Canadian Forest Products Ltd.
Grande Prairie Operations

Supplementary
Timber Supply Analysis:

Benchmark Run Results and Amended
Timber Supply Analysis Information Package

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1. Introduction

This report describes the inputs, process and results for Scenario #1 as described in Report #9 of the Growth and Yield Information Package. Much of the information from Report #9 is repeated here to provide a complete document. It should be noted that there are some minor changes in the area summary information due to an error discovered in the initial timber supply runs. It was discovered that approximately 1 500 ha of forested land had been classified as non-forest due to a problem with the road buffer coverage. This error has been corrected and the appropriate changes have been made.

The Timber Supply Analysis used COMPLAN, a spatially explicit simulation model that can be used for both operational and strategic planning. The intent of this document is to outline the data and procedures that were used in the COMPLAN analysis. Specific items that are addressed include:

- spatial data coverages;
- landbase;
- growth and yield;
- modelling parameters for non-timber resources and operational constraints;
- proposed analysis framework; and
- proposed scenarios.

2. Spatial Data Coverages

A number of ARC/INFO data coverages were used in the preparation of the spatial dataset for the Timber Supply Analysis. These coverages and their general role in the Analysis are provided below.

2.1 Alberta Vegetation Inventory

Canfor completed an Alberta Vegetation Inventory (AVI 2.1) for the entire Forest Management Area (FMA) in December 1996 using colour infrared photography taken during 1993-1995. This inventory has since been updated to reflect harvest areas up to April 30, 1997. Additional updates to the end of 1998 will be modelled within the COMPLAN simulations through use of the proposed cutblock coverage from the 1998 Annual Operating Plan (AOP).

The AVI forms the basis for assigning yield tables and ages for use by the simulation model in the Analysis.

2.2 Existing Cutblocks

A coverage consisting of cutblocks harvested prior to 1997 was used to assign yield tables and ages to areas identified as clearcut in the AVI. This additional information consisted of:

- year harvested;
- yield group assignment for regeneration; and
- flag indicating where conifer has been released by weeding with brush saws.

When assigning yield groups to the harvested areas, a strategy was used that considered whether weeding has occurred. In general, weeded areas are more conifer dominated and remaining areas are more mixedwood dominated. A random approach was used in applying this strategy and Canfor believes that the results favour mixedwood stands over pure conifer. Therefore, the Analysis will be somewhat conservative with respect to future conifer volumes. Table 1 summarizes the assignment of yield groups for harvested areas.

Please refer to Table 5 in Section 3.3 for a complete list of yield groups that will be used in the Timber Supply Analysis.

Table 1
Yield Group Assignment for Harvested Areas

Yield Group	Description	Areas Assigned to Each Yield Group				
		Harvested Before 1991, Weeded (ha)	Harvested Before 1991, Not Weeded (ha)	Harvested 1991 and Later, Weeded (ha)	Harvested 1991 and Later, Not Weeded (ha)	Total (ha)
3	AWSW/PBSW/BWSW	0.0	7 680.52	0.0	0.0	7 680.52
8	PL/PLFB+(H)	0.0	179.64	0.0	1 857.38	2 037.02
9	PLAW/AWPL	6 622.97	0.0	19.48	325.63	6 968.09
11	PLSW/SWPL+(H)	1 330.83	0.0	0.0	3 617.34	4 948.18
16	SW/SWFB+(H) – CD	494.17	2 630.73	0.0	6 106.39	9 231.30
17	SWAW/SWAWPL	431.25	18 431.52	0.0	3 996.87	22 859.65
Total		8 879.24	28 922.42	19.48	15 903.63	53 724.79

NOTE: There are no changes to this table other than increasing the precision.

2.3 Proposed Cutblocks

A coverage containing 1998 Annual Operating Plan (AOP) blocks was used to provide harvested updates to forest inventory for 1998 and to provide operational realism for the scheduled harvest up to 2001. Proposed cutblocks for both Canfor and Tolko were included in this coverage. It was necessary to use automated GIS processing with manual intervention to rationalize this coverage with the stream and lake buffer coverage.

2.4 Additional Road Clearings

Some but not all of the road right-of-ways were classified as clearings within the AVI (20-metre tolerance). Therefore, an additional coverage was created to account for road clearings not contained within the AVI. This coverage was created by classifying and buffering existing roads and then rationalizing the buffers with the AVI road clearings. Areas within these buffers were assumed to be non-forest for purposes of the Analysis.

2.5 Trumpeter Swan Sites

Fish and Wildlife supplied a map of the Trumpeter Swan nest sites. A 200-metre buffer was created around these water bodies. Areas within these buffers are considered unavailable for harvest.

2.6 Stream and Lake Buffers

A coverage with buffer polygons (100%) around riparian features was created. Buffer widths correspond to the current operating ground rules and were:

- Major rivers – 60 metres each side
- Perennial streams – 30 metres each side
- Intermittent streams – 30 metres each side
- Lakes >= 4 hectares and <= 16 hectares – 100 metres
- Lakes > 16 hectares – 100 metres

Areas within these riparian buffers are considered unavailable for harvest.

2.7 Caribou

Two caribou habitat coverages were used. The first contained core and buffer polygons used in the 1991 Detailed Forest Management Plan that will be used in the baseline run. The second is a new line obtained from the West Central Caribou Committee that will be utilized with all other runs.

Forest cover constraints will be applied in a similar approach to that used by Weyerhaeuser Canada Ltd. (Grande Prairie/Grande Cache Operations).

