows that an initial average harvest level of 23,458 m³ per year can be maintained for 90 years before it begins to transition up to a long term harvest level of 25,822 m³/year.



The short term harvest level is limited primarily by the amount of past harvesting activity and the forest cover constraints applied to the community watershed and partial retention VQO areas. There is reasonable harvest opportunity in the initial years of the planning horizon but this volume must be metered out over the first 9 decades until second growth stands are fully online. Harvest opportunity is most limited during the 2nd and 3rd decades. The long term harvest level is 10% higher than this initial level and occurs once second growth stands begin to dominate the harvest profile. These stands provide more flexibility in meeting limiting forest cover constraints and tend to produce more volume per hectare.

Acknowledgements

Preparation of this report and analysis would not have been possible without cooperation and input from several individuals and organizations. Doug Stewart (MoF) provided direction on key project concepts and issues. Jim Brown (MoF) provided timber supply modeling support. Emma Neil (MoF) assisted in the localization of assumptions. Peter Kofoed (Weyerhaeuser Naniamo Woodlands) and Ross Petit (consultant) provided the data and associated TFL assumptions.

The Forsite project team consisted of Mike Landers, RPF, Cam Brown, RPF, Stephen Smyrl, and Steve Patterson.

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Introduction

The major tenure transfer which occurred when Weyerhaeuser purchased MacMillan Bloedel resulted in a 5 percent timber take-back. Part of this area is being considered for a new Community Forest Agreement (CFA). This report describes the both CFA proposed near Port Alberni on Vancouver Island British Columbia and the results of a timber supply analysis completed to help define an area able to support an annual allowable cut (AAC) of approximately 22,000 m³/yr.

The Port Alberni CFA area consists of 5 physically separate land units covering 8,206.5 hectares (net of private land) located in the South Island Forest District and Arrowsmith Timber Supply Area (Figure 1).

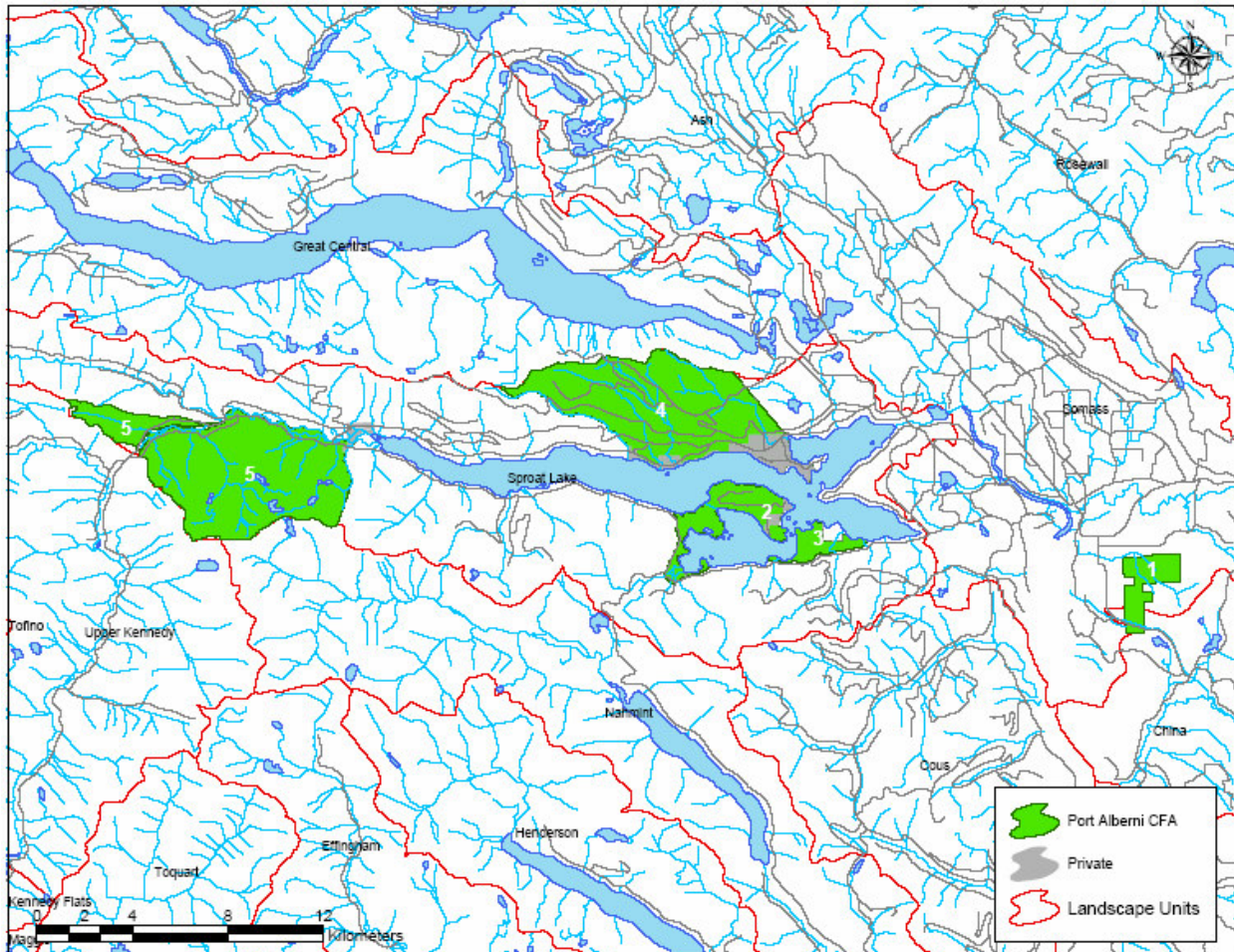


Figure 1. Port Alberni Community Forest

Methods

Ministry of Forests district staff provided boundaries for a CFA area that was expected to provide the desired harvest level. Within the proposed boundaries, internal units were identified and prioritized in case only a portion of it was needed to achieve the 22,000 m³/yr target. The timber supply model incorporated all of the proposed area and yields were derived using the THLB portion of this land base. The CFA area shown in this report is the version that corresponds with the desired harvest level.

The primary objective of this project is to determine and assess the long and short term timber supply for the community forest proposed in Port Alberni as noted above. The landbase used in this analysis was broken down into five separate units (see Figure 1) with the objective being to meet the desired harvest objective using only the area required. The harvest objective is to use each block in order of preference where 1 is given first preference and subsequent units can be added as required up to and including area 5. Additional area originally considered and not required to meet the target has been removed.

The spatially explicit model *Forest Planning Studio* (FPS-ATLAS) was used to provide timber supply forecasts. FPS-ATLAS is a forest-level simulation model that was developed by Dr. John Nelson at the University of British Columbia. FPS-ATLAS is designed to schedule harvests according to a range of spatial and temporal objectives (i.e. harvest flows, opening size, riparian buffers, seral stage objectives and patch size distributions). Silviculture systems, rotation ages and growth and yield curves are assigned to each polygon. At each time step, polygons are first ranked according to a cutting priority (e.g. oldest first). Polygons are then harvested from this queue subject to constraints designed to meet forest level objectives (e.g. opening size and seral stage targets). Polygons are harvested until either the queue is exhausted or the periodic harvest target is met. At this stage the forest is aged to the next time period, and the process is repeated. At each time period, the model reports the status of every polygon in the forest estate.

While FPS-ATLAS is a spatially explicit timber supply model it is not the intention or objective of this analysis to produce an operational plan. A spatial model such as the one used allows visual verification of the analysis inputs and results. No spatial constraints were applied at the block level that would result in the output of realistic harvest 'blocks'. Modeling results are meant only to assess overall harvest levels in the short and long term.

The data used for timber supply input is primarily a subset of the data used for the timber supply analysis component of Weyerhaeuser's Management Plan 4 for TFL 44 in June of 2002. Therefore, the timber harvesting landbase (THLB) for the community forest has been defined using the landbase definitions used by Weyerhaeuser. The demonstration forest data which comes from the TSA has been integrated into the TFL data for this project. All other assumptions are based on the Arrowsmith timber supply review (TSR2) of September 2001.

Community Forest Attribute Summary:

The Community Forest Area proposed in Port Alberni is highly operable with more than 63% of the contributing landbase being operable area. The contributing landbase for the proposed area totals 8,206.5 ha (84% of the total area) and the timber harvesting landbase is 4,364.7 ha (60% of the contributing area). Table 1 below details the gross area by BEC variant.

Table 1. BEC variant classification for the total CFA area.

