Timber Supply Analysis Report

Nicola-Similkameen Innovative Forestry Society

Timber Supply Review 2 Benchmark Analysis

Note: This report is provided to the Nicola-Similkameen Innovative Forestry Society in order to identify potential timber supply increases associated with IFPA programs.

Prepared by:

Timberline Forest Inventory Consultants Ltd.

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1. BACKGROUND

The Nicola-Similkameen Innovative Forestry Society (referred to as the Society in this document) has been created to implement Innovative Forest Practices Agreements (IFPAs) structured with the Ministry of Forests (MoF). Partners in the Society include:

- Weyerhaeuser Company Ltd;
- Tolko Industries Ltd;
- Aspen Planers Ltd;
- Ardew Wood Products Ltd;
- Riverside Forest Products Ltd:
- The Nicola Tribal Association;
- Upper Similkameen Indian Band; and
- Merritt Forest District Small Business Forest Enterprise Program (SBFEP)

The agreement area lies within the bounds of the Merritt Timber Supply Area (TSA). The TSA represents a total productive area of approximately 811,398 hectares. The net timber harvesting landbase (NTHL) as defined in the most recent Timber Supply Review process (TSR#2) comprised 660 326 hectares. The IFPA encompasses all of the productive forest area in the TSA.

In 1996, the allowable annual cut (AAC) for the Merritt TSA was set at 1,454,250 cubic metres/year. This included a 250,000 cubic metre partition attributable to small-diameter pine stands. Effective January 1, 1999 the AAC was increased to 2,004,250 cubic metres, with the addition of a 550,000 cubic metre partition attributable to stands requiring harvest for salvage of fire-killed timber as well as an outbreak of Mountain Pine Beetle. This AAC was reviewed as part of the second Timber Supply Review and the AAC was determined to be 1,508,050 cubic metres, which will remain in effect until the next AAC determination.

The existing AAC determination for the Merritt TSA was based on a timber supply analysis completed in 2001. In order to identify timber supply opportunities associated with IFPA programs, it is necessary to identify the marginal increases over the base level timber supply forecast that formed the basis for the current AAC determination. This analysis must ultimately incorporate an assessment of the spatial feasibility of achieving the new proposed AAC. The linkage between the TSR#2 and IFPA analyses is critical to presenting a technically defensible analysis. In essence, developing this linkage entails the following steps:

1. Reproduce the TSR#2 base case using the same data sources and modeling tool (FSSIM);
2. Incorporate new IFPA data sources and assumptions, and reassess using a spatially explicit analysis tool;

Timberline Forest Inventory Consultants has been contracted by the Society to complete this analysis. At this point the TSR#2 base case has been replicated using FSSIM(Step 1), and a new data set is being prepared in order to proceed with the IFPA analysis (Step 2). In the interim, the Society has requested an evaluation of the expected impacts of the IFPA programs, using the current FSSIM TSR#2 model formulation, with new assumptions substituted directly into the model formulation or otherwise accounted for, to reflect the inputs which ultimately will be incorporated into the IFPA analysis (Step 2). This final analysis will be completed using Timberline's CASH6 spatial timber supply model.

2. GENERAL METHODOLOGY AND RESULTS

2.1 TSR#2 Base Case

All the data elements included in the TSR#2 analysis were identified from documentation contained in the Information Package, and through discussions with Ministry of Forests (MoF) regional and district staff.

Digital data layers were then combined into a single resultant GIS coverage, and the TSR#2 landbase classification protocol employed to arrive at a net timber harvesting landbase.

Table 1. Timber harvesting landbase determination – Base Case

Classification	TSR#2	Timberline
Total Landbase (incl. fresh water)	**1,130,064**	**1,130,064**
Non-crown	209,456	209,456
Total Crown Landbase (incl. fresh water)	**920,608**	**920,608**
Non-forest, non-productive, non-commercial	98,193	98,193
Parks, ecological reserves	11,017	11,017
Crown Productive Forested Landbase	**811,398**	**811,398**
Reductions to Productive:		
ESAs	34,531	34,529
Unstable terrain	36,365	36,367
Problem forest types	22,856	22,702
Cultural heritage resources	43	43
Riparian management areas	32,111	32,119
Hudsons Bay trail	423	423
Water intakes for community watersheds	3	3
Existing roads, trails and landings	11,745	11,746
Wildlife tree patches	12,995	12,998
Tailed frog WHAs	0	0
Total Operable Reductions	151,072	150,930
Current Net Harvesting Landbase	**660,326**	**660,467**
Future reductions:		
Conversion to grasslands	1,258	1,258
Future Roads, Trails, Landings	38,516	39,362
Long-term Net Harvesting Landbase	**620,552**	**619,847**

A complete description of this process will be included in the report to be prepared upon completion of the full IFPA analysis.