2.8 Government Landbase Deletions (DRS)

A polygon coverage containing government DRS sites was used. Specific types of DRS present included:

- base camps;
- cabin sites;
- fire towers;
- permanent sample plots;
- public pits;
- recreation sites;
- research sites;
- reforestation projects;
- sand and gravel pits;
- staging areas;
- stockpiles; and

- weather stations.

Timbered areas within DRS sites are considered to be unavailable for harvest with the exception of sand and gravel pits, public pits and stockpiles. These exceptions are only available for harvest for the first cut, at which time they become non-forest land.

2.9 Grave Sites

Known archaeological grave sites were buffered with a 100-metre buffer. These buffers are considered to be unavailable for harvest.

2.10 Special Areas of Interest

The following special areas of interest were identified in a coverage and excluded from harvest:

- Cactus Creek;
- Fourth Creek;
- Peace River Dunvegan;
- Sand Dunes.

2.11 East Slopes

Polygons from the East Slopes Higher Level Plan were included in the resultant overlay. Since the Major Valley Complex Landscape Management Unit overlaps with this area, it is not intended to constrain the Analysis using this information. However, it will be possible to report on this information if necessary. Polygons within this coverage include:

- Critical wildlife;
- General recreation; and
- Multiple use.

2.12 Natural Subregions

A natural subregions (NSR) coverage was included in the resultant coverage and will be used to provide information for development and assignment of the yield tables. NSRs present in the FMA include:

- Central Mixedwood (CMW);
- Dry Mixedwood (DMW);

- Lower Foothills (LFH);
- Upper Foothills (UFH);
- Peace River Parkland (PRP); and
- Sub-Alpine (SAL).

2.13 Landscape Management Units

Fourteen Landscape Management Units (LMUs) have been defined within the FMA. These units will be used to report seral stage distributions and other ecological parameters for selected scenarios. The LMUs are:

- Deep Valley Plateau (DVP);
- Iosegun Plain (IP);
- Kakwa Benchlands (KB);
- Latornell Delta (LD);
- Little Smoky Valley (LSV);
- Major Watercourse/Valley Complexes (MVC);
- Peace Parkland (PPK);
- Puskwaskau (PSK);
- Peace Slopes (PSL);
- Peace Upland (PUP);
- Simonette Benchlands (SB);
- Smoky Plain (SP);
- Simonette Uplands (SU); and
- Simonette Uplands Slope (SUS).

2.14 Operating Unit and Sub-Unit Boundaries

A coverage with 10 operating units and 41 sub-unit boundaries was included in the overlay. These boundaries form logical operating units and will be used in the Timber Supply Analysis for geographic harvest prioritization. The operating units are:

- Deep North;
- Deep South;
- E8;
- Economy North;
- Economy South;
- Latronell;
- Peace;
- Puskwaskau;

- Simonette; and
- Smoky

3. Landbase

3.1 Timber Harvesting Landbase

The FMA covers a total area of 649,160 hectares (ha). A stepwise netdown procedure was used to determine the net landbase available for timber harvesting. This procedure classifies land in a stepwise manner, ensuring that there is no double counting. Table 2 provides a summary of the netdow.

Table 2
Landbase Summary

Classification	Area (ha)	Area (ha)	% of Total Area	% of Forested Area
Total landbase		**649 159.94**	**100.0**	
Reductions for non-forest				
Natural non-vegetated	12 959.92		2.00	
Anthropogenic non-vegetated	4 939.38		0.76	
Anthropogenic vegetated	4 946.45		0.76	
Non-forest vegetated	32 884.38		5.06	
AVI Attribute MODCON1 = “cl”	0.68		0.00	
Roads not included in AVI	1 132.93		0.17	
Total non-forest reductions	56 863.74	56 863.74	8.76	
Total forested landbase		**592 296.24**	**91.24**	**100.00**
Reductions to forested landbase				
Steep slopes (from AVI)	10 522.06		1.62	1.78
Slumps (from AVI)	42.51		0.01	0.01
Gravesites	5.15		0.00	0.00
DRS	320.47		0.05	0.05
Peace Parkland special area of interest	303.82		0.05	0.05
Cactus Hills special area of interest	8.00		0.00	0.00
Peace River Dunvegan special area of interest	374.33		0.06	0.06
Prabolic Sand Dunes special area of interest	5 480.31		0.84	0.92
Swan buffers	2 247.53		0.35	0.38
Lake > 16 ha buffers	248.41		0.04	0.04
Lake 4-16 ha buffers	506.87		0.08	0.09
Major river buffers	4 694.36		0.72	0.79
Perennial river buffers	1 202.23		0.18	0.20
Intermittent river buffers	31 061.26		4.78	5.24
Unproductive (Yield Group 13)*	25 816.15		3.98	4.36
River buffers (Beaver)	3.79		0.00	0.00
AVI Attribute MODCON2 = “sc”	0.18		0.00	0.00
Total reductions to forested landbase	82 838.43	82 838.43	12.76	13.99
Timber harvesting landbase		**509 458.83**	**78.47**	**86.0**

* Approximately 14 ha of Yield Group 13 in proposed cutblocks are not included in unproductive.

NOTE: The previous report table did not contain the netdowns for River buffers (Beaver), modcon1-cl and modcon1-sc. In addition, the previous value for unproductive(YG13) incorrectly included a small portion which was classed as part of the timber harvesting landbase and should not have been included in the netdowns.

