Coastal Small Tenures
Timber Supply Analysis

Sechelt Community Forest Agreement
Sunshine Coast TSA

Timber Supply Analysis Report

DRAFT v1.0

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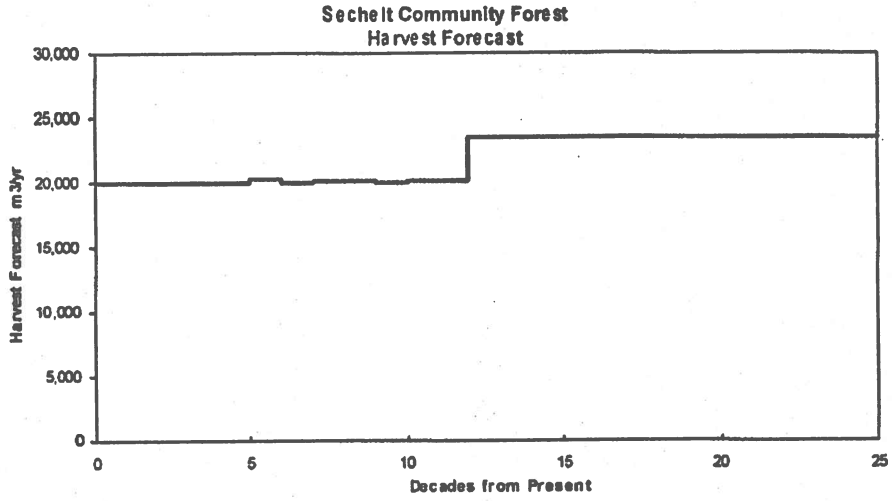
The Forsite project team consisted of Cam Brown, RPF, Mike Landers, RPF, Jonathan Armstrong, RPF, Pat Wylie, Stephen Smyrl, and Steve Patterson.

Executive Summary

This report provides a timber supply forecast for the proposed Sechelt Community Forest area located near the community of Sechelt in the Sunshine Coast Timber Supply Area. The total size of the proposed CFA area is 10,818 ha, of which the majority (94%) is crown forested land base (CFLB) but only 5,809 (54%) is considered timber harvesting land base (THLB).

Timber supply was modeled spatially over 250 years using similar assumptions as those used in the last timber supply review (TSR2) for the Sunshine Coast TSA. Alterations were made to these assumptions as requested by MoF District staff to better reflect the unique circumstances of this land base. The figure below illustrates the projected harvest flow over time and shows that the initial harvest level of 20,000 m^3 per year can be maintained for 120 years before it transitions up to a long term harvest level of 23,500 m^3/year.



A large portion of the THLB is made up of hemlock leading stands (49%), while Douglas-fir (22%) and Balsam (19%) are the next most common. The majority of the THLB has site indexes between 10 and 25 with a weighted average site index for the THLB of 19.1. A substantial portion (47%) of the THLB area is currently under 40 yrs of age due in part to past logging. The majority (73%) of the area over 80 years old is hemlock leading, so short term harvesting opportunities are focused on old hemlock stands.

In the short term, the constraints having the largest impact on harvest availability are the partial retention VQOs on the lower slopes of the CFA. These areas are violating the allowable disturbance limits at the beginning of the planning horizon and so no harvest is allowed until the stands have aged into the 2nd decade. Community watershed harvest limits (1% per year) and green up restriction are not limiting the harvest levels in the short term.

In the long term, all of the VQO constraints and green up constraints act to limit harvest as many of them are pushed to maximum disturbance levels. The Gray Creek CWS restrictions also serves to limit harvest in the long term but the Chapman CWS restrictions are never reached because of the small proportion of this area that is eligible for harvest.

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Introduction

As a result of timber volume reallocations under Bill 28, new Community Forest Agreements (CFAs) are being created across the province of BC. This report describes the proposed Sechelt CFA areas and the results of a timber supply analysis completed to define an appropriate area to support an annual allowable cut (AAC) of 20,000 m^3/yr. This harvest objective was defined during the Bill 28 reallocation process

The proposed Sechelt CFA area consists of one contiguous area covering 10,818ha and is located just outside the community of Sechelt in the Chapman Landscape Unit (see Figure 1).

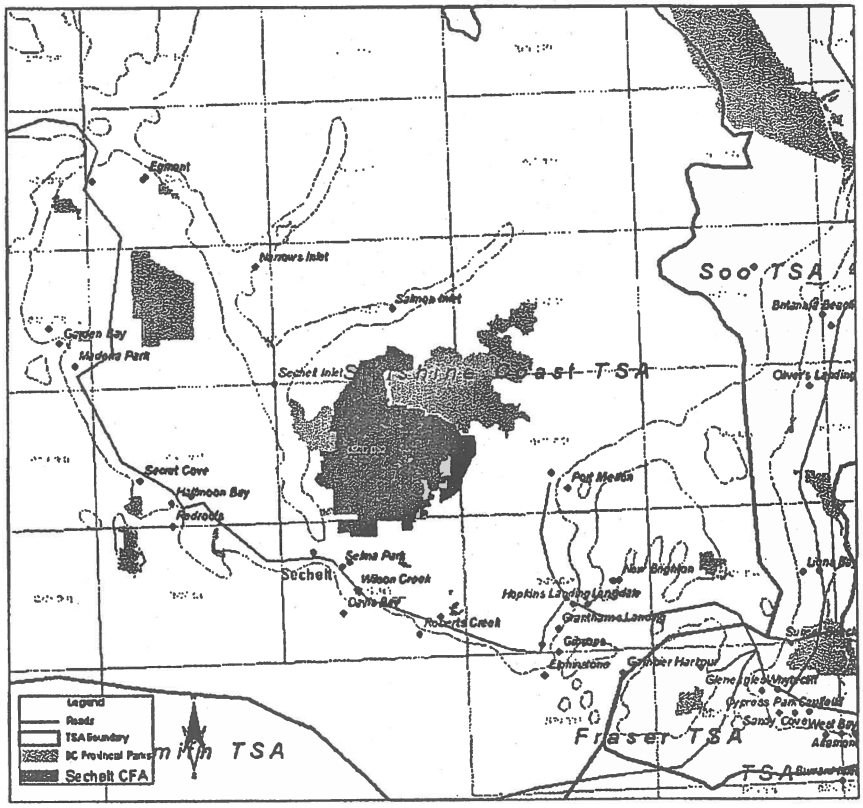

Figure 1. Proposed Sechelt Community Forest

Methods

MoF 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 20,000 m^3/yr. 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 (priority areas 1A and 1B).