This information was then employed to develop an FSSIM data model, and a base case forecast prepared employing the same modeling assumptions as were used by MoF staff in the TSR#2 base case. The projected timber supply forecast results replicated those developed by the MoF analysis. Figure 1 shows the timber flow over 250 years. Periods 1 and 2 represent 5-year time steps, while periods 3-26 represent 10-year steps. This figure shows the overall net annual harvest in each period, as well as the contribution from existing natural and managed stands.

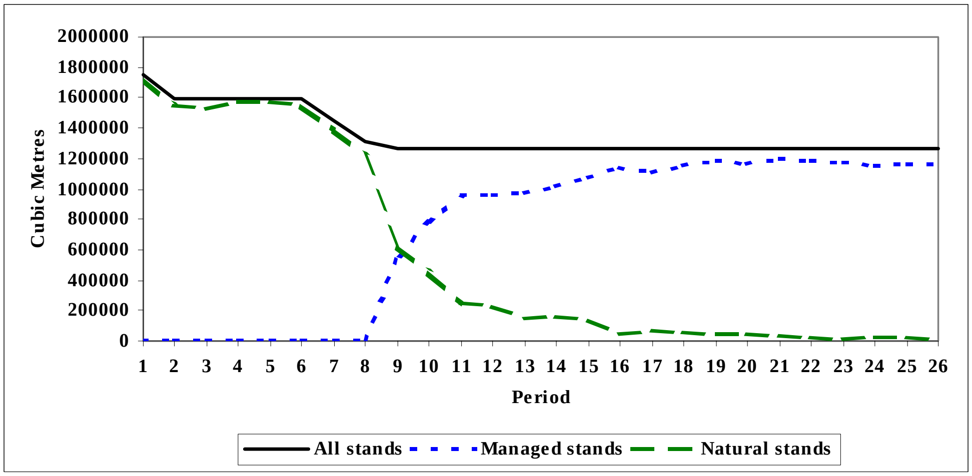

Figure 1. Overall timber supply forecast – TSR#2 base case

This base case harvest includes a partition of 250,000 cubic metres from existing smallwood stands, for the first 60 years. Beyond this point harvesting in these types is not explicitly controlled, but is still monitored. In addition, a selection harvest system is modeled in Douglas-fir types. Figure 2 depicts the harvest flow from these two treatments. The volume from existing smallwood types is exhausted by period 9 (80 years from now). The "smallfuture" harvest represents the volume harvested from the regenerated smallwood areas. The selection harvest represents volumes harvested in Douglas-fir types on a 30-year reentry schedule (40-50 cubic metres/ha harvest per entry). In the base case this harvest is not explicitly controlled, and in fact is given a lower priority in the short-term. This lower priority reflects the MoF concern that licensees are not currently aggressively harvesting in these areas.

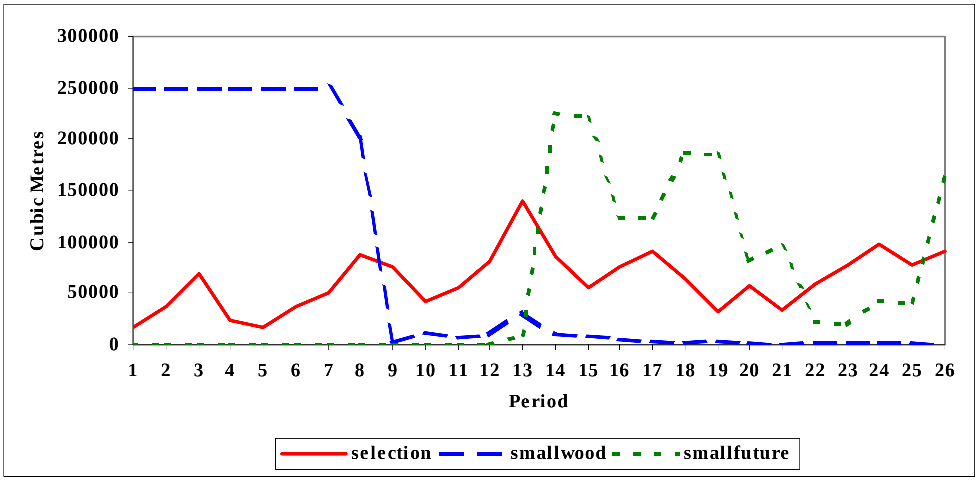

Figure 2. Smallwood and selection harvest forecasts – TSR#2 base case

Figure 3 shows the growing stock trends associated with the base harvest level. ***Total*** stock represents the total volume of all stands within the net timber harvesting landbase (NTHL). ***Merchantable*** represents the proportion of this volume currently above minimum harvest age. ***Available*** represents the maximum volume that could be harvested in a given period without violating any of the forest cover constraints.