3.2 Assignment of Conifer Understorey to Deciduous Yield Groups

The identification of deciduous stands with coniferous understorey is very important due to the substantial contribution to the coniferous annual allowable cut. Each forested polygon within the FMA was initially classified into one of the yield groups using the methodology outlined in the document *Landbase Stratification in the Canfor FMA* (Report #2, June 1999). Based on an analysis of temporary sample plots (please refer to *Coniferous Understorey Study in the Canfor FMA*,(Report # 3, June 1999), it was determined that a proportion of stands in Yield Groups 1, 2, 4 and 7 contain coniferous understorey with sufficient stocking to be classified as coniferous landbase. Table 3 provides a summary of these proportions.

Table 3
Proportion of Deciduous Stands with Conifer Understorey

Yield Group	Description	Proportion with Conifer Understorey
1	AW+(S) – AB	29%
2	AW+(S) – CD	22%
4	BW/BWAW+(S)	40%
7	PB+(S)	14%

NOTE: Numbers changed to match Information Package Report #3. Change due to rounding.

Because of the spatially explicit nature of the Timber Supply Analysis, it is necessary to assign the stands with understorey to specific polygons. Although this does not reflect operational reality, it provides consistency between scenarios and gives adequate information for strategic annual allowable cut determination.

Based on the conclusions from the *Coniferous Understorey Study in the Canfor FMA (*Report # 3, June 1999) report, the following generic methodology was used to assign the presence of understorey to specific stands:

1. Initially flag all stands as having understorey if they meet specified criteria as outlined in the *Coniferous Understorey Study in the Canfor FMA, June 1999* report. This is completed without reference to the timber harvesting landbase.

2. Add or subtract stands as necessary to meet the specified percentage. The procedure used attempts to distribute the additions/subtractions across the FMA in a random manner from within a subset of candidate stands. This process is completed without reference to the timber harvesting landbase.

3. Evaluate the proportion of stands flagged as having understorey within the net timber harvesting landbase. Add or subtract stands as necessary to meet the targets within the net timber harvesting landbase using a similar procedure to that used in Step 2.

4. No attempt is made to adjust the percentages further for stands not within the net timber harvesting landbase since there should be no effect on available harvest volumes.

Specific criteria for each yield group are described below.

Yield Group 1

All stands with understorey indicated on the AVI classification were initially flagged as having understorey present. This resulted in a percentage greater than that indicated in Table 3. Therefore, a procedure was used to adjust the number with understorey down to the target of 29%. This procedure selected stands without any coniferous species in the combined inventory label on a random basis from across the FMA. A further reduction was required within the net timber harvesting landbase.

Yield Group 2

All stands with understorey indicated on the AVI classification and within the Lower Foothills Natural Subregion were initially flagged as having understorey present. To increase the resulting proportion up to the required 22%, a random procedure was used to select additional Yield Group 2 stands from across the FMA. A reduction was required within the net timber harvesting landbase.

Yield Group 4

All stands with understorey indicated on the AVI classification were initially flagged as having understorey present. To increase the resulting proportion up to the required 40%, a random procedure was used to select additional Yield Group 4 stands containing coniferous species in the combined inventory label from across the FMA. A reduction was required within the net timber harvesting landbase.

Yield Group 7

All stands in Yield Group 7 and containing coniferous species in the combined inventory label were initially flagged as having understorey present. To reduce the resulting proportion to the required 14%, a random procedure was used to select stands from across the FMA. Additional stands were required within the timber harvesting landbase.

Table 4 provides a summary of the area of deciduous stands classified as having coniferous understorey.

Table 4
Deciduous Stands with Coniferous Understorey

Yield Group	Description	Total Landbase		Timber Harvesting Landbase	
		Total Area (ha)	With Understorey (ha)	Total Area (ha)	With Understorey (ha)
1	AW+(S) – AB	19 383.14	5 471.71	16 799.28	4 868.26
2	AW+(S) – CD	107 355.85	23 048.71	97 832.45	21 522.60
4	BW/BWAW+(S)	15 449.28	6 167.51	14 265.58	5 705.79
7	PB+(S)	27 706.63	4 001.25	25 937.80	3 636.88
Total		169 894.90	38 689.18	154 835.11	35 733.53

NOTE: Precision added to numbers.

3.3 Summary of Landbase by Yield Group

Table 5 provides a summary of the area by yield group for the FMA.

Table 5
Area by Yield Group

Yield Group	Description	Excluded From Timber Harvesting Landbase (ha)	Included In Timber Harvesting Landbase (ha)	Total (ha)
1	AW+(S) – AB	1 980.41	11 931.02	13 911.43
2	AW+(S) – CD	7 997.30	76 309.84	84 307.14
3	AWSW/PBSW/BWSW	2 977.78	29 075.04	32 052.82
4	BW/BWAW+(S)	721.98	8 559.79	9 281.77
5	FB+OTH	836.18	7 609.06	8 445.25
6	H+(S)/S	3 710.78	49 749.28	53 460.06
7	PB+(S)	1 404.45	22 300.93	23 705.38
8	PL/PLFB+(H)	4 740.47	48 347.33	53 087.79
9	PLAW/AWPL	1 346.13	18 256.08	19 602.21
10	PLSB+OTH	979.67	9 638.49	10 618.15
11	PLSW/SWPL+(H)	2 780.19	20 364.99	23 145.17
12	SBLT/LTSB(G,M,F)	5 002.46	52 184.90	57 187.36
13	SBLT/LTSB(U)	29999.98	16.85	30 016.83
14	SBPL/SBSW/SBFB	1 732.95	17 170.93	18 903.88
15	SW/SWFB+(H) – AB	5 891.30	24 089.28	29 980.58
16	SW/SWFB+(H) – CD	3 548.40	32 937.19	36 485.58
17	SWAW/SWAWPL	4 231.20	45 184.24	49 415.44
US	Deciduous moved to Dec. with Con. US	2 955.64	35 733.53	38 689.17
Total		82 837.27	509 458.71	592 296.01

NOTE: The only change in this table is a correction for an incorrect value entered for Yield Group 13 as described in Table 2.