AT	CWHmm1	CWHmm2	CWHvm1	CWHvm2	CWHxm1	CWHxm2	MHmm1	Total (ha)
55	1,471	973	1	1,130	911	2,474	1,013	8,702

Table 2 below details the distribution of the THLB area by leading species group and the site index associated with the group.

Table 2. THLB by species group and site index.

Site Index	Hectares by Leading Species Group				
	FD	HBS	C	Decid	Total
6.1-11	10.3	0.4	-	-	10.7
11.1-16	73.3	118.0	2.1	3.2	196.6
16.1-21	520.9	595.3	0.2	-	1,116.3
21.1-26	1,278.3	384.9	21.7	12.0	1,696.9
26.1-31	753.0	69.4	-	21.9	844.3
31.1-36	283.4	-	-	1.3	284.7
36.1-41	77.9	12.5	-	-	90.4
>41	124.8	-	-	-	124.8
Total	3,121.8	1,180.5	24.0	38.4	4,364.7
Percent of Total:	71.5	27.0	06.	0.9	

Table 3 below describes the THLB area in terms of leading species and age class.

Figure 2 illustrates the age class distribution on both the Crown Forested Land Base and the THLB. Figure 3 illustrates the spatial distribution of the age classes associated with the THLB.

Table 3. THLB Area by leading species and age class

Age Class	Hectares by Leading species				
	FD	HBS	C	Decid	Total
0-20	156.6	268.8	9.4	-	434.8
21-40	950.8	269.3		4.6	1,224.7
41-60	1,487.7	133.1	4.4	5.5	1,630.7
61-80	291.8	-	-	26.0	317.7
81-100	31.7	-	-	-	31.7
101-120	35.4			2.3	37.7
121-140	-	-	-	-	-
141-250	26.4	77.4	-	-	103.8
250+	141.4	431.9	10.2	-	583.6
Total	3,121.8	1,180.5	24.0	38.4	4,364.7
Percent of Total:	71.5	27.0	0.6	0.9	

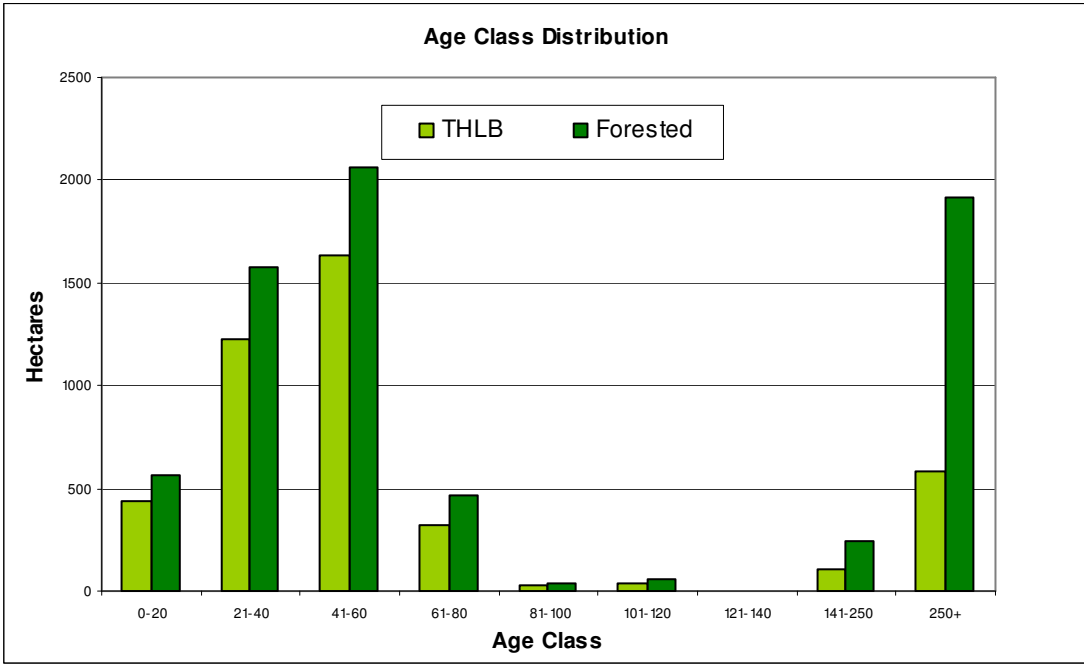


Figure 2. Current age class distribution by land base type.

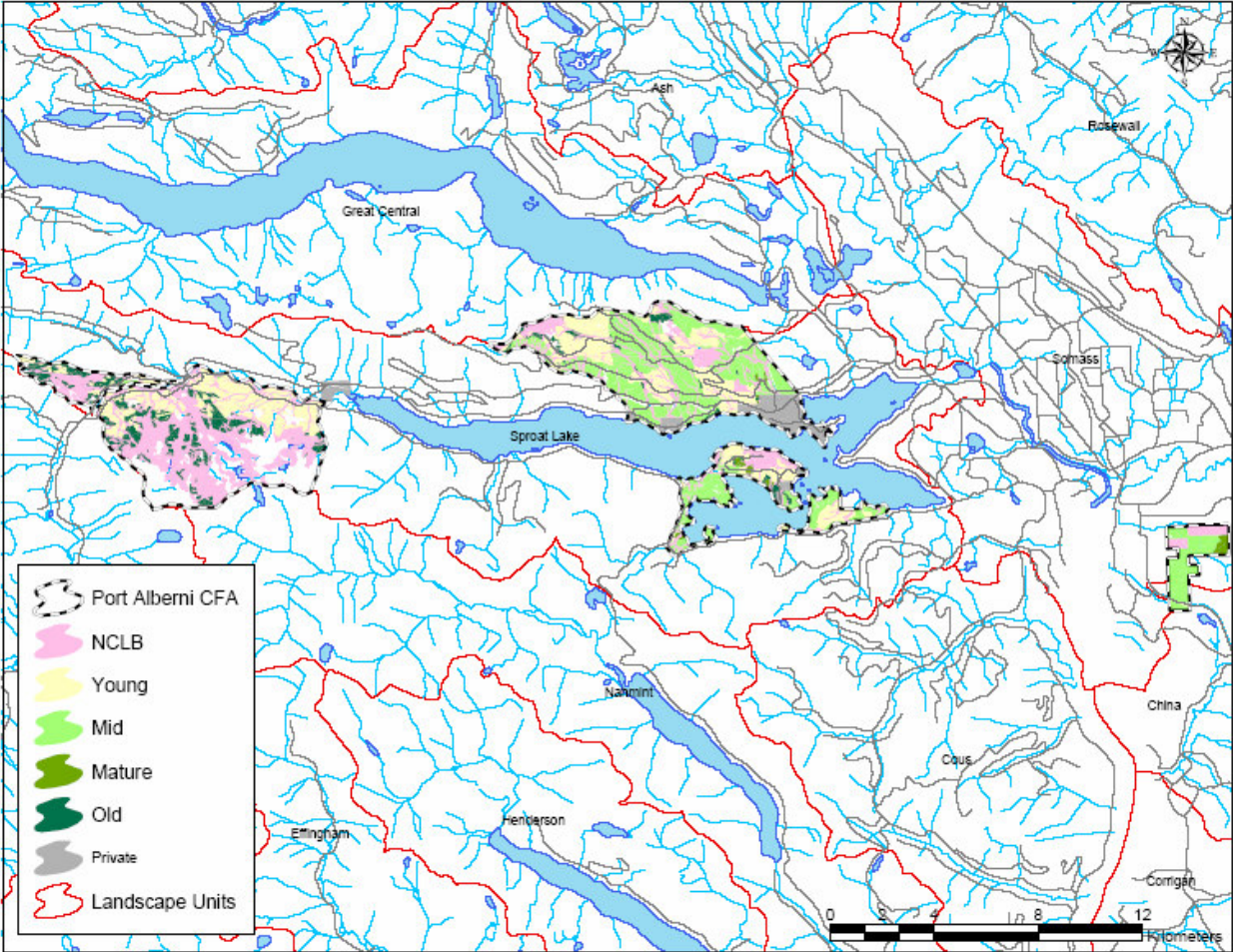


Figure 3. Port Alberni community forest THLB distribution by age class group

Land Base Assumptions

The timber harvesting land base (THLB) derivation is shown in Table 4 and described below. In many instances, polygons could have been removed by several netdown factors but netdown areas were only attributed to the predominate factor to avoid double counting. Areas were always assigned to the netdown reason occurring highest on the list (Table 4).

Table 4. Timber harvesting land base definition.