A spatially explicit model called *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 and 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). Land base status, silviculture systems, rotation ages and growth and yield curves are assigned to each polygon in the model. At each time step, polygons are first ranked according to a cutting priority (e.g. oldest first) and then harvested from this queue subject to constraints designed to ensure forest level objectives (e.g. seral stage targets) are achieved. 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 harvest schedule that can be implemented operationally. Little effort was invested in making logical harvest units or controlling block level spatial relationships. The benefit of using the spatial model is the ability to visually verify model inputs and outputs. The spatial representation of the harvest schedule should only be used to identify eligible high priority (as defined in the model) harvest areas as they occur over the planning horizon.

Community Forest Attribute Summary:

The characteristics of this community forest area are described in the tables and figures below.

The land base is described by ecosystem type (BEC variant) in Table 1 and Figure 2 below. The dominant ecosystems are the Coastal Western Hemlock variants.

Table 1. BEC variant classification for the CFA area.

	Hectares by Landbase Type			
BEC LABEL	THLB	NCLB	NoN-CFLB	Totals
CWH dm	1,689	945	102	2,736
CWH vm 1	195	551	47	792
CWH vm 2	2,325	1,373	167	3,865
CWH xm 1	170	20	16	206
MH mm 1	1,430	1,701	87	3,218
Totals	5,809	4,590	419	10,818

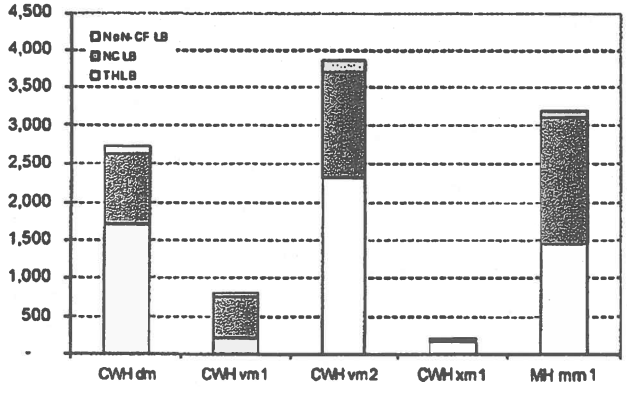

Figure 2. Land base area by BEC variants

Table 2 below details the distribution of the THLB area by leading tree species and site index. A large portion of the THLB is made up of hemlock leading stands (49%), while Douglas-fir (22%) and Balsam (19%) are the next most common.. The majority of the THLB has site indexes between 10 and 25 with a weighted average site index for the THLB of 19.1.

Table 2. THLB by species group and site index.

	THLB hectares by Leading Species									
Site Index	Balsam	Cedar	Cypress	Fir	Hemlock	Pine	Alder	Maple	NSR	Totals
<10	27	-	-	-	253	-	-	-	-	279
10-15	315	0	-	-	1,017	11	-	-	17	1,361
15.1-20	161	258	4	719	675	-	7	-	-	1,825
20.1-25	409	8	4	246	487	-	4	-	142	1,300
25.1-30	160	29	29	195	297	-	31	3	-	744
30.1-35	20	3	-	53	108	-	65	-	-	249
35.1-40	-	-	-	28	-	-	-	-	-	28
40+	-	-	-	17	-	-	6	-	-	23
Totals	1,091	297	37	1,259	2,837	11	114	3	159	5,809
% of Total	19%	5%	1%	22%	49%	0%	2%	0%	3%	100 %

Table 3 below describes the THLB area in terms of leading species and age class while Figure 3 presents the age class distribution graphically for both the THLB and CFLB.

A substantial portion (47%) of the THLB area is currently under 40 yrs of age due in part to past logging. The majority (73%) of the area over 80 years old is hemlock leading so short term harvesting opportunities will likely focus on old hemlock stands.

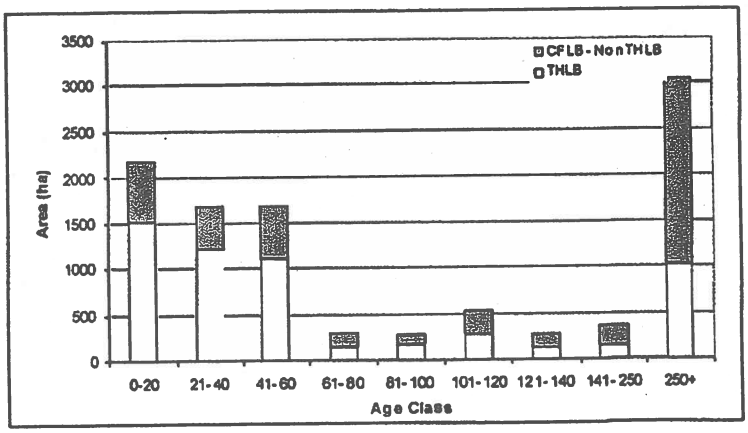

Figure 3. Age class distribution for the CFLB and THLB.

Table 3. THLB Area by leading species and age class

	Hectares by Leading species									
Age Class	Balsam	Cedar	Cypress	Fir	Hemlock	Pine	Alder	Maple	NSR	Total
0-20	671	17	33	228	395	11	-	-	159	1,518
21-40	317	136	-	300	437	-	21	3		1,214
41-60	18	122	-	275	676	-	19	-		1,112
61-80	23	-	-	66	16	-	58	-		165
81-100	-	-	-	98	59	-	16	-		174
101-120	-	22	-	136	126	-	-	-		284
121-140	-	-	-	104	47	-	-	-		152
141-250	0	-	-	36	130	-	-	-		166
250+	63	0	4	15	943	-	-	-		1,024
Total	1,091	297	37	1,259	2,837	11	114	3	159	5,809
% of Total:	19%	5%	1%	22%	49%	0%	2%	0%	3%	100%