3.4 Reductions for Cutlines

Yield table reductions will be used to account for cutlines within the FMA. The following procedure was used to determine the appropriate reduction for each yield group.

1. The ARC/INFO cutline coverage was buffered to a total width of 4 metres.

2. The cutline buffers were overlaid on the resultant coverage.

3. The proportion of area in cutline buffers within each yield group was calculated for the net timber harvesting landbase (i.e. after application of netdowns).

4. The calculated reduction factor for each yield group will be applied to the yield table for that yield group.

The yield group reduction factors are summarized in Table 6. An average of 1 % was applied to all yield tables since COMPLAN restricts this factor to integer values.

Table 6
Cutline Reduction Factors

Yield Group	Reduction Factor (%)
1	1.22
2	1.06
3	1.12
4	1.13
5	1.24
6	1.21
7	0.93
8	1.09
9	1.31
10	1.13
11	0.87
12	1.19
13	1.26
14	1.26
15	0.98
16	0.96
17	1.03
Weighted Avg.	1.10

3.5 Reduction for Future Roads

A yield table reduction of 2% will be applied to regenerated yield tables to account for the area lost to future road construction.

4. Growth and Yield

The development of the base yield tables for the Timber Supply Analysis has been documented in a separate report called *Development of a Multiple Utilization Yield Table System in the Canfor FMA, June 1999*. Therefore, the intent of this section is to describe the implementation of these yield tables within the Timber Supply Analysis.

4.1 Assignment of Breast Height Age for Existing Stands

The yield tables used in the Analysis are referenced to breast height age. Therefore, it is necessary to convert AVI origin date to breast height age. Age adjustment factors for each yield group/natural sub-region combination were subtracted from AVI origin age. Table 7 summarizes the adjustment factors used.

Table 7
Conversion of AVI Age to Breast Height Age

Yield Group	Years to Breast Height
1	6
2	6
3	15
4	6
5	15
6	15
7	6
8	10
9	10
10	10
11	10
12	20
13	20
14	20
15	15
16	15
17	15

4.2 Assignment of Breast Height Age for Harvested Areas

As discussed in Section 2.2, previous harvested areas were identified in the database with a year of cut, yield group and flag to indicate if they have been weeded. Using performance survey results, a regeneration lag and years to breast height were assigned on the basis of yield group, weeding history

and whether harvesting occurred prior to 1991. Table 8 summarizes the regeneration lags and breast height age adjustments used for this Analysis.

Table 8
Regeneration Lag and Years to Breast Height for Harvested Areas

Yield Group	Natural Subregion	Weeded ?	Harvest Year	Regeneration Lag (yrs)	Zero to Breast Height (yrs)	Total to Breast Height (yrs)
3	All	Y	Pre-1991	4	15	19
8	All	Y	Pre-1991	4	8	12
9	All	Y	Pre-1991	4	8	12
11	All	Y	Pre-1991	4	8	12
16	All	Y	Pre-1991	4	8	12
17	All	Y	Pre-1991	4	8	12
3	All	N	Pre-1991	9	15	24
8	All	N	Pre-1991	9	8	17
9	All	N	Pre-1991	9	8	17
11	All	N	Pre-1991	9	8	17
16	All	N	Pre-1991	9	8	17
17	All	N	Pre-1991	9	8	17
9	CMW, DMW, LFH, PRP	Y	1991+	4	1	5
9	UFH, SAL	Y	1991+	4	4	8
3	All except UFH	N	1991+	1	7	8
3	UFH	N	1991+	1	10	11
8	CMW, DMW, LFH, PRP	N	1991+	1	4	5
8	UFH, SAL	N	1991+	1	7	8
9	CMW, DMW, LFH, PRP	N	1991+	1	4	5
9	UFH, SAL	N	1991+	1	7	8
11	CMW, DMW, LFH, PRP	N	1991+	1	4	5
11	UFH, SAL	N	1991+	1	7	8
16	CMW, DMW, LFH, PRP	N	1991+	1	7	8
16	UFH, SAL	N	1991+	1	10	11
17	CMW, DMW, LFH, PRP	N	1991+	1	7	8
17	UFH, SAL	N	1991+	1	10	11

4.3 Assignment of Breast Height Age for Deciduous Stands with Conifer Understorey

As discussed in Section 3.2, a proportion of deciduous stands was reassigned to reflect the presence of coniferous understorey. The proposed modelling strategy requires an age for the understorey. Information to assign breast height age to the understorey was derived from an analysis of the temporary sample plots.

- For those stands where the AVI indicated an understorey origin, this origin was converted to a breast height age by subtracting the years to breast height (indicated in Table 9) from the total age.

- For those stands where the AVI did not indicate an understorey origin, the understorey was assigned the average breast height age of the understorey based on plot data. This is shown in Table 10.