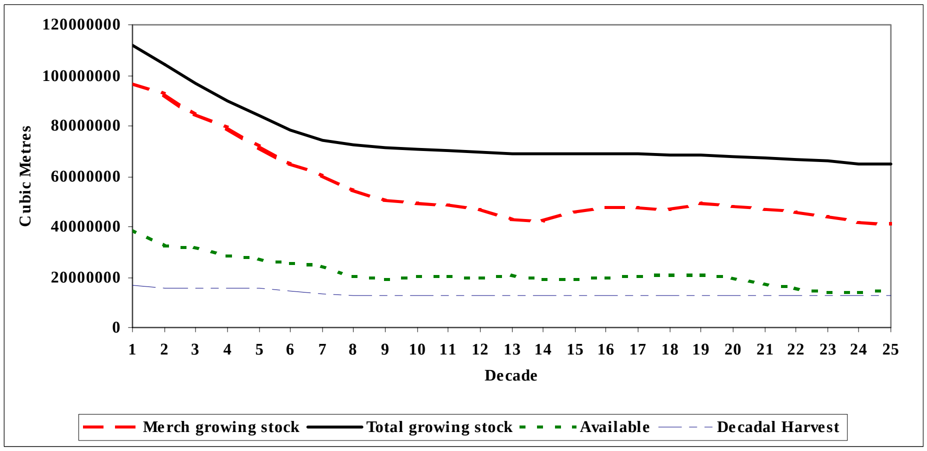

Figure 3. Growing stock forecast – TSR#2 base case

Figure 3 shows that harvest is not overly constrained in the immediate future. However, availability steadily declines over the first rotation, and is particularly constrained in the long-term, towards the end of the planning horizon. It is this availability that dictates the harvest flow that can be realized, and ultimately the AAC that can be realistically achieved in the immediate future.

2.2 IFPA Managed Yield Curve Scenario

In this analysis, managed yield curves based on updated site productivity information were substituted. These new yield curves employ substantially higher site index values than those used in the TSR#2 base case, resulting in higher stand yield forecasts. In addition, these higher yield estimates provide for reductions in minimum harvest ages. It is important to note that no changes were made to the yield forecasts for existing natural stand types. As would be expected, application of these improved managed yield estimates has a significant and positive impact on timber availability, as shown in Figure 4. Availability in both scenarios is based on the TSR#2 base case harvest targets.

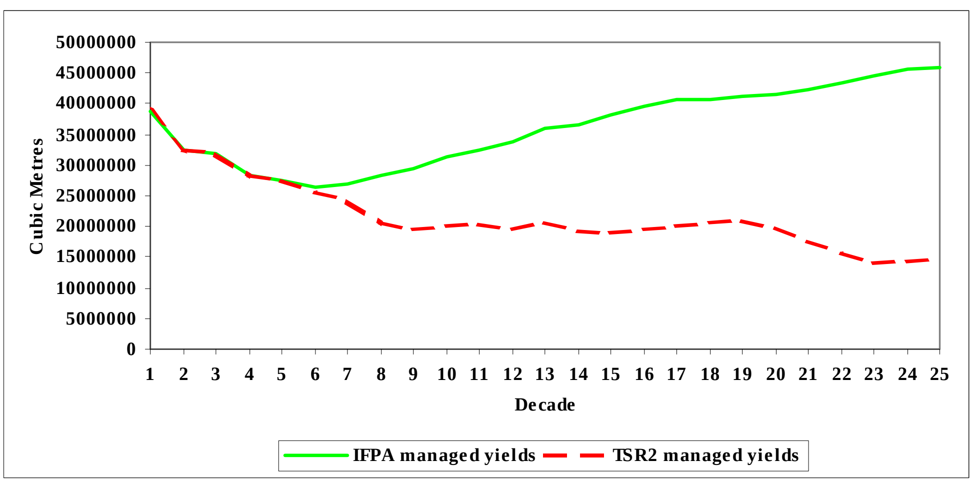

Figure 4. Impact on availability of employing IFPA managed yield forecasts

Availability improvements start to accrue at decade 5, the first period in which new managed stands achieve minimum harvest age. From that point onward, the surplus availability accumulates over time, as no change in the TSR#2 harvest has been implemented to absorb the additional timber available for harvest.