Classification	Area (hectares)	Percent of total area	Percent of CFLB area
Gross Area of CFA	8,206.5	100.0	
Non productive	(1,105.5)	13.5	
Existing Roads	(173.0)	2.1	
Total Crown Forest Land Base	6,928.0	84.4	100.0
Reductions to Crown Forest			
OGMAs	811.0	9.9	11.7
Riparian Reserves	837.0	10.2	12.1
Economically Inoperable	145.2	1.8	2.1
High recreation value	279.3	3.4	4.0
Environmentally Sensitive Areas	297.4	3.6	4.3
Physically Inoperable	166.1	2.0	2.4
Total productive forest exclusions	1,079.4	22.1	25.9
Timber Harvesting Land Base	4,364.7	53.2	63.0

Modeling THLB

The THLB for this analysis represents a combination of TFL 44 MP4 and TSA TSR2 data sets¹ being merged together to form one resultant data set for the analysis. The net THLB in each of these data sets was derived using partial netdowns. For spatial timber supply modeling, polygons must be entirely THLB or Non-THLB so partial netdowns were converted to full netdowns. The total area of THLB remained the same but the spatial location was slightly altered. For this unit, the THLB used for modeling is 0.4 ha smaller than the THLB area on the MP4/TSR2 file. To arrive at this result, polygons which were largely non-contributing were excluded until the area target was met, while those polygons that are primarily contributing were wholly included. If a break was needed within an inclusion factor class, the smallest polygons were removed until the THLB target was achieved.

The netdowns applied to the crown productive forest (CFLB) are listed below.

Non Productive Areas

All land classified as non-forested, such as lakes, swamp, rock and alpine, were excluded from the crown forested land base.

Private Land

Any private land falling within the CFA area was removed from the crown forested land base.

Roads Trails and Landings

Existing roads for the plan are in the GIS database for TFL 44 as line features. The area degraded by roads was estimated by applying a buffer of 6.7 meters to either side of the line.

Estimates for future roads, trails and landings are applied after stands are first harvested in the simulation model. Estimates will be applied as a 4 percent volume netdown on future yield curves. This method permits the volume in road right of ways to be captured in first pass harvesting.

¹ Depletions updated to spring of 2004

Old Growth Management Areas

Spatially explicit draft OGMAs have been identified in the Sproat Lake landscape unit. These OGMAs have withstood extensive review and are not expected to change. Consequently, these OGMAs have been netted out of the productive landbase and will satisfy old growth retention requirements.

Riparian Reserve and Management Zones

The netdown assumptions for riparian management areas (reserves and management areas) are based on the TFL 44 MP4 data set supplied. These netdowns are based on maximum values provided in the Riparian Guidebook. The classifications and associated netdowns are summarized in Table 5. Mapped streams were assigned classifications (S1-S6), buffered then removed from the THLB.

Table 5. Landbase reductions for riparian management

Stream Class	Stream Width (m)	Reserve Zone		Management Zone	
		Width (m)	Netdown (%)	Width (m)	Netdown (%)
S1	20.1-100	50	100	20	50
S2	5.1 - 20	30	100	20	50
S3	1.5 - 5	20	100	20	50
S4	<1.5	0	0	30	25
S5	>3.0	0	0	30	25
S6	3.0	0	0	20	5

The presence of fish and community watersheds has been recognized in this netdown process. Streams that are not mapped at 1:20 000 are expected to be small; an additional netdown of 1% of the net landbase (after considering mapped netdowns) is made as an additional allowance for these areas.

Economic Operability

Currently uneconomic stands have been eliminated from this analysis based on the following economic operability standards (Table 6).

Table 6. Economic operability classification

Stand Type	Conventional (m ³ /ha)		Non-conventional (m ³ /ha)	
	Uneconomic	Marginal	Uneconomic	Marginal
Fir-Cedar	< 278	278–389	< 444	444–556
Hem-Bal	< 333	333–434	< 500	500–611
Hem-Bal-Cyp				
<40% X, Y, Z Grades	< 333	333–444	< 444	444–556
>40% C, Y, Z Grades	< 444	444–556	> 556	556–667
Cedar				
<40% X, Y, Z Grades	< 278	278–389	< 389	389–500
>40% X, Y, Z Grades	< 389	389–500	< 556	556–667

Recreation

Recreation areas or recreation features have been addressed following the precedent set by Weyerhaeuser in MP4 and the associated data records.

Table 7. Recreation feature netdowns

Recreation Feature Significance	Recreation Management Class	Netdown (%)
A,B	0	100
A,B	1	50
C	1A	Polygon specific ²

Environmentally Sensitive Areas

Terrain stability mapping for the plan area uses the 5 class system for mapping terrain stability. Classes I, II, and III are considered stable, class IV is considered potentially unstable and class V is unstable. Based on this classification system terrain stability netdowns were applied as outlined in Table 8. The terrain zones noted are the terrain groupings used by Weyerhaeuser to track their different terrain inventories.

Table 8. Environmentally sensitive area netdowns

Terrain Zone	Partial Netdown (%)		
	Terrain Classification		
	Class I - III	Class IV	Class V
5A/5B	0	20	90

Avalanche run-out zones have been mapped as Ea1 areas. A 20% net-down is applied to these areas.

Operability

The mature productive forest has been assessed for physical operability and for broad classes of logging methods. The assessment was done in 1993. Three classes have been mapped, specifically:

1. Physically Inoperable Timber
Timber on productive land that is steep and/or rocky and it cannot be safely felled or yarded, or a significant proportion of the volume could not be recovered.
2. Conventional Harvest Systems
Includes timber on productive, physically operable land that is harvestable by conventional methods, *i.e.*, grapple, high-lead, hoe-chuck, skidder, etc.
3. Non-conventional Harvest Systems
Includes timber on productive, physically operable land that is harvestable only by non-conventional methods. These include helicopter, balloon or long-line cable systems.

Both conventional and non-conventional harvest systems are included in the THLB, while physically inoperable timber was excluded.

Wildlife Habitat Area Removals

Ungulate Winter Range

Ungulate winter range recently confirmed under Order #U-1-013 on October 18, 2004 have been excluded from the THLB in this analysis.

² Attempts to "roll over" Weyerhaeuser's recreation inventory to MOF 1998 standards were unsuccessful. Consequently, the netdowns for C1A recreation polygons were visited individually to determine the appropriate netdown. Net downs range from 10 to 100%

Marbled Murrelets

The 2 approved MAMU WHAs in the Sproat LU (#1-030 and #1-031) do not fall within any of the area proposed for the community forest plan area.

Deciduous Species

The net deciduous area (after reductions for other reasons, such as low sites and riparian) has been further reduced by 50% to address poor quality issues arising from deterioration due to age. The net result is that some deciduous area is retained in the contributing land base as it is expected that there will be a steady market for this hardwood species³.

Cultural Heritage Resources

Existing management experience to date suggests that there is little if any additional netdown for culturally modified trees (CMTs). Based on Weyerhaeuser's MP4 assumptions, a netdown of 0.5% for CMTs was applied.

Growth & Yield AssumptionsYield Model Assignment

Two growth and yield models were used to estimate timber volumes for this Community Forest analysis.

- The variable density yield prediction (VDYP) model developed by the B.C. Ministry of Forests, Resources Inventory Branch, was used for estimating timber volumes for all existing coniferous and deciduous stands. Managed deciduous stand volumes were also modeled using VDYP volume estimates.
- The table interpolation program for stand yields (TIPSY), developed by the B.C. Ministry of Forests, Research Branch was used to estimate timber volumes for existing and future managed stands as follows. In keeping with the standard set in TSR 2, all future stands and stands currently less than 50 years old, (except for alder analysis units) were assigned to a managed stand yield curve.

Utilization Levels

- All stands will require a minimum top diameter inside bark (DIB) of 10cm and a maximum stump height of 30cm.
- Stands using the VDYP model used a 17.5 minimum dbh
- Stands using the TIPSY model used a 12.5 minimum dbh

Analysis Units

To facilitate modeling of stand growth and expected harvesting and silvicultural treatments, stands are grouped by leading tree species and site productivity; these groups are called analysis units (AUs). The TSR2 analysis unit definitions were used as a starting point to group stands for developing yield curves. As the stands in this community forest are not representative of the stands at the TSA level, new yield curves were developed.

Table 9 details how the area in the community forest area was grouped into the TSR2 analysis units. Analysis units suffixed with "EM" describe existing managed stands in the plan area.

³ In 2000, Northwest Hardwoods (a subsidiary of Weyerhaeuser) purchased Coast Mountain hardwoods. This has resulted in an increased interest in the supply of alder from tenures in the area, for the alder sawmill in Delta. This expectation of alder supply from the community forest to the Delta sawmill is the basis for retaining some of the deciduous area in the analysis.