Table 9
Years to Breast Height Age for Deciduous Stands with Conifer Understorey

Yield Group	Natural Subregion	Years To Breast Height (yrs)
1	CMW, PRP, SAL	15
1	DMW	15
1	LFH	15
1	UFH	15
2	CMW, UFH, PRP, SAL	15
2	DMW	15
2	LFH	15
4	CMW	15
4	DMW	15
4	LFH, UFH, PRP, SAL	15
7	CMW, UFH, PRP, SAL	15
7	DMW	15
7	LFH	15

Table 10
Average Breast Height Age for Deciduous Stands with Conifer Understorey

Yield Group	Natural Subregion	Average Breast Height Age (yrs)
1	CMW, PRP, SAL	5
1	DMW	7
1	LFH	8
1	UFH	5
2	CMW, UFH, PRP, SAL	9
2	DMW	4
2	LFH	10
4	CMW	17
4	DMW	15
4	LFH, UFH, PRP, SAL	6
7	CMW, UFH, PRP, SAL	11
7	DMW	19
7	LFH	2

4.4 Modelling of Stands with Conifer Understorey

All stands identified as having conifer understorey (Yield Group 6 and those portions of Yield Groups 1, 2, 4 and 7 reassigned to have coniferous understorey) will be modelled using the yield tables developed for Yield Group 3. These stands will be modelled using the conifer component to drive harvest scheduling.

4.5 Regeneration Strategy

The Timber Supply Analysis will use a regeneration strategy that is based on current practice, results from field surveys, NIVMA PSPs, tree improvement programs and general observations. The implementation of this strategy within the Timber Supply Analysis consists of yield table shifts, reduced years to breast height and volume multipliers for tree improvement. Table 10 summarizes the regeneration strategy.

Table 11
Regeneration Strategy

Yield Group	Natural Subregion	Regenerated Yield Group	Years to Breast Height*	Tree Improvement Multiplier**
1	All	2	4	0.50
2	All	2	4	0.50
3	CMW, DMW, LFH, PRP	17	9	1.00
3	UFH, SAL	17	11	1.00
4	All	4	5	0.50
5	CMW, DMW, PRP	16	9	1.00
5	UFH, LFH, SAL	5	0	1.00
6	CMW, DMW, LFH, PRP	17	9	1.00
6	UFH, SAL	17	11	1.00
7	All	7	4	0.50
8	CMW, DMW, LFH, PRP	8	6	1.07
8	UFH, SAL	8	9	1.00
9	CMW, DMW, LFH, PRP	9	6	1.07
9	UFH, SAL	8	9	1.00
10	CMW, DMW, LFH, PRP	8	6	1.07
10	UFH, SAL	8	9	1.00
11	CMW, DMW, LFH, PRP	11	7	1.07
11	UFH, SAL	8	9	1.00
12	All	12	15	1.00
13	All	13	23	1.00
14	CMW, DMW, LFH, PRP	14	7	1.00
14	UFH, SAL	14	10	1.00
15	DMW, PRP	15	9	1.00
15	CMW, LFH	16	9	1.00
15	UFH, SAL	16	12	1.00

Yield Group	Natural Subregion	Regenerated Yield Group	Years to Breast Height*	Tree Improvement Multiplier**
16	CMW, DMW, LFH, PRP	16	9	1.00
16	UFH, SAL	16	12	1.00
17	CMW, DMW, LFH, PRP	17	9	1.00
17	UFH, SAL	16	12	1.00

* Includes an allowance for plantation failures; includes an allowance for regeneration delay; and an entry of 0 indicates understorey protection

** tree improvement multiplier includes an allowance for non-treated areas.

4.6 Minimum Harvest Ages

Minimum harvest ages by yield group and natural subregion are provided in Table 11. The Timber Supply Analysis will use the breast height age value since all ages in the yield tables and simulations are referenced to breast height age. However, the estimated age at breast height and total stand age for existing stands is also provided for information purposes. Since the time to reach breast height will be less for regenerated stands as a result of the regeneration strategy, the total stand age and years from harvest will be less for regenerated stands for a given minimum harvest age expressed in breast height age.

Table 12
Minimum Harvest Ages

Yield Group	Natural Subregion	Estimated Age at Breast Height* (yrs)	Minimum Breast Height Age (yrs)	Estimated Minimum Total Age* (yrs)
1	CMW, PRP, SAL	6	44	50
1	DMW, LFH, UFH	5	45	50
2	CMW, DMW, UFH, PRP, SAL	5	45	50
2	LFH	6	44	50
3	All	15	80	95
4	CMW, LFH, UFH, PRP, SAL	7	43	50
4	DMW	6	44	50
5	All	22	80	102
6	All	15	80	95
7	All	5	45	50
8	CMW, DMW	8	80	88
8	LFH	10	80	90
8	UFH, PRP, SAL	11	80	91
9	CMW, DMW	8	80	88
9	LFH, PRP, SAL	9	80	89
9	UFH	10	80	90
10	LFH	10	80	90

Yield Group	Natural Subregion	Estimated Age at Breast Height* (yrs)	Minimum Breast Height Age (yrs)	Estimated Minimum Total Age* (yrs)
10	SAL	12	80	92
10	CMW, DMW, UFH, PRP	11	80	91
11	LFH	10	80	90
11	CMW, DMW, UFH, PRP, SAL	11	80	91
12	CMW, UFH, LFH, PRP, SAL	19	90	109
12	DMW	18	90	108
13	CMW, LFH, PRP, SAL	21	Never Merch	Never Merch
13	DMW	20	Never Merch	Never Merch
13	UFH	19	Never Merch	Never Merch
14	CMW, UFH	17	90	107
14	DMW, LFH, PRP	16	90	106
14	SAL	18	90	108
15	CMW, DMW	16	80	96
15	LFH, PRP, SAL	15	80	95
15	UFH	18	80	98
16	CMW, DMW	16	80	96
16	LFH, PRP, SAL	15	80	95
16	UFH	17	80	96
17	CMW, DMW	16	80	96
17	LFH, PRP, SAL	15	80	95
17	UFH	17	80	97

* For existing stands only. Regenerated stands will be less as a result of reduced time to reach breast height.