This increased availability provides for significant increases in harvest. The fact that short term availability in not limiting means that increases can be achieved immediately. Several alternative timber flow scenarios were explored to determine the magnitude and timing of increases. Each represents an incremental increase over the TSR#2 base case. The results are presented in Figure 5 and Table 2. Harvest levels beyond year 70 are maintained to the end of the 250-year time horizon.

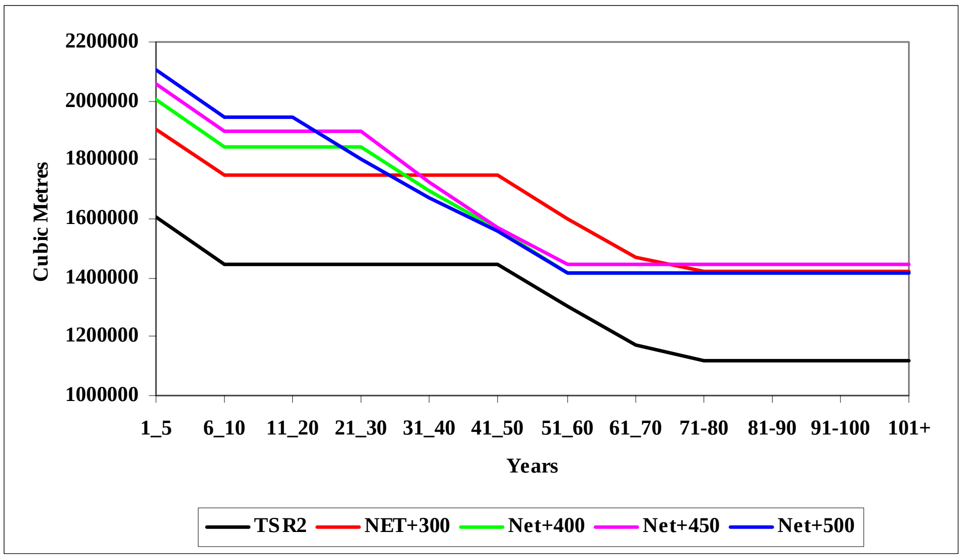

Figure 5. Alternative timber flow scenarios – IFPA managed yield inputs

Table 2. Alternative timber flow scenarios – IFPA managed yield inputs

Years	TSR#2	+300,000		+400,000		+450,000		+500,000	
	Harvest	Harvest	Increase	Harvest	Increase	Harvest	Increase	Harvest	Increase
1-5	1605550	1905550	300000	2005550	400000	2055550	450000	2105550	500000
6-10	1445550	1745550	300000	1845550	400000	1895550	450000	1945550	500000
11-20	1445550	1745550	300000	1845550	400000	1895550	450000	1945550	500000
21-30	1445550	1745550	300000	1845550	400000	1895550	450000	1800995	355445
31-40	1445550	1745550	300000	1697906	252356	1725000	279450	1670896	225346
41-50	1445550	1745550	300000	1562074	116524	1570000	124450	1555896	110346
51-60	1300995	1600995	300000	1415550	114555	1445550	144555	1415550	114555
61-70	1170895	1470896	300001	1415550	244655	1445550	274655	1415550	244655
71+	1120000	1420000	300000	1415550	295550	1445550	325550	1415550	295550

All scenarios achieve the same long-term gain of approximately 300,000 cubic metres. This is the maximum that can be achieved without incurring any shortfalls over the 250-year time horizon. All scenarios incorporate future harvest stepdowns consistent with those observed in the TSR#2 base case. The difference is in the timing of the stepdown. The most aggressive increase explored (500,000 cubic metres), necessitates a stepdown after 20 years, while in the minimum increase scenario (300,000 cubic metres) the starting harvest can be sustained for 50 years.

In assessing these results, it should be recognized that they do not incorporate several additional IFPA environmental issues, which when fully factored into the IFPA analysis, are expected to exert approximately a 4% downward pressure on timber availability. While this cannot be explicitly analyzed at this time, the impact will be to require earlier stepdowns in each of the above timber flow scenarios. The expected impacts are shown in Table 3.