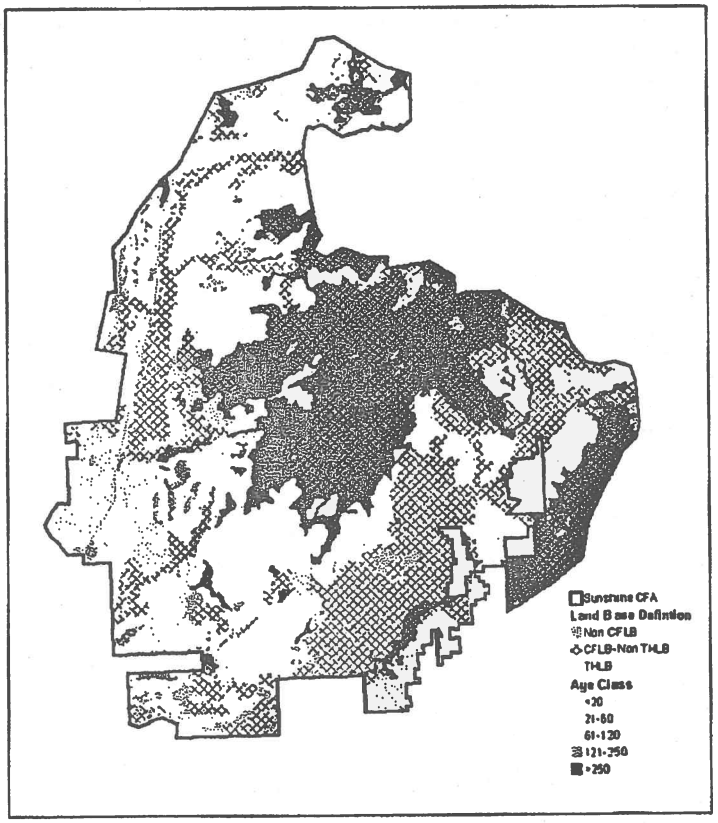

Figure 4. Age class and land base definition map

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 tallied toward one factor to avoid double counting. Areas were always assigned to the netdown reason occurring highest on the list in Table 4.

Table 4. Timber harvesting land base definition.

Landbase Description	Area (ha)	% Total	% CFLB
Total CFA Area	10,818	100%	
Less			
Private land / Misc Rsvs	2	0%	
Non Forested / Existing Rds	417	4%	
Total Crown Forest Land Base	10,399	96%	100%
Less			
Parks	19	0%	0%
Inoperable	1,433	13%	14%
ESAs	58	1%	1%
Low Site / Non Merch	673	6%	6%
Soils/Terrain	623	6%	6%
OGMA	368	3%	4%
IWMP Zone1 or 2	1,416	13%	14%
Timber Harvesting Land Base	5,809	54%	56%

Modeling THLB

The THLB found in the TSR2 spatial file was derived using partial netdowns. For spatial timber supply modeling, polygons must be entirely THLB or NonTHLB 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 larger than the THLB area on the 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. Where 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 described below.

Parks

A small area of park ownership still overlaps into the CFA area so it was removed from the THLB. The final CFA boundary will exclude this area.

Inoperable Areas

Inoperable polygons are those polygons unavailable for terrain related or economic reasons. TSR2 used a combination of TSA wide mapping from 1992 and a licensee review in 1998. This analysis uses the operability criteria as outlined in TSR2.

Environmentally Sensitive Areas

Avalanche tracts and areas where reforestation problems are expected to prevent harvesting (ESA categories A1 and P1/2) have been reduced 100% consistent with TSR2. Soils ESAs are discussed below under Terrain and Soils. No other ESA values requiring netdowns existed in the CFA area but were not used (i.e. Recreations- Low polygons).

Terrain and Soils

Areas of sensitive soils and areas prone to mass-wasting and post-harvest landslides were removed from the land base. The criteria for this analysis followed that used in TSR2:

Stability class V (high) was reduced by 100%,
Stability class IV was reduced by 30%,
ESA category S1 (high) was reduced by 90%,
ESA category S2 (moderate) was reduced by 50%,

Slopes over 60% were reduced by 30%.

Low Productivity Sites / Non Merchantable Types

Low productivity sites are those areas that do not meet minimum volume per hectare and site index criteria. The criteria used are the same as those used in TSR2:

- All unmanaged stands with volumes less than 300m³/ha and
  - a site index less than 15.5 for Douglas-fir, not projected to produce 300m³/ha by age 150 years
  - a site index less than 13.5 for cedar, not projected to produce 300m³/ha by age 150 years
  - a site index less than 12.0 for hemlock/bal sam/s pruce, not projected to produce 300m³/ha by age 150 years
  - a site index less than 31.0 for alder, not projected to produce 300m³/ha by age 150 years
  - a site index less than 35.0 for other merchantable deciduous, not projected to produce 300m³/ha by age 150 years
- Deciduous species other than alder and maple are considered non-merchantable

Roads, Trails, and Landings

Existing roads were mapped spatially at 12 meters wide and then removed from the THLB to address existing roads, trails and landings. Future roads will be addressed using a 4.6% volume reduction on future yield curves. This is consistent with the TSR2 approach.

Cultural Heritage Resources

This analysis uses the spatial data contained in the TSR2 resultant and employs the same process as TSR2 where culturally modified trees and areas within 50 meters of archaeological sites were 100% removed from the THLB.

Riparian Reserves and Management Zones

TSR2 accounted for riparian management and gully management through a 4.1% reduction (3.3% riparian + 0.8% gully) on each THLB polygon. For this analysis, these will be addressed by reducing all yield curves by 4.1%.

OGMAs

All OGMAs as provided by MSRM (Gary Sutherland, Dec 2004) for the Sechelt and Chapman Landscape Units were 100% removed. These OGMA areas were confirmed to be at 100% of target levels.

Integrated Watershed Management Plan for Chapman/Gray Creeks

The areas inside the Conservation zone (1) and the Terrain/FEN zone (2) were completely excluded from the timber harvesting land base because harvesting is not likely to occur within these areas. See discussion under *Integrated Resource Management - Community Watersheds* for more details.

Growth & Yield Assumptions

Yield Model Assignment

- Two growth and yield models were used to estimate timber volumes for this 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 natural stands (coniferous and deciduous) and regenerating pine stands.
- 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 managed coniferous stands (currently < 20 yrs old plus all future regenerated stands). Deciduous stands are assumed to regenerate to coniferous species and these regenerated stands are also grown using TIPSY.

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 will use a 17.5 minimum dbh
- Stands using the TIPSY model will use a 12.5 minimum dbh.

Volume Exclusions

Alder and maple species are commercially utilized but all other deciduous species volumes have been removed from stands in VDYP.

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). Table 5 details how the area in the community forest area was grouped into analysis units. Analysis units starting with "EM" describe existing managed stands in the plan area. These EM analysis units represent broader groupings than TSR2 because areas did not warrant more detail.