4.7 Cull Factors

The yield tables developed for this Analysis do not include allowances for cull. Therefore, cull factors based on analysis of waste surveys, check scale percentages and bush bucking practices were developed for both coniferous and deciduous volumes. The cull factors applied in the Timber Supply Analysis are summarized in Table 12.

Table 13
Cull Factors

Yield Group	Coniferous (%)	Deciduous (%)
1,2,4,7	5	10
5	9	15
3,6,8-17	5	15

4.8 Growing Stock Adjustments

COMPLAN allows for initial volumes and other stand parameters to be assigned to individual stands. These values are then trended using the yield tables to forecast future stand parameters. The growing

stock adjustments discussed in the *Development of a Multiple Utilization Yield Table System in the Canfor FMA,* (Report #5, June 1999) document will be implemented in the Timber Supply Analysis.

5. Modelling Parameters for Non-timber Resources and Operational Constraints

There are a number of model parameters that can be set in COMPLAN to address non-timber resource requirements or other operational constraints. Specific parameters to be addressed in the Timber Supply Analysis include seral stage distribution, caribou habitat, green-up requirements, maximum aggregated sub-compartment size and habitat modelling.

5.1 Seral Stage Distribution

Four seral stages have been defined for use in this Analysis. Table 13 outlines the breast height age by yield group that will be used to define these seral stages. Seral stage distributions will be applied at the landscape management unit level. It is proposed not to constrain the simulations to meet specific seral stage targets initially. Rather, the resulting seral stage distributions through time will be reported and compared to theoretical fire-return intervals. However, constraints may be applied if the distributions in one or more of the LMUs do not appear to be acceptable for the initial simulations.

Table 14
Breast Height Age Ranges for Seral Stages

Yield Group	Pioneer	Young	Mature	O.Mature	Old	Species	Years to BH
1	0	1-20	21-70	71-110	110+	AW	6
2	0	1-20	21-70	71-110	110+	AW	6
3	0	1-40	41-80	81-120	120+	SW	15
4	0	1-20	21-70	71-110	110+	BW	6
5	0	1-40	41-100	101-120	120+	FB	15
6	0	1-40	41-80	81-120	120+	SW	15
7	0	1-20	21-80	81-110	110+	PB	6
8	0	1-40	41-80	81-120	120+	PL	10
9	0	1-30	31-70	71-120	120+	PL	10
10	0	1-40	41-90	91-120	120+	PL	10
11	0	1-40	41-90	91-120	120+	PL	10
12	0	1-50	51-130	131-150	150+	SB	20
13	0	1-50	51-140	141-160	160+	SB	20
14	0	1-40	41-100	101-130	130+	SB	20
15	0	1-40	41-90	91-120	120+	SW	15
16	0	1-40	41-90	91-120	120+	SW	15
17	0	1-40	41-90	91-120	120+	SW	15

Note: Ages are breast height ages

5.2 Caribou Habitat

Cover constraints will be applied to the forested stands identified as being within the caribou habitat area identified by the West Central Caribou Committee. Because Canfor is using breast height age as the reference for the Timber Supply Analysis, it is not possible to implement the caribou cover

constraints in a manner identical to that used by Weyerhaeuser Canada Ltd. (Grande Prairie/Grande Cache Operations) in the preparation of their Detailed Forest Management Plan. Therefore, it is intended to use seral stage to formulate the constraints. The proposed cover constraint formulation is:

- No more than 20% of the area can be in a pioneer or young seral condition; and
- At least 20% of the area must be in an old seral condition.

However, this constraint formulation may be changed somewhat once the initial analysis results are interpreted in order to better meet the effective habitat requirements of caribou. It is also anticipated that there may be some modification to green-up and maximum aggregated sub-compartment sizes required to meet the objectives within the caribou habitat area.

5.3 Green-up Requirements

It is proposed to use a required green-up height of 2 metres between adjacent aggregated sub-compartments for simulations completed with a full spatial analysis. For pseudo-spatial simulations, this will be emulated with the following cover constraint formulation applied to each landscape management unit:

- No more than 30% of the area may be less than 10 years since harvest; and
- No more than 30% of the area may be less than 2 metres in height.

It is recognized that it will likely be necessary to adjust these green-up requirements in the caribou habitat zone to meet the habitat objectives. Initially, a green-up requirement of 30 years will be used in the caribou habitat area. Further adjustments may be made once the initial results are examined.

5.4 Maximum Aggregated Sub-compartment Size

For the full spatial simulations, COMPLAN allows aggregation of sub-compartments to a pre-determined maximum size. It is intended to use a maximum aggregated sub-compartment size of 500 hectares for the Timber Supply Analysis. Although this is a maximum, a distribution of sizes ranging from very small (i.e. less than 10 hectares) up to the maximum will be obtained because of the effect of timber maturity and other constraints.

Depending on the initial results from the simulations, it may be necessary to modify this maximum size for certain landscape management units or within the caribou habitat area. Initially, a 1000 hectare maximum aggregated sub-compartment size will be used within the caribou habitat area. However, further adjustments may be made once the initial results are examined.