Table 3. Expected impacts of IFPA environmental factors on timing of stepdown

Timber Flow Scenario	Current Analysis	With 4% downward pressure
+300,000 cubic metres	year 51	year 41
+400,000 cubic metres	year 31	year 21
+450,000 cubic metres	year 31	year 21
+500,000 cubic metres	year 21	year 11

The impact in each case is to accelerate the timing of the stepdown by 1 decade. While somewhat preliminary in nature, the trend is expected to be demonstrated in the full IFPA analysis. It is also expected that the inclusion of block-level spatial constraints in the final IFPA analysis will exert additional downward pressure, which will likely accelerate the timing of the stepdown by an additional decade (Table 4).

Table 4. Expected additional impacts of block-level spatial rules on timing of stepdown

Timber Flow Scenario	With 4% downward pressure	With block-level constraints
+300,000 cubic metres	year 41	year 31
+400,000 cubic metres	year 21	year 11
+450,000 cubic metres	year 21	year 11
+500,000 cubic metres	year 11	year 1

Without further upward pressure on timber supply, and in order to maintain an increase for at least 2 decades, the maximum increase would be less than 400,000 cubic metres. Further analysis has confirmed this maximum increase to be 385,000 cubic metres .

2.3 Additional Yield Improvements

Several factors provide additional opportunities for increases in timber flow. Substantial data collected in Merritt TSA indicates a 21% higher yield from the Douglas-fir. selection harvest than is predicted in the TSR#2 base case. In addition, the application of genetic gain factors will result in a further increase in the managed stand yields. These impacts were also assessed in a stepwise fashion to evaluate their potential to improve the timber supply outlook.

Figure 6 and Table 5 show the incremental effects of incorporating these two factors. When combined with the improved managed stand yield forecasts discussed in Section 2.2, the improved yields from Douglas-fir increase the timber flow by an additional 20,000 cubic metres/year, while the managed yield increases results in a further increase of 25,000 cubic metres/year.

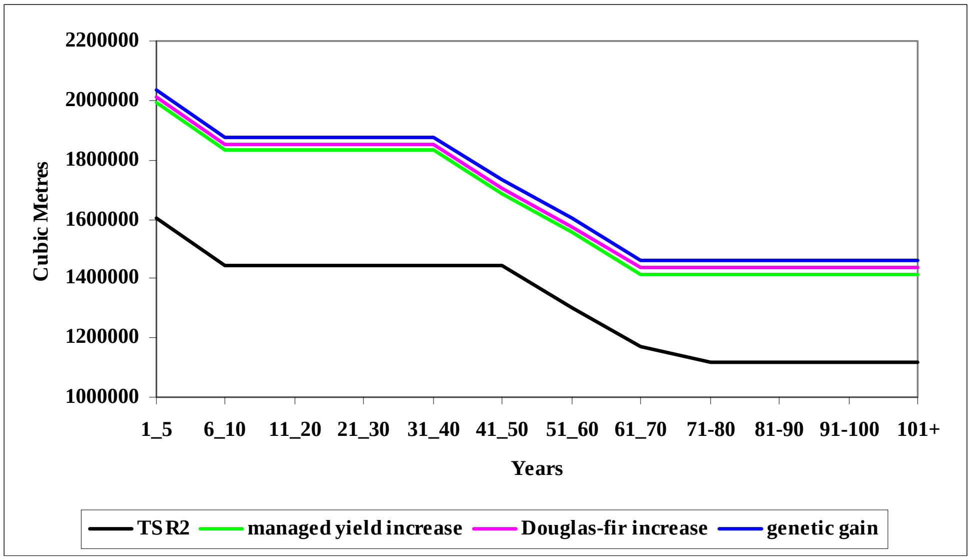

Figure 6. Incremental impacts of stand yield improvements on timber flow

Table 5. Incremental impacts of stand yield improvements on timber flow

Years	TSR#2	Improved managed Yield		+Improved Df yield		+Genetic Gain (composite)	
	Harvest	Harvest	Increase	Harvest	Increase	Harvest	Increase
1-5	1605550	1990550	385000	2010550	405000	2035550	430000
6-10	1445550	1830550	385000	1850550	405000	1875550	430000
11-20	1445550	1830550	385000	1850550	405000	1875550	430000
21-30	1445550	1830550	385000	1850550	405000	1875550	430000
31-40	1445550	1830550	385000	1850550	405000	1875550	430000
41-50	1445550	1685995	240445	1705995	260445	1730995	285445
51-60	1300995	1555896	254901	1575896	274901	1600896	299901
61-70	1170895	1415550	244655	1435550	264655	1460550	289655
71+	1120000	1415550	295550	1435550	315550	1460550	340550

Overall therefore, the composite effect of these factors is to increase timber supply by 430,000 cubic metres over the TSR#2 base case results.

Figure 7 illustrates