Table 5. Analysis Units for Existing Stands

AU#	AU Description	Regen AU #	THLB Area	Wtd Avg Site Index	Definition
101	Fd G/M CC	201	197	31.4	Fd leading stands on good/med sites >= 20 yrs of age – clearcut
102	Fir P	202	862	20.7	Fd leading stands on poor sites >= 20 yrs of age – clearcut
103	Cw All	203	284	17.6	Cw leading stands >= 20 yrs of age.
104	HwBlSs G/M	204	743	25.6	Hw or Ba or Ss leading stands on good/med sites >= 20 yrs of age – clearcut
105	HwBlSs P	205	2174	15.1	Hw or Ba or Ss leading stands on poor sites >= 20 yrs of age – clearcut
106	Pine	206	11	11.0	Pine leading stands >= 20 yrs of age.
107	Deciduous	207	117	29.7	Deciduous leading stands (alder and maple only).
501	EM Fir All - CC	501	200	21.6	Fd leading stands under 20 yrs of age - clearcut
502	EM Cw All	502	50	19.4	Cw leading stands under 20 yrs of age.
503	EM HwBlSs All	503	1171	20.1	Hw or Ba or Ss leading stands under 20 yrs of age.
Grand Total			5,809		

Forest Cover

The forest cover used in this analysis is that used in the TSR2 data package but with ages projected to 2004. No harvest has taken place in the proposed area since TSR2 so no depletions update was completed.

Management Assumptions

Minimum Harvest Age

The minimum harvest ages used in this analysis will be consistent with the methodology used in TSR2. The age at which the stand has reached all of the following defines the minimum harvest age:

- 95% of culmination (maximum mean annual increment)
- a minimum volume/ha of 300 m^3/ha (as per TSR2)

This resulted in minimum harvest ages as low as 50 on good sites and as high as 110 on poor sites.

Harvest Scheduling Priorities

Harvesting will be scheduled to select the relative oldest stands first in each operating area. Harvesting will also be prioritized based on the ranked areas the Sunshine Coast Forest District have provided in order to identify how much of the proposed CFA will actually be required to support the 20,000 m3 harvest level.

Unsalvaged Losses

Unsalvaged losses due to fire and wind for the Sunshine Coast TSA have been assessed at 1% of the harvest level based on the 2001 TSR2 Timber Supply Area Analysis Report. This amount was modeled as an additional harvest that "nature" takes each year and is subtracted from all harvest forecasts shown in this report.

Silviculture Systems

Good and medium site Douglas-fir leading sites within the community interface zone had a shelterwood system applied in TSR2. District staff have confirmed that this is not appropriate for modeling in the CFA so all stands will be modeled using a clear cut silvicultural system. No thinning was modeled.

Silviculture Assumptions

Assumptions for regeneration method, regeneration delay, initial density and species composition can be found below in *Table 6*. These assumptions are the same as those used in TSR2. Harvested stands move from their respective natural stand analysis units (100 series) to corresponding future stand analysis units (200 series).

Table 6. Regeneration assumptions by analysis unit

Analysis unit	AU Number	Regen delay[1]	OAFs		Method		Density		Species			
			1*	2**	Type	%	Initial	Space	SPC 1	SPC 1%	SPC 2	SPC 2%
Fir, good / medium site	201	3	26.2	6.6	Plant	100	1200	0	Fd	80	Cw	20
Fir, poor site	202	3	26.1	5.0	Plant	100	1200	0	Fd	100		
Cedar, all sites	203	3	26.2	5.0	Plant	100	1200	0	Cw	80	Fd	20
Hemlock/balsam/spruce, good / medium site	204	3	28.3	5.0	Plant	100	1200	0	Fd	50	Cw	50
Hemlock/balsam/spruce, poor site	205	3	27.6	5.0	Plant	100	1200	0	Hw	50	Cw	50
Pine	206	3	26.1	5.0	Natural	100	1200	0	Pl	100		
Deciduous (Alder/Maple)	207	3	26.1	5.0	Plant	100	1200	0	Fd	60	Cw	40
Managed, Fir, all sites	501	3	21.5	7.0	Plant	100	1200	0	Fd	70	Cw	30
Managed Cedar, all sites	502	3	23.5	5.0	Plant	100	1200	0	Cw	80	Fd	20
Managed Hemlock/balsam, all sites	503	3	24.4	5.0	Plant	100	1200	0	Fd	50	Cw	50

* Reflects standard OAF1 (15%) + 4.1% riparian + 4.6% future roads (not 500 series)+ 2.4% WTP + IWMP Zone 3 reduction
** Reflects standard OAF2 (5%) + 4.6% future roads + root rot reduction where applicable

As per TSR2, future regenerated stands have been assigned gains associated with the planting of Class A seed. A genetic gain of 1.3% for planted cedar, 1.9% for hemlock and 3.6% for Douglas-fir were incorporated into the managed stand yield tables.

As per TSR2, medium and good Douglas-fir leading stand types of the CWHxm1 and xm2 variants had an additional yield reduction applied (OAF2 increased by 7%) to account for root rot disease. This

[1] Regen delay provided by Brian Kukulies, RPF (MoF Sunshine Coast Tenures Forester), *pers comm.* Dec 2nd, 2004

reduction was applied to AU's 101 (1.6%) and 501 (2.0%) by prorating the 7% according to the amount of THLB in CWHxm variants.

To reflect the 15% volume reduction being applied to stands in the Chapman/Gray IWMP zone 3 areas, an additional OAF1 was applied to specific AU's. The additional OAF was based on the proportion of THLB area in the AU falling within the Zone 3 area. Values ranged from 0 to 2.9%.

Other

There are no approved forest development plan blocks within the bounds of the proposed plan area.

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 33% of 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 17 years. This represents a total age of 14 years based on Douglas-fir leading and an average site index of 19.5m plus a regen delay of 3 years. This constraint is only applied to the THLB area.

For the portions of the CFA that fall within the Community Interface Zone, a maximum 25% of the total THLB can be under 5 meters tall or 21 years. This is based on a Douglas-fir leading stand with an average site index of 19.73 meters (18 yrs) plus a regeneration delay of 3 years.

The TSR2 constraint for Helicopter Harvest Zones was not applied because only no area fell within the THLB.

Visual Quality - Scenic Areas

Management for visual quality will be managed to TSR2 standards by limiting that portion of the relevant visual polygon less than 5 meters tall to between 1 and 25 percent dependant on the targets for the respective scenic area visual polygon. These specifics are detailed in Table 7 below. Site Tools version 3.3 was used to translate this height requirement to an age of 21 years. This is based on a Douglas-fir leading stand with an average site index of 19.5 meters (18 yrs) plus a regeneration delay of 3 years.

Table 7. Visual quality objectives

Group	Forest Cover Requirements
RVQC = Preservation (P)	Maximum 1% of CFLB < 5 meters tall (21 yrs)
RVQC = Retention (R)	Maximum 5% of CFLB < 5 meters tall (21 yrs)
RVQC = Partial Retention (PR)	Maximum 15% of CFLB < 5 meters tall (21 yrs)
RVQC = Modification (M)	Maximum 25% of CFLB < 5 meters tall (21 yrs)

Landscape Level Biodiversity

The current draft spatial OGMAs were excluded from the THLB area. All OGMAs as provided by MSRM (Gary Sutherland, Dec 2004) for the Sechelt and Chapman Landscape Units were 100% removed. These OGMA areas were confirmed to be at 100% of target levels.