5.5 Habitat Modelling

It is not intended to constrain the simulations to reflect habitat requirements other than for caribou. However, habitat suitability indices will be generated and reported for the results of selected scenarios for the following species:

- pine marten;
- pileated woodpecker; and
- moose.

6. Benchmark AAC Run Based on 1991 DFMP Strategies

The intent of this scenario is to determine the effect of new inventory data and yield tables on the AAC when compared to the previous timber supply analysis carried out in the 1991 DFMP. Specific assumptions regarding this simulation are:

- Pseudo-spatial analysis. An adjacency file is not used within the model;
- Net coniferous timber harvesting landbase as defined in Section 3.1 (excludes Yield Groups 1, 2, 4 and 7 that do not have coniferous understorey);
- Net deciduous landbase consists of Yield Groups 1, 2, 4 and 7 less areas assigned to have conifer understorey. Deciduous landbase is excluded from the analysis. There is no determination of a deciduous AAC although deciduous wood flows are reported;
- New yield tables;
- Four-year regeneration delay is applied to each yield curve. This essentially sets the cutblock age to –4 years after harvesting;
- Reforestation of conifer stands (i.e. all yield groups except 1, 2, 4 and 7) to fully stocked coniferous.
- 2-metre green-up is mimicked through the use of a green-up cover constraint within the model. For example, this constraint could state that "no more than 30% of the area can be less than 2 metres in height";
- Minimum harvest age for Yield Groups 1, 2, 4, 7 will be 70 years (stand age rather than breast height age) applied to each new yield table;
- Minimum harvest age for Yield Groups 3, 5, 6, 8, 9, 10, 11, 15, 16 and 17 will be 90 years (stand age rather than breast height age) applied to each new yield table;
- Minimum harvest age for Yield Groups 12 and 14 will be 120 years (stand age rather than breast height age) applied to each new yield table;
- All harvesting will be specified as clearcut;
- A two pass harvesting system will take place in all areas except the caribou habitat. A maximum of 50% of the area and merchantable volume will be removed in the first pass;
- Caribou constraints will be applied to the buffer and core areas identified in the 1991 DFMP. The minimum harvest age within the buffer area is 90 for the first rotation and 120 for the second rotation. Minimum harvest age within the core area is 120 years for both the first and second rotations. These minimum harvest ages will be applied to the

new yield curves. Also, within the core area there is a 30-year retention (currently in year 14) and a three-pass harvest requirement;

- Since the 1991 DFMP did not calculate a deciduous AAC, the deciduous will merely be reported from stands which have a coniferous understory. Any deciduous volumes that are incidental will be subject to conifer priority but will only be available for the first rotation.

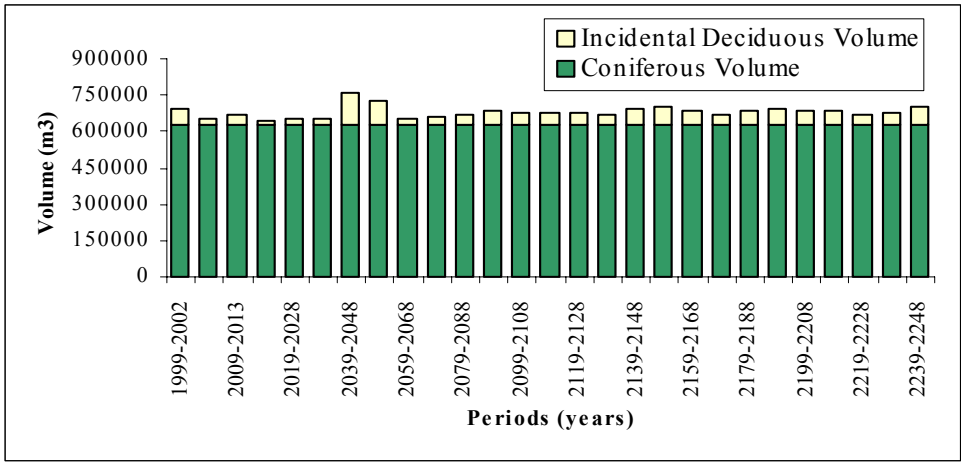
- The previous Management Plan runs incorporated an anticipated 20-year sequence of compartmental wood flows. In order to ensure continuity between this run and the previous, a 10-year sequence of compartmental wood flows is being used to finish off the original 20-year sequence. This sequence differs from the previous and is still under development within the timber supply process. These differences reflect different operating conditions and assumptions since the previous Plan.

7. Results

7.1 Harvest Levels – Coniferous and Incidental Deciduous

A coniferous harvest level of 630 000 m^3 was shown to be maintained over the entire planning horizon. This compares against 626 000 m^3 showing that the harvest levels predicted in the previous Management Plan remain valid and that new inputs such as inventory data and yield tables are consistent with those from previous runs. Figure 1 shows the coniferous and deciduous harvest levels calculated as the average annual harvest level by period.

Figure 1
Coniferous and Deciduous Harvest Levels



The deciduous wood flows are based solely on the incidental volume coming from the coniferous harvest. As with the previous plan, no attempt was made to balance the deciduous wood flows resulting in a high variance from period to period.

7.2 Standing Inventory

Figures 2 and 3 show the standing coniferous and deciduous volume inventory at the start of each period over the entire planning horizon. Again, it should be noted that in this case the deciduous standing volume is that from the C, CD, and DC stands and which includes those stands with greater than 80% deciduous but having a conifer understory.