Table 9. Analysis units and average site index for Existing Stands

AU Name	AU No	Future AU	Area Weighted SI	THLB area
Fir, G/M	101	201	32.8	974.7
Fir, P	103	203	22.6	459.0
Other ⁴	105	205	25.0	62.4
Hw/Ba, G/M	106	206	23.7	149.3
Hw/Ba, P	107	207	19.1	366.2
Fir - EM	501	501	23.6	1,688.1
HemBal - EM	502	502	22.5	665.1

Management Assumptions

Minimum Harvest Age

The minimum harvest ages used in this analysis will be consistent with the methodology used in TSR2. The minimum harvestable age for stands in each analysis unit will be set to the greater of:

- The estimated age for the stand to reach the required stand volume;
- The age at which the stand achieves a specified minimum mean diameter at breast height; or
- The age at which the stand achieves 90% of the maximum mean annual increment (MAI)

Table 10. Minimum harvest age criteria⁵

Analysis Unit species	Site Index	Minimum Criteria			MAI (m ³ /ha/year)
		Age (years)	Diameter(cm)	Volume (m ³ /ha)	
All species	All	N/A	25	300	90% of MAI

Harvest Scheduling Priorities

Harvesting will be scheduled to select the relative oldest stands first in each operating area. All eligible stands in an operating area were harvested before the next operating area was considered. Operating areas were prioritized by District staff at the beginning of the analysis process.

Unsalvaged Losses

Unsalvaged losses due to fire and wind for the Arrowsmith TSA translate to a 0.6 percent loss over the entire TSA based on the figures provided in the September 2001 Timber Supply Area Analysis Report. This amount was modeled as an additional harvest to recognize unsalvaged timber lost as a result of natural disturbances on the THLB each year and is subtracted from all harvest forecasts shown in this report.

Silviculture Systems

All harvesting will be modeled as clearcutting and no thinning of stands was modeled.

⁴ This analysis unit captures small components of cedar, cypress and alder leading stands.

⁵ Figures based in the East Division of the Arrowsmith TSA

Silviculture Assumptions

Assumptions for regeneration method, regeneration delay, initial density and species composition can be found below in Table 11. These assumptions are the same as those used in TSR2. Once harvested stands move from their respective natural analysis (100 series) unit to the corresponding future stand analysis unit (200 series) described in Table 11.

Table 11. Regeneration assumptions by analysis unit

Analysis unit	AU Number	Regen delay	OAFs		Method		Species %							Density	
			1	2 ⁶	Type	%	Gain ⁷	Fd	Cw	Pw	Ba Bg	Hw	Dr	Initial	Final
Douglas-fir — G/M	201	2	15	5	Plant	100	2.7	75	10	5	10			1200	700
Douglas-fir — P	203	3	15	5	Plant	100	2.7	70	10	10		10		1200	700
Other — good/medium/poor site	205	2	15	5	Plant	100	1.3		58		12	30		1000	900
Hemlock/balsam — good/medium site	206	2	15	5	Plant	100	1.9		20		10	70		1000	800
Hemlock/balsam — poor site	207	3	15	5	Plant	100	1.9		20			80		1000	N/A

Standard OAF1 (15%) and OAF2 (5%) values were used for all existing managed and future managed stands with the following exceptions:

- Root diseases⁸:
 - An additional OAF2 of 7.5% was applied to existing managed stands ≥10 years old if they were Douglas-fir leading and on good and medium sites, in the CWHxm1 and CWHxm2 sub zones.
 - An additional 5% was applied to future managed and existing managed stands <10yrs old if they were Douglas-fir leading on good and medium sites, in the CWHxm1 and CWHxm2 sub zones.

Other

There are approved forest development plan blocks within the bounds of the proposed plan area. These blocks have been included in the community forest using current age classes and will contribute volume toward the CFA's AAC. It is assumed that the community forest will likely acquire the rights to these areas as part of the agreements between existing licensees and the provincial government⁹.

⁶ Additional OAF2 values were applied for root disease as described immediately below this table.

⁷ Using the figures determined in TSR 2, the gains noted will be included in the volume tables for future regenerated stands – figure represents % volume gain at age 80.

⁸ Additional information not provided in the TSR documents regarding variants and additional OAF factors provided by Stephan Zelgan ministry of forests pathologist.

⁹ Emma Neil, Tenures Forester, South Island Forest District

Integrated Resource Management

Forest cover requirements stipulating specific seral stage targets are applied in this model to manage for biodiversity, wildlife habitat, scenic values, community watersheds and cutblock adjacency.

Green Up Constraints

As a surrogate for cut block adjacency, a maximum 25% of the THLB in any LU in the CFA may be in stands that are less than 3 meters tall. Site Tools version 3.3 was used to translate this height requirement to an age of 15 years. This represents a total age of 13 years based on a Fir leading stand with a site index of 24.3 meters, and an average regeneration delay of 2 years. This constraint is only applied to the THLB area.

Community Watersheds (CWS)

The majority of the Port Alberni CFA area falls within the Sproat Lake community watershed. Consistent with TSR2, a forest cover constraint will be applied to the crown forest area limiting the area under 5 yrs old to 5% (i.e. limit harvest to 1% of the CFLB per year). Because 10 yr periods were modeled in this analysis, the constraint applied in the model was maximum 10% under 10 yrs (ie. Max 1% per year).

Visual Quality - Scenic Areas

Management for visual quality is consistent with TSR2 standards and limited the area in visual polygons less than 5 meters tall to between 3 and 25 percent depending on the visual quality objective and scenic zone (see Table 14). Site Tools version 3.3 was used to translate the 5 m height requirement to an age of 18 years. This represents a total age of 16 years based on a Fir leading stand with an average site index of 24.3 meters, and an average regen delay of 2 years.

Table 12. Visual quality objectives

VQO	Zone	Green-up height (m)	Maximum allowable area not greened-up (%)
R	1	5	3
PR	1	5	10
M	1	5	20
R	2	5	5
PR	2	5	15
M	2	5	25

Landscape Level Biodiversity

Spatially explicit OGMAs for this area were provided by MSRM and have been excluded from harvesting during the simulation. These OGMAs satisfy the targets established in the old growth order of June 2004. Therefore, additional old seral management constraints are not required for this exercise.

Wildlife Tree Retention

Wildlife tree retention will be modeled as a 2.25% volume netdown applied to both existing and future stands in the contributing land base. The rationale for applying 2.25% is that 75% of the gross WTR target¹⁰ of 9% will be met by forested areas already outside the timber harvesting land base.

¹⁰ A Weyerhaeuser review of South Island Forest District WTP targets has confirmed that this is appropriate.

Results

Projected Harvest Flow

The results of the timber supply modeling simulations indicate that an initial average harvest volume of 23,458 m³/yr is sustainable for the first 9 decades of the 250 year planning horizon. This figure can be increased steadily after the 9th decade to a long term average harvest level of 25,822 m³/yr. Figure 4 illustrates the harvest volumes achieved, net of non-recoverable losses, for the 250 year planning horizon. The slight over achievements seen in some decades is a result of the spatial model being forced to harvest whole polygons until the harvest request is met or exceeded.