Wildlife Trees (WT) and Tree Patches (WTP's)

Future wildlife tree retention will be modeled as a volume reduction applied to all stand yields (2.4%). TSR2 specified WTP reductions for each BEC variant but they were rolled up to an average value (area weighted) for purposes of this analysis. TSR2 assumed that 75% of the WTP requirement could be met in non-contributing areas of CFA and this assumption is maintained.

Table 8. Wildlife Tree Patch retention by BEC

BEC sub-zone	% Retention recommended in LUPG - Table A3.1	Residual area of WTP on the THLB (%)	THLB Area (ha)
CWHdm	10	2.5	1,689
CWHvm	12	3.0	2,520
CWHxm	7	1.8	170
MHmm	6	1.5	1,430
Totals		2.4% (wtd avg)	5809

Community Watersheds (CWS)

Two community watersheds exist in the proposed CFA area (Chapman and Gray Creeks). As per TSR2 assumptions, each of these watersheds will have disturbance limited to 1% of their area per year.

Table 9. Community Watershed Areas

CWS	Total Area (ha)	1% of Area	Constraint Applied Each Decade
Chapman	3972.0	39.7	Max 1% < 1 yr old, or
Gray	2965.9	29.7	Max 10% < 10 yrs old.*
Totals	6937.9	69.4	

* Application will depend on the number of years in a modelling period.

These watersheds are also part of an Integrated Watershed Management Plan[2] (IWMP) prepared in 1998. The direction in this detailed plan has been summarised below with the help of Barry Miller (MoF Sunshine Forest District):

> General guidelines the IWMP provide for higher levels of retention within riparian areas (relative to FPC standards). For this, analysis the differences will not be modelled as the vast majority of the features with higher levels of retention are in areas where harvesting will not be modelled (i.e. FEN's along Chapman and Gray creeks).
>
> Specific management guidelines are provided for the four broad zones that have been mapped within the watersheds :

1. *Watershed Conservation Zone*

   This zone includes the high elevation areas of both Chapman and Gray Creek watersheds and encompasses much of the watersheds' lake storage areas and their respective sub-drainages. No industrial resource extraction or development is permitted. Much of the area is located within the Tetrahedron Provincial Park (declared in June of 1995) and management of this area is provided for under the Tetrahedron Provincial Park Master Plan.

2. *FEN/Terrain Constraint Zone*

   This zone includes areas where terrain characteristics constrain or preclude resource development, Forest Ecosystem Network (FEN) areas established to preserve and maintain wildlife habitat and biodiversity, and a No-Staking-Reserve zone along the mainstem of Chapman and Gray Creeks that precludes mineral exploration and development. The zone encompasses approximately 24% of the Chapman/Gray watersheds. The FEN includes a 600m biodiversity corridor along Chapman Creek and a 200m corridor along Gray Creek, as well as other connecting 100-200m corridors with old growth attributes. Forest harvesting and road development are very limited by IWMP guidelines within this zone. Any tree removal within FEN areas must be approved by WLAP and MoF staff.

   - Timber supply modelling: Terrain class 4 and 5 will be netted out of the land base. No harvesting will be allowed in FEN areas as old growth/biodiversity is the primary

[2] Chapman/Gray Integrated Watershed Management Plan - Jan 1998

objective within them. This effectively prevents harvest from the entire zone so it will not be eligible for harvest during modelling.

3. *Plateau Zone*

This zone is the Tetrahedron Plateau, but outside of the provincial park. The primary goals for this zone are for maintaining and enhancing low water temperatures during the summer months and maintaining late season flows for down stream aquatic habitat and water supply. The management strategy for the zone is for integrated use which accommodates industrial activity subject to specific requirements included in the IWMP (more stringent than the FPC). Innovative harvesting/silviculture prescriptions are highly encouraged. The IWMP defines full hydrologic recovery to occur when stands are 9m tall and directs average opening size to be ~12 ha (max 20ha) and limits the harvest of adjacent areas until they have reached 60% hydrologic recovery (5.4m tall avg ht) if ECA is below 20%.

- Timber supply modelling: The recovery time periods (moratoriums) have elapsed so harvest will be allowed in all sub-basins subject to the 1% per year disturbance limit from TSR2. A four pass harvest system will be assumed across the zone so the modelled greenup constraint will be "maximum 25% < 5.4m tall". Finally, because alternative harvest systems are expected to be heavily used in this zone, a 15% volume reduction has been implemented on all yield tables to account for volume retained above WTP requirements and future losses associated with shading and site occupancy of residuals.

4. *Valley Slopes Zone*

This zone is largely at lower elevations and separated by FENs from the main stems of Chapman and Gray Creeks. It encompasses approximately 34% of the Chapman/Gray watersheds. Forest harvesting is acceptable under provisions of the FPC and the more stringent IWMP specific guidelines. The management strategy for this zone is to allow environmentally sensitive forest harvesting, but at a lower rate of cut and a wider dispersion than that permitted under the FPC. The use of roads for harvesting is to be minimized in favour of heli logging whenever possible. The plan directs average opening size to be ~15 ha (max 30ha) and limits the harvest of adjacent areas until they have reached 60% hydrologic recovery (5.4m tall avg ht).

- Timber supply modelling: The recovery time periods (moratoriums) have elapsed so harvest will be allowed in all sub-basins subject to the 1% per year disturbance limits from TSR2. A four pass harvest system will be assumed across the zone so the modeled constraint will be "maximum 25% < 5.4m tall".

Results

Projected Harvest Flow

The figure below illustrates the projected harvest flow over time for the proposed CFA area. The initial harvest level of 20,000 m^3/yr can be maintained for 120 years before it transitions up to a long term harvest level of 23,500 m^3/year. These value have had non recoverable losses removed.