Figure 2
Total Standing Coniferous Volume

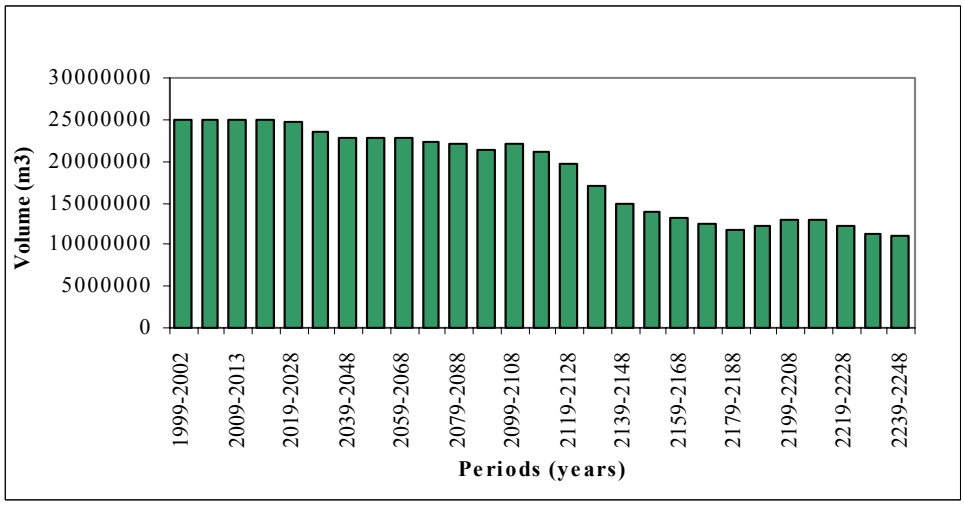
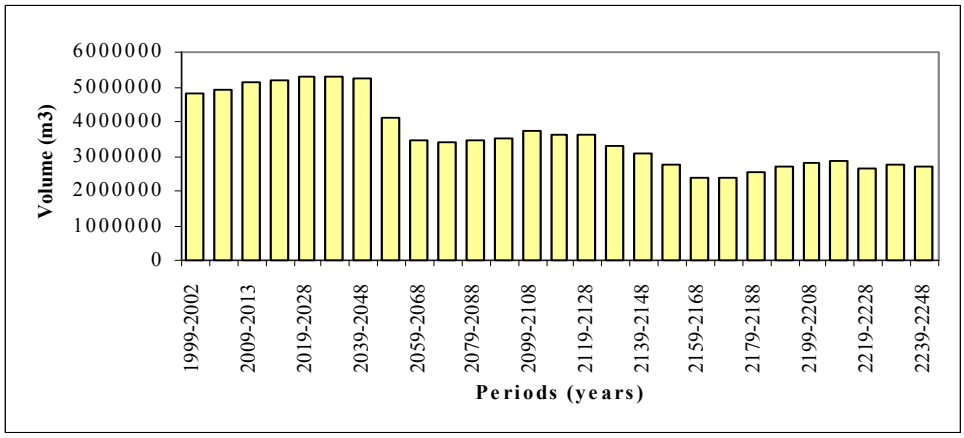


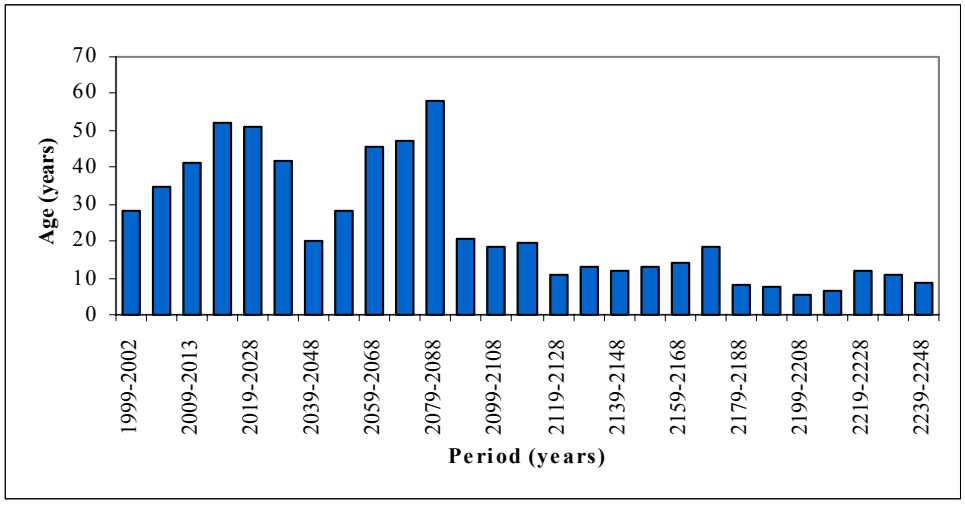
Figure 3
Total Standing Deciduous Volume



7.3 Average Harvest Age

Average harvest age in absolute terms can be deceiving in that the minimum harvest age can vary considerably between growth types. Harvest age is important because a general reduction of it often indicates a supply bottleneck. In order to account for the variability of minimum harvest age, a better measure of harvest age is the average number of years above the minimum harvest age. Figure 4 shows the average years above minimum harvest age by period.

Figure 4
Years Above Minimum Harvest Age



8. Summary

The results from this run show that the new information used in this analysis does not materially affect the results in of themselves. It can then be said that potential changes in harvest levels coming from subsequent analyses will be due to changes in management practices, assumptions or objectives.