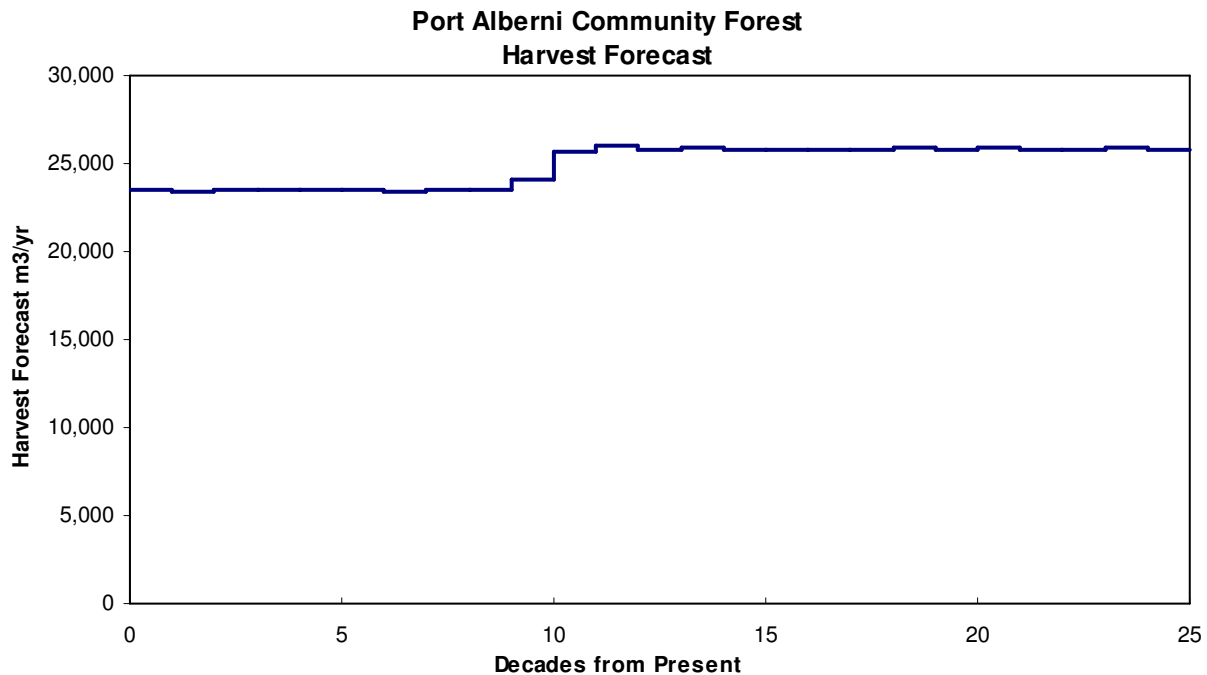


Figure 4. Harvest volumes projected over the 250 year planning horizon

The short term harvest level is limited primarily by the amount of past harvesting activity and the forest cover constraints applied to the community watershed and partial retention VQO areas. There is reasonable harvest opportunity in the initial years of the planning horizon but this volume must be metered out over the first 9 decades until second growth stands are fully online. Harvest opportunity is most limited during the 2nd and 3rd decades. The long term harvest level is 10% higher than this initial level and occurs once second growth stands begin to dominate the harvest profile. These stands provide more flexibility in meeting limiting forest cover constraints and tend to produce more volume per hectare.

Growing Stock

Figure 5 illustrates the total and merchantable volume of timber occurring on the THLB over the 250 year planning horizon. Total volume is the net volume (considering utilization standards and decay/waste/breakage) of all stands. The merchantable volume is the subset of total volume where stands meet minimum harvest age criteria. The merchantable stock decreases initially as the currently merchantable stands are logged and then climbs in 40-100 year time period as the large area of currently young stands comes online. The generally flat trend from decade 12 onward indicates that harvest rates are close to matching growth rates and a sustainable harvest level is occurring.

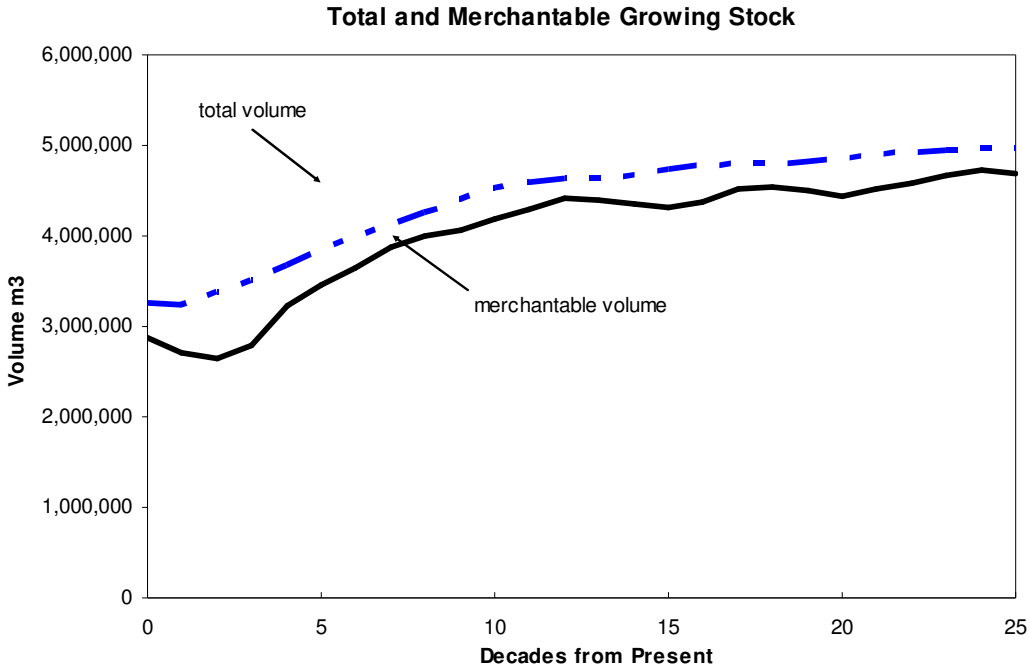


Figure 5. Total and Merchantable growing stock on the THLB

Average Harvest Age

Figure 6 illustrates the average harvest ages over the planning horizon. The spike evident in the 8th decade is a result of the model harvesting a substantial amount of very old low site productivity hemlock sites during this period.

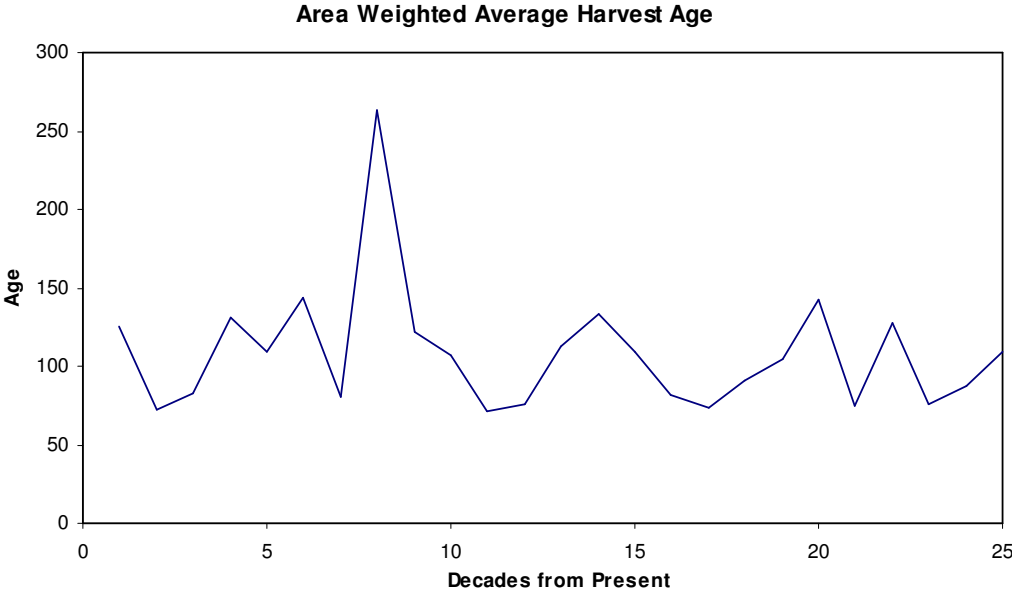


Figure 6. Area Weighted Harvest Age

Natural and Managed Stand Composition

Figure 7 illustrates the transition from natural to managed stands. Managed stands are first harvested in the 2nd decade and continue to contribute significantly to the harvest volume from that point onward. They almost completely dominate the harvest after decade 10. The transition to managed stands is slowed down by the harvest priority setup in the model – all eligible stands in each operating area were harvested before moving to the next operating area. Thus, some younger stands were being harvested before eligible older stands because of their location.