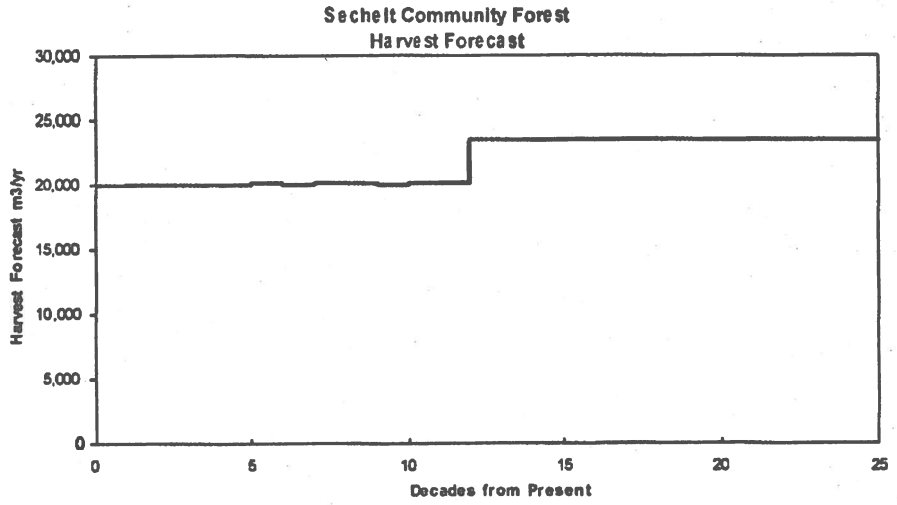

Figure 5. Harvest volumes projected over a 250 year planning horizon

Growing Stock

The total and merchantable volume of timber occurring on the THLB over time is shown in Figure 6. Total volume is the net volume (considering utilization standards and decay/waste/breakage) of all stands on the THLB. The merchantable volume is the subset of total volume where stands meet minimum harvest age criteria.

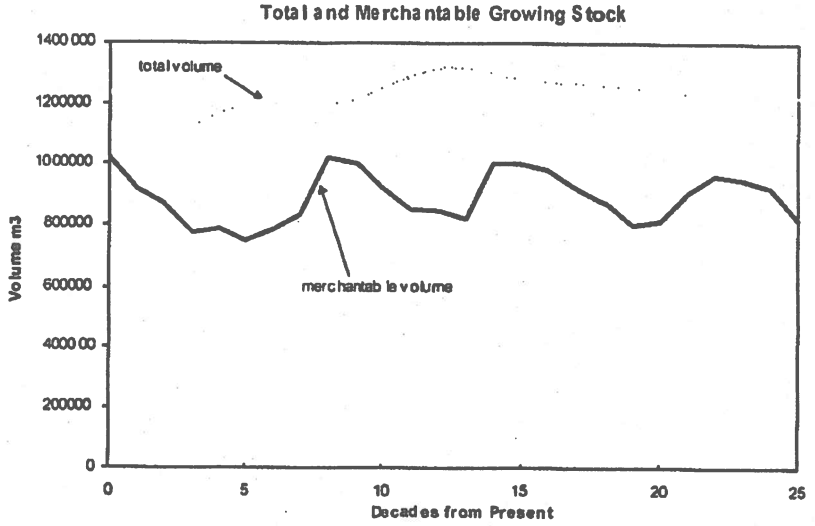

Figure 6. Total and merchantable growing stock on the THLB

Average Harvest Age

The average harvest ages over the planning horizon are shown in Figure 7.

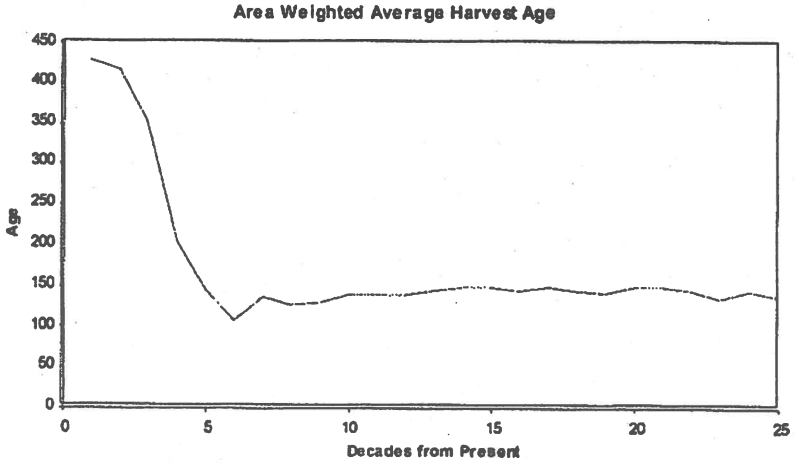

Figure 7. Area Weighted Harvest Age

The average age of harvested stands is initially above 400 yrs old as the model pursues the oldest stands relative to minimum harvest age as first priority. Once all of the existing older stands are harvested, the average harvest age drops to a long term average of 136 years old. This average age is higher than what might be expected based on the minimum harvest ages used in the model because forest cover constraints (i.e. community watersheds, green-up, visuals) are forcing longer rotations.

Natural and Managed Stand Composition

Figure 8 illustrates the transition from natural to managed stands. Managed stands are first harvested in the 11th decade and make up the majority of harvest volume beginning in the 13th decade. The transition to the long term harvest level is possible once managed stands dominate the harvest profile.

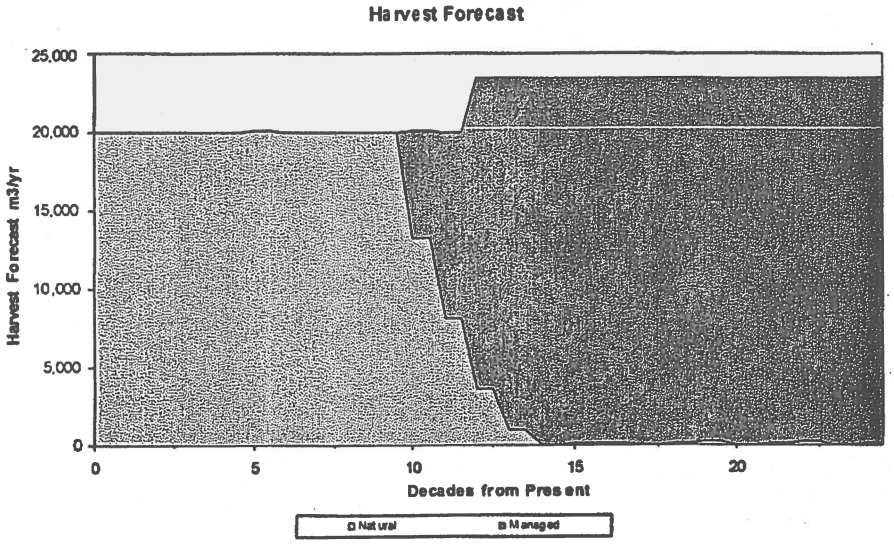

Figure 8. Natural and Managed Stand Contributions to Harvest Profile

Average Harvest Volume

The average harvest volume per hectare realized in each decade of the simulation is shown in Figure 9. Harvest volumes average ~600m3/ha over the planning horizon. The lowest volume stands are being harvested in the 9th to 11th decades as the last of the natural stands are harvested. Other deviations from the average occur because the productivity of the sites harvested in a given period has a large impact. In addition, future managed stands have slightly higher volumes/ha than the existing natural stands.

Average Annual Harvest Area

The average area harvested per year is shown in Figure 10. Harvest area follows shows an inverse relationship with the harvest volume per hectare figure because as the volume realized per hectare increases fewer hectares are required to fulfill the harvest objective and vise versa. The harvest area/yr averages 34 ha in for the first 4 decades and then reflects the volume/ha trends until the 13th decade when the increased harvest request begins. This larger cut requires an average harvest of 42 ha/yr.

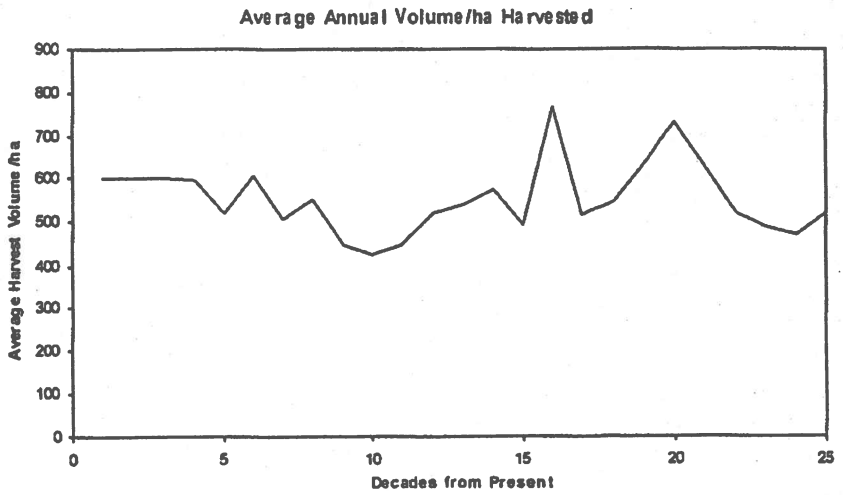

Figure 9. Average Annual Volume/ha Harvested

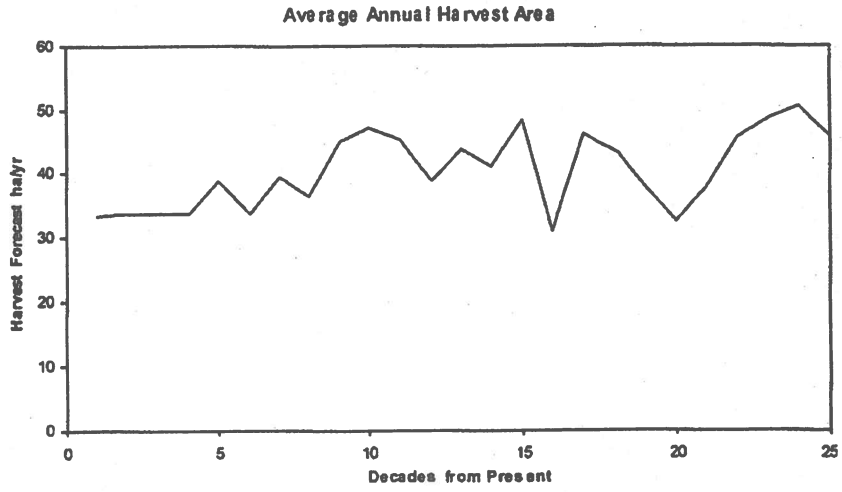

Figure 10. Average Annual Harvest Area

Age Class Distribution

Figure 11 illustrates 50 year time steps of the age class distribution as it occurs over the 250 planning horizon.