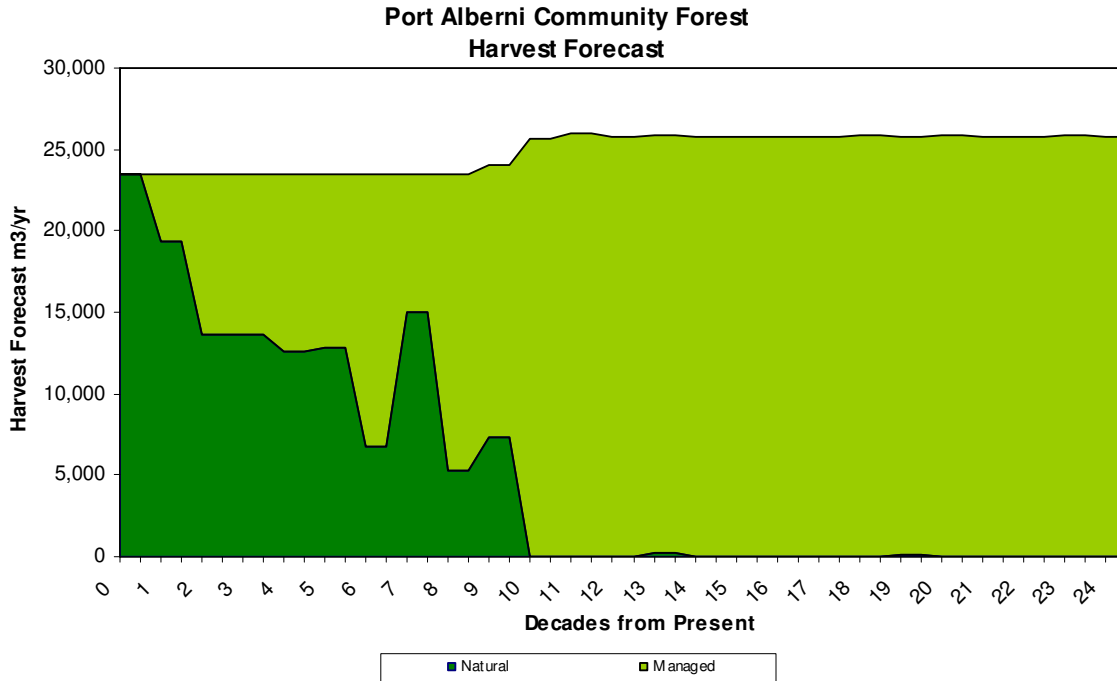


Figure 7. Natural and managed Stand Contributions to Harvest Profile

Average Harvest Volume

Figure 8 illustrates the average harvest volume per hectare realized in each decade of the simulation. Harvest volumes realized in different periods of the simulation correspond with different site productivity characteristics encountered on the CFA land base. In periods where low productivity sites are drawn into the average, the average declines. The higher peaks occurring in the latter stages of the simulation are due to the higher volumes associated with managed stands compared to unmanaged stands. During the first 100 years the average volume per hectare is 526 m³/ha compared to the remainder of the planning horizon which averages 585 m³/ha.

Average Annual Harvest Area

The average annual harvest area exhibits an inverse relationship with harvest volume per hectare. As the volume realized per hectare increases, fewer hectares are required to fulfill the harvest objective and vice versa. Figure 9 illustrates the average annual harvest area as it fluctuates over time. During the first 100 years the average area harvested is 45.9 ha compared to the remainder of the planning horizon which averages 45.8 ha while supporting a slightly higher annual volume of harvest.

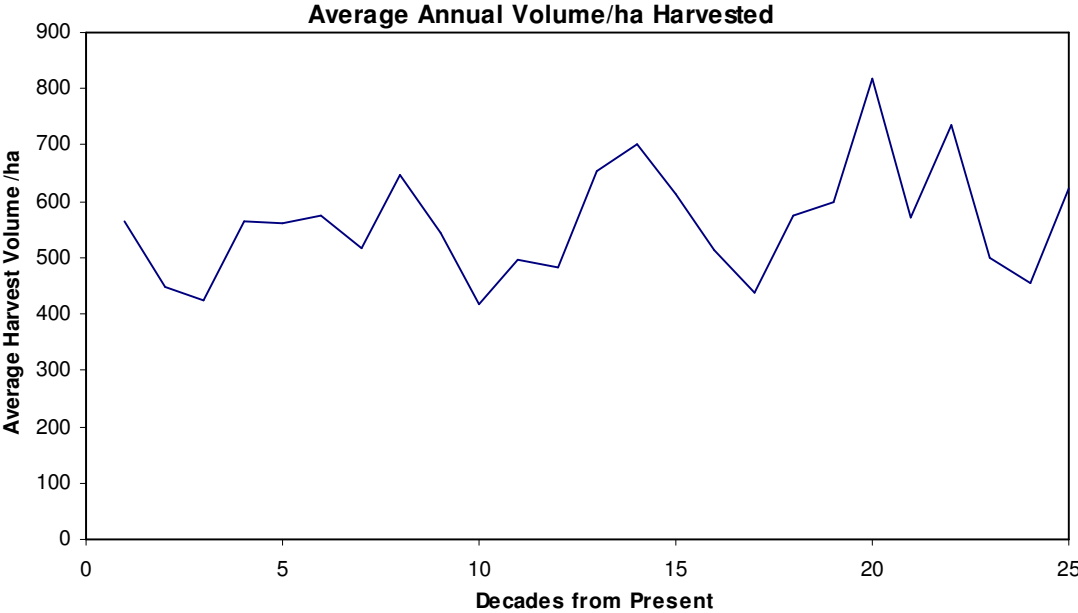


Figure 8. Average Annual Volume/ha Harvested

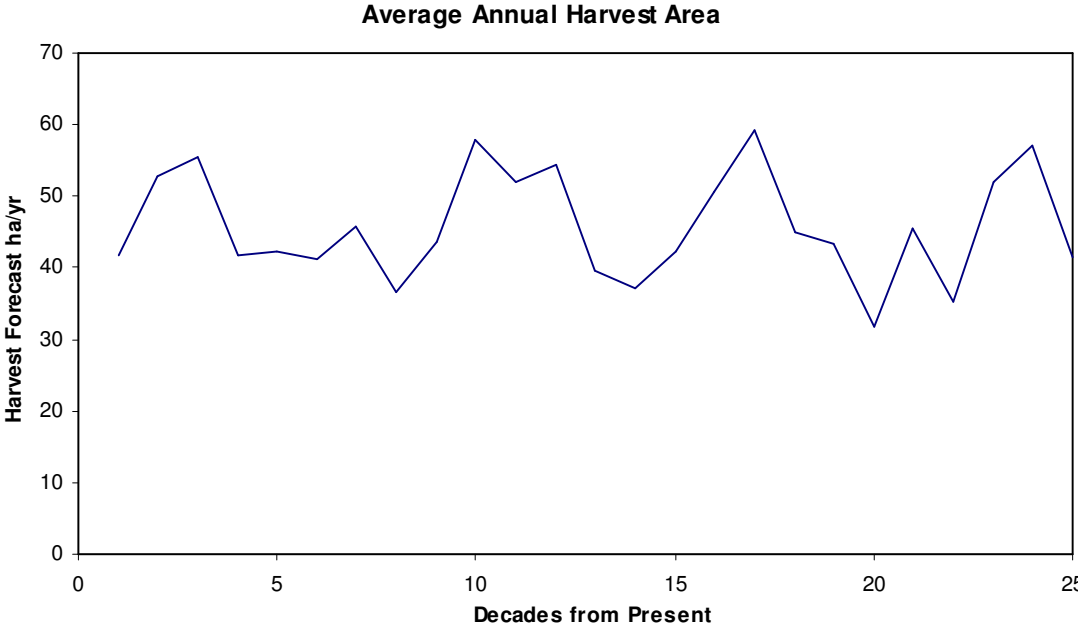


Figure 9. Average Annual Harvest Area

Age Class Distribution

Figure 10 illustrates 50 year time steps of the age class distribution as it occurs over the 250 planning horizon. The present condition (year 0) shows a heavy weighting towards young and mid seral stands, many of which do not meet minimum harvest age requirements. This condition is one of the limiting factors defining the short term harvest level.

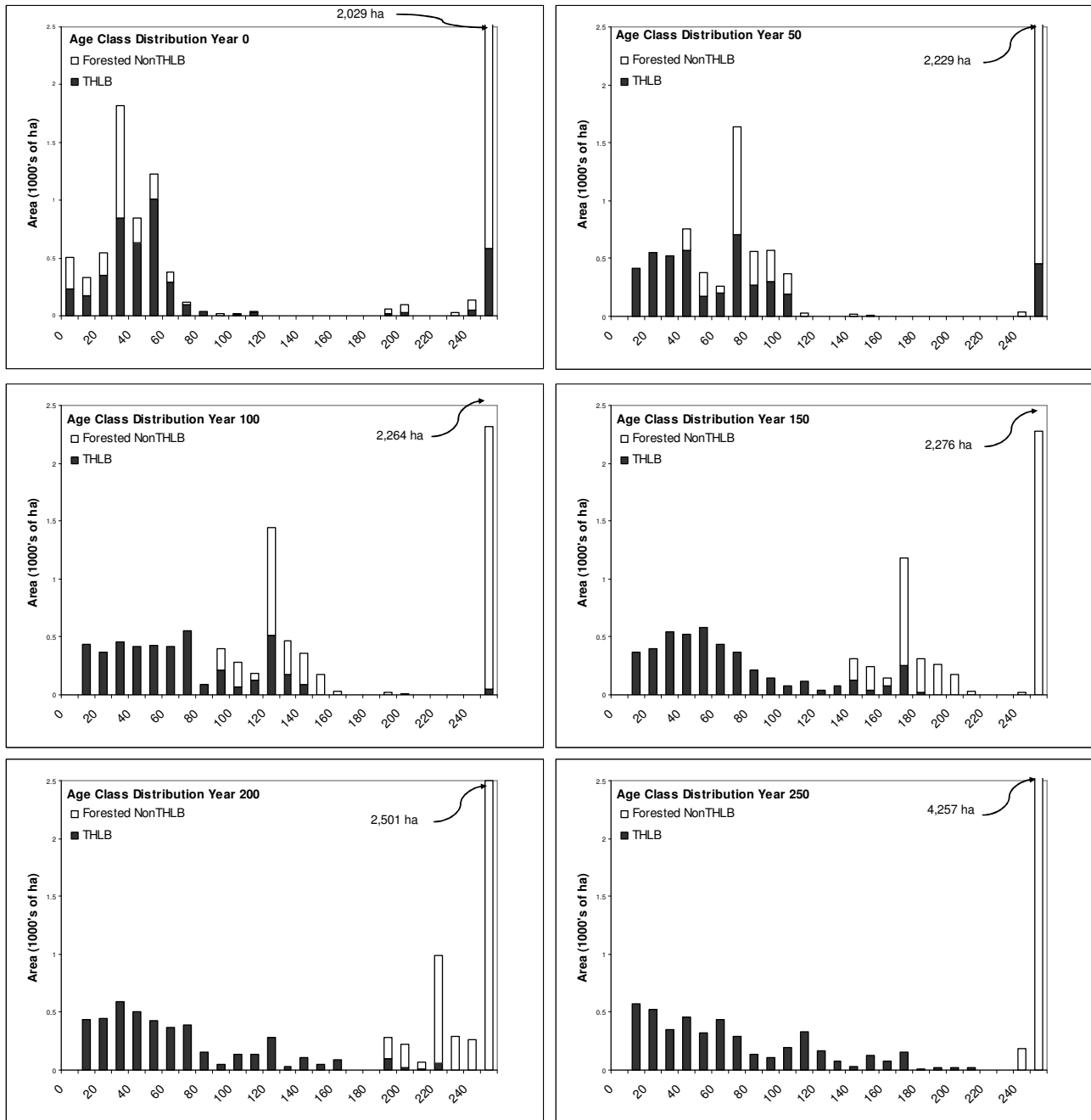


Figure 10. Age Class Composition over Time of the Port Alberni Community Forest

By the 100th year there is a much more uniform distribution of area in age classes on the THLB. This corresponds with the point in time where the long term harvest level is achieved. At 250 yrs into the simulation, very little THLB area occurs in older age classes because it is all cycling within rotation ages averaging approximately 100 years old. A small amount of THLB area exists in older ages because forest cover constraints force them to remain unharvested.

The forested area outside the THLB continues to age over the planning horizon and is all old by the end of the planning horizon.

Constraint Analysis

There are several constraints applied to the contributing land base to address forest management issues and objectives. These management objectives limit disturbance or maintain appropriate levels of specified forest types that are required to satisfy visual quality, biodiversity and other attributes at specified levels. Old seral requirements were met using spatial OGMA (811 ha) that were netted out of the THLB (see Table 5). The area affected by each of these constraints is illustrated in Figure 11.

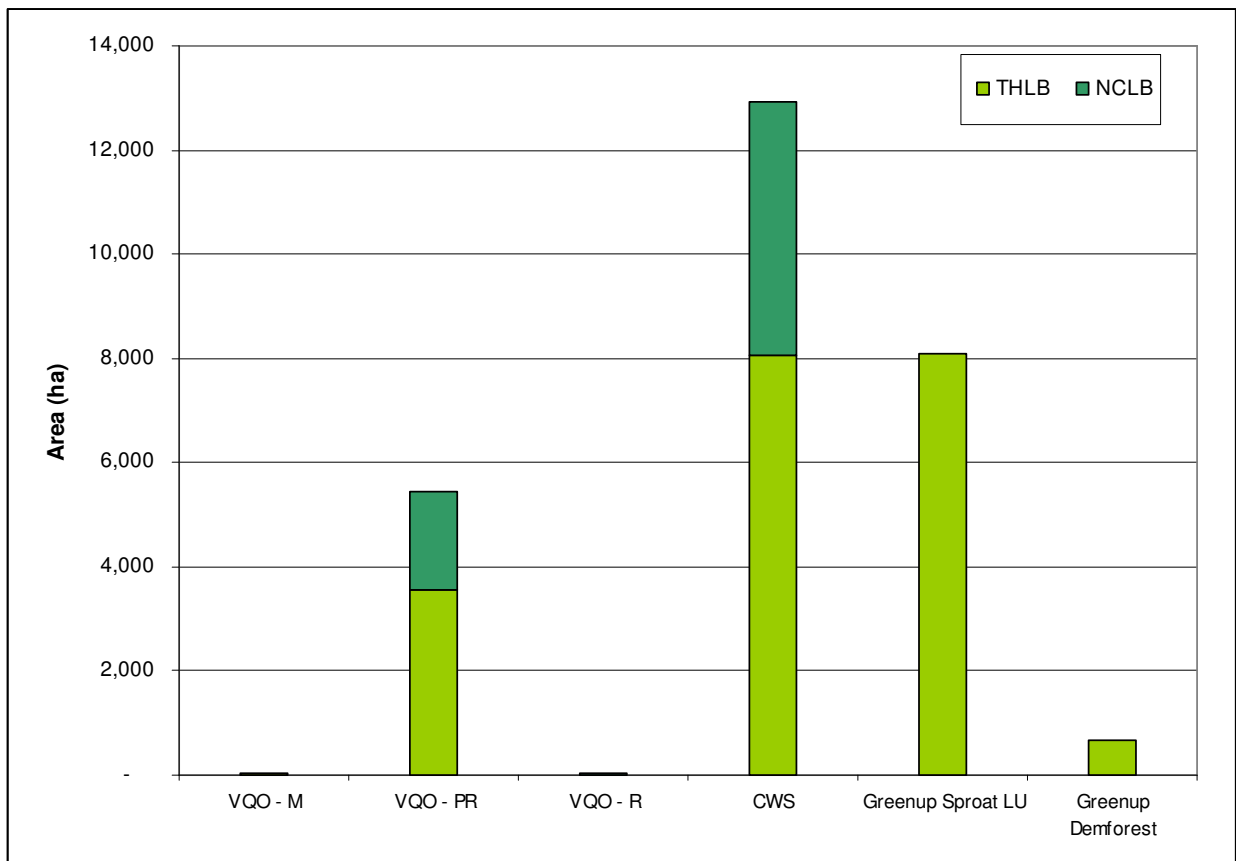


Figure 11. Integrated Resource Values: Area Summary by Objective

Young seral constraints, those which limit the portion of the land base under a certain height have the largest impact on this analysis in the short and long term. The young seral constraints modeled in this simulation are green-up, visual quality, and the Sproat Lake Community Watershed (CWS). The CWS constraint is the most extensive and limiting constraint.

Contribution of Helicopter Wood

The contribution to the harvest flow from helicopter volume typically ranges between 0 and 19 percent as illustrated in Figure 12. A spike occurs in the 8th decade where it represents 31% of the harvest volume.

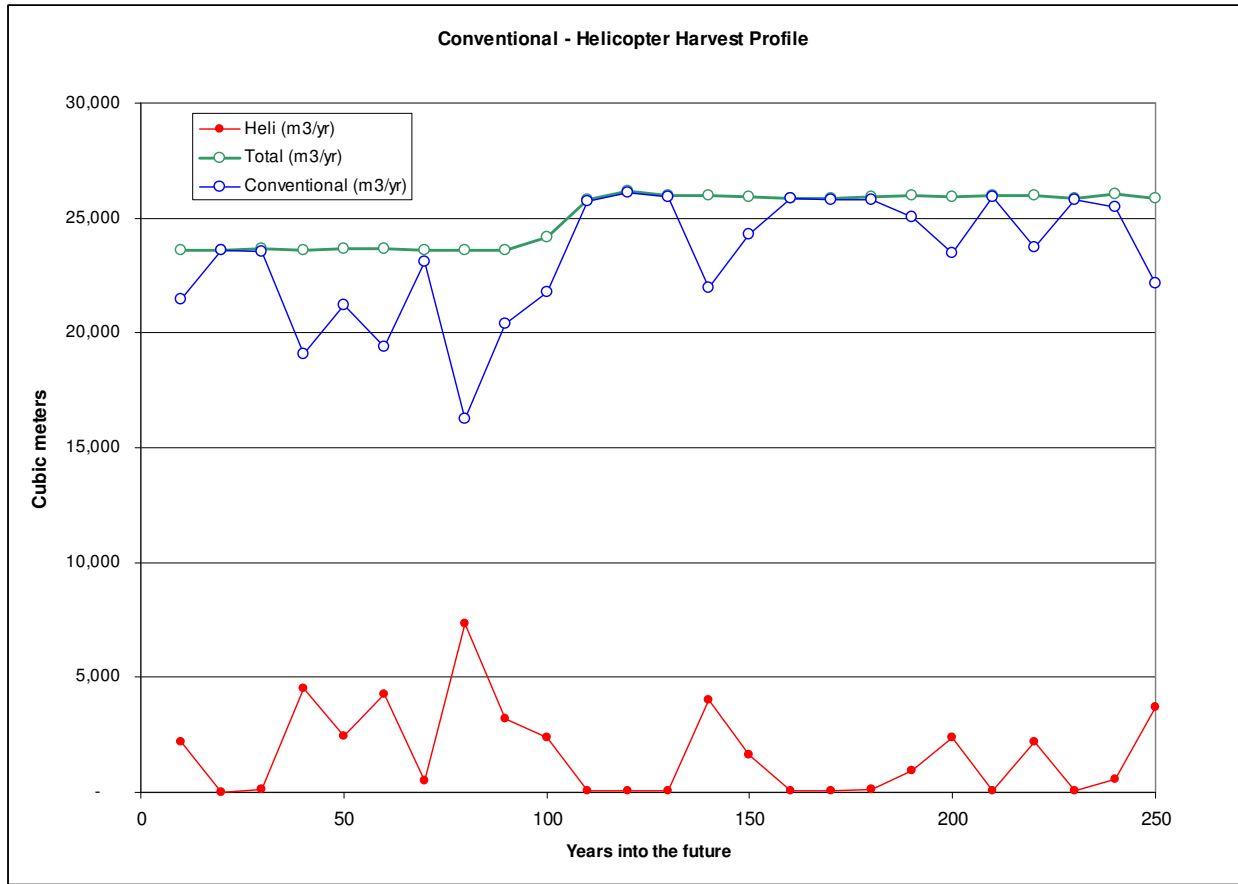


Figure 12. Conventional – Helicopter harvest profile.

Short Term Harvest Availability

This report presents an initial average harvest flow of 23,458 m³/year. The area ‘harvested’ during the first 20 years in the modeling exercise is illustrated spatially in Figure 13 using two 10 year periods. This should not be construed as an operational plan but it does illustrate areas considered high priority and available for harvest by the model. Figure 13 also illustrates “Other Available Options” which represent other stands which were available or became available during the 20 year period (consistent with the current harvest priorities). Initial harvesting in the CFA is unlikely to follow the mapped projection but the areas illustrated do provide a starting point for more detailed planning.

Harvest availability is limited in the initial stages of the planning horizon for this community forest. The initial condition of the CFA has 10% of the plan area less than 21 years old and 75% of the plan area is less than 61 years old. Fortunately, the minimum harvest ages for many sites in this CFA are quite low and this initial condition requires a relatively short time to overcome.

Table 13 details harvest volumes by analysis unit during the first 50 years of the planning horizon. Fir analysis units dominate the profile which is to be expected considering the species composition of the CFA. Table 3 indicates that the bulk of the older stands are actually hemlock/balsam but these areas tend to occur in the most western operating areas and are the lowest priority, thus the model does not harvest there in the short term. Because of the harvest priority setup, there is significant spatial

concentration of harvest in the highest priority operating areas. This is not likely to occur in reality but there are additional options available (as shown on map), and even more additional options available if the harvest priority setup were to be changed.¹¹

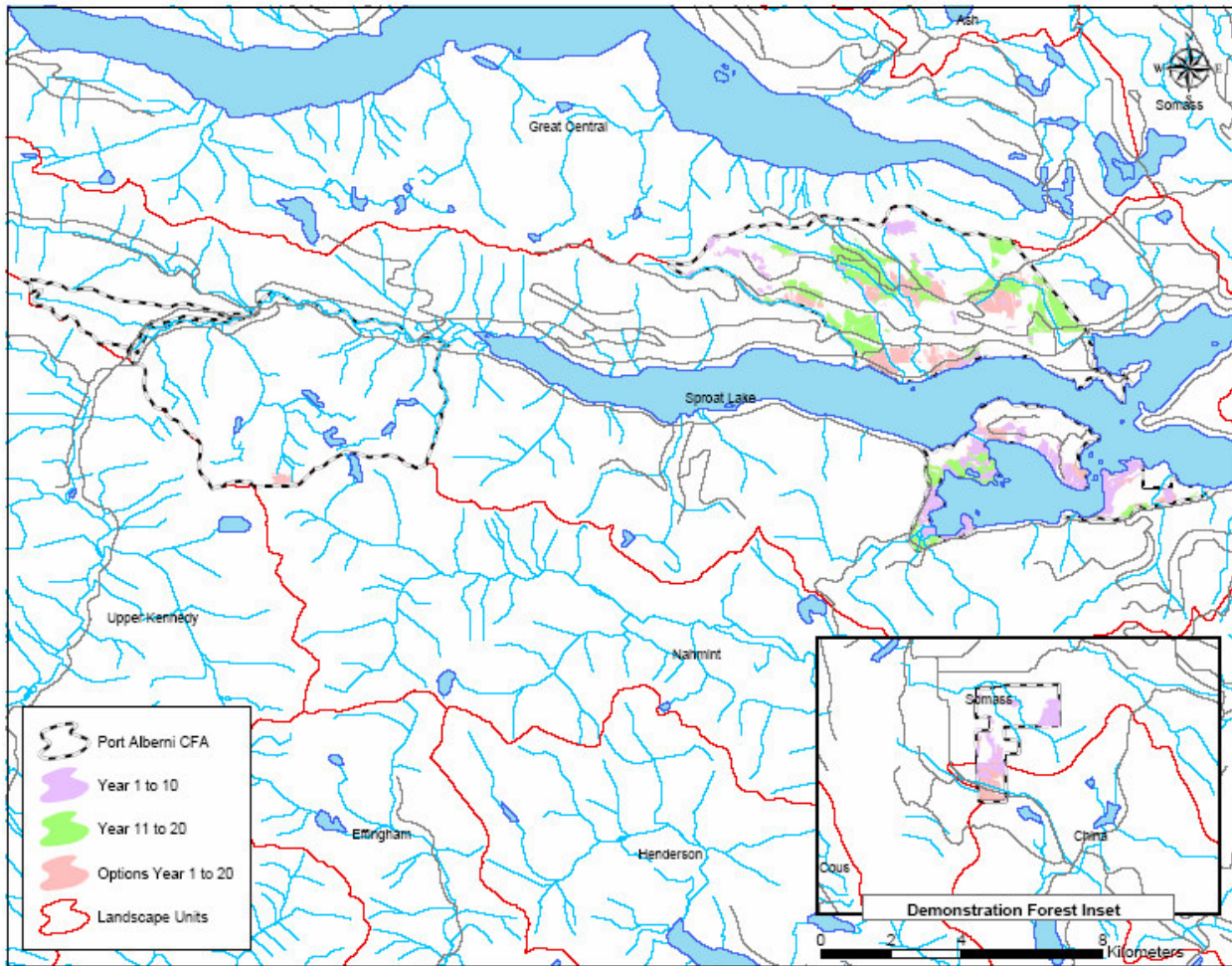


Figure 13. Harvest Availability in years 1 to 20

Table 13. Analysis unit volume summary

Analysis Unit	Avg Harvest Volume/yr by Period				
	Yr 1-10	Yr 11-20	Yr 21-30	Yr 31-40	Yr 41-50
Fd G/M	14,991	16,349	7,930	6,004	9,450
Fir Poor	3,326	2,346	5,564	-	9
HB GM	578	-	-	7,597	2,771
HB P	4,042	610	248	50	-
Other	680	192	-	9	430
Fd EM	-	4,080	8,704	6,781	5,497
HB EM	-	-	1,200	3,172	5,483
Total	23,618	23,578	23,649	23,616	23,643

¹¹ The available options shown here are based on the operating area/oldest first priority system. If a pure oldest first priority system were to be implemented, the old HB stands in the western operating areas would be considered available because the model would rank these stands before younger stands in the east. There are more stands that are old enough to harvest than can actually be harvested when the cover constraints are considered, thus the spatial location of these 'available' stands is partially dictated by harvest priorities.