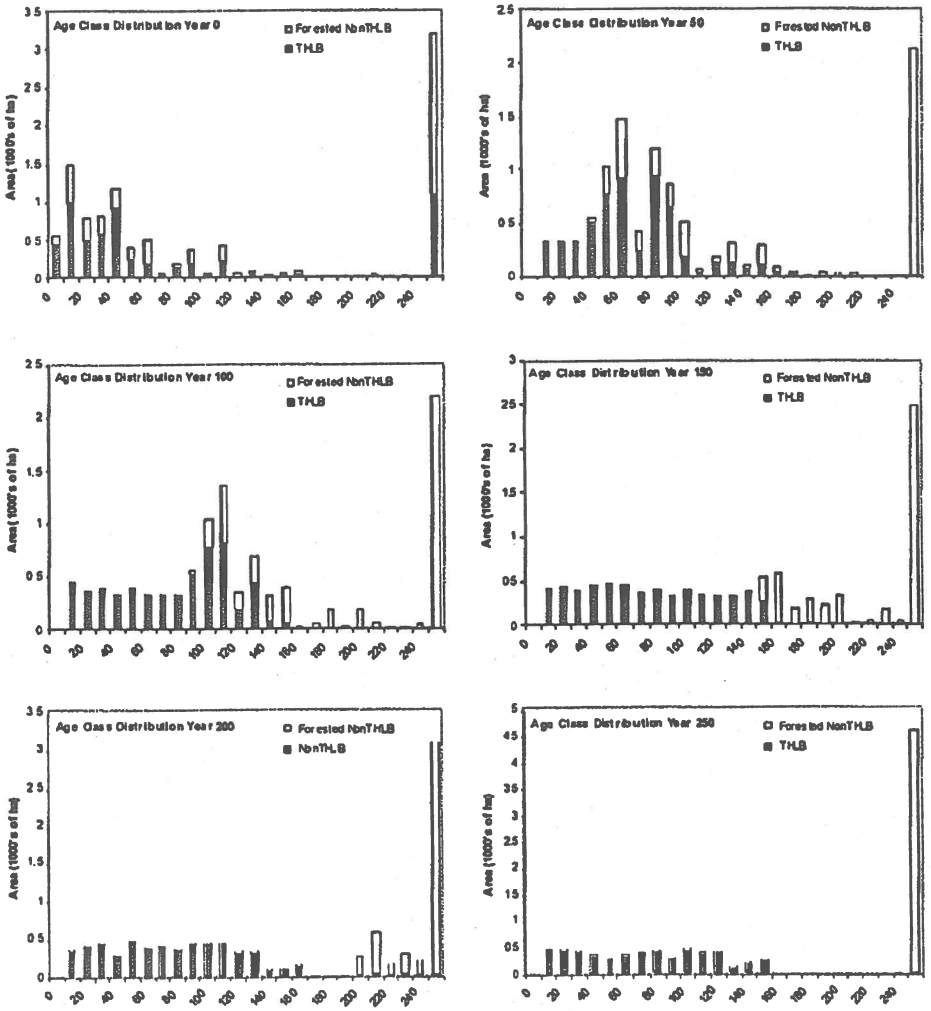

Figure 11. Age Class Composition over Time of the Sechelt Community Forest

The age class structure on the THLB starts out polarized into very old or very young stands but as harvesting occurs, the area becomes more even distributed below typical harvest ages (130 yrs) with some occurring at older ages because of forest cover constraints. The Non-THLB area grows over the planning horizon without disturbance and is all over 250 yrs 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. Within this CFA, these management objectives all limit disturbance is some way to satisfy objectives for visuals, community watersheds, or green up. The area affected by each of these constraints is illustrated in Figure 12. Old seral requirements were met using spatial OGMAs (624 ha) that were removed from the THLB (see Table 4).

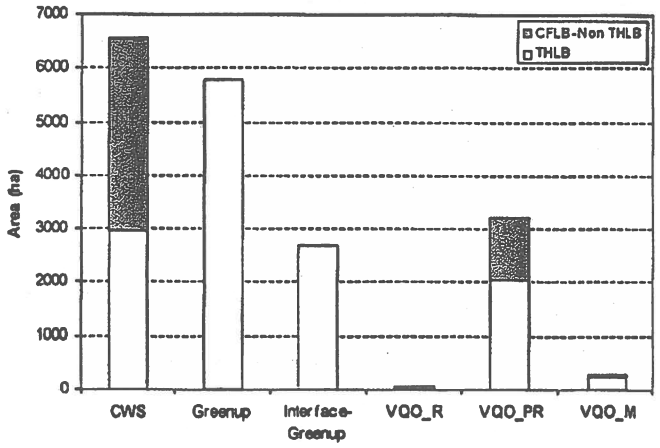

Figure 12. Integrated Resource Values: Area Summary by Objective

In the short term, the constraints having the largest impact on harvest availability are the partial retention VQOs on the lower slopes of the CFA. These areas are violating the allowable disturbance limits at the beginning of the planning horizon and so no harvest is allowed until the stands have aged into the 2nd decade. Community watershed harvest limits (1% per year) are not limiting the harvest levels in the short term not are greenup requirements.

In the long term, all of the VQO constraints and greenup constraints act to limit harvest as many of them are pushed to maximum disturbance levels. The Gray Creek CWS restrictions also serves to limit harvest in the long term but the Chapman CWS restrictions are never reached because of the small proportion of this area that is eligible for harvest.

Short Term Harvest Availability

The projected short term harvest level for this CFA is 20,000 m^3/year. The area harvested by the model during the first 20 years 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 (relative oldest first 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. Initial harvesting in the CFA is unlikely to follow this projection but the areas illustrated do provide a starting point for more detailed planning. A different set of available stands would be shown if a different harvest priority was used.

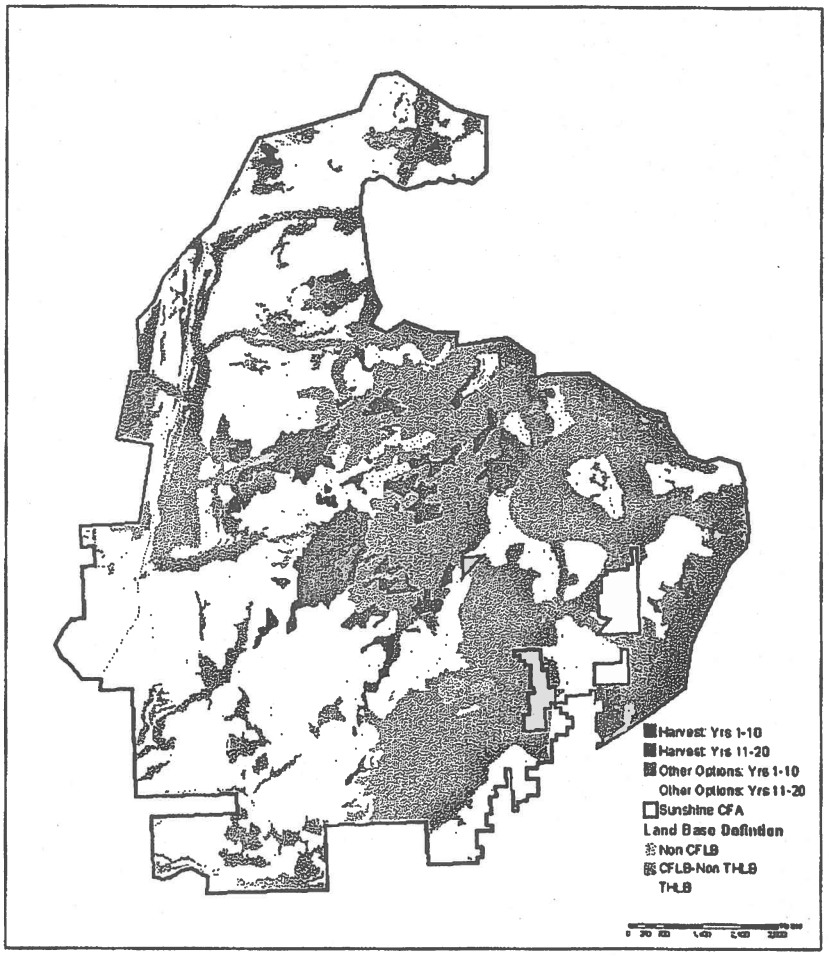

Figure 13. Harvest availability in years 0-20.

Short term harvest as selected by the model consists primarily of old hemlock stands (400+ yrs old) on poor productivity sites (Table 10). This is because the model prioritized old stands for harvest and these are the oldest stands on the land base. Other harvest priorities give a more dispersed harvest pattern and stand mix but poor site hemlock stands still dominate the forecast because most of they form the bulk of the currently available timber.

Table 10. Analysis unit volume summary

AU	Description	Annual Harvest Volume Yr 1-10	Yr 11-20	Totals	%
101	Fd G/M			-	0%
102	Fir P		834	834	2%
103	Cw All	231		231	1%
104	HwBlSs G/M			-	0%
105	HwBlSs P	19,954	19,350	39,304	97%
107	Deciduous			-	0%

In summary, short term harvest availability appears to be good but will need to rely heavily on poor site hemlock stands. As stated earlier, the majority (73%) of the THLB area over 80 years old is hemlock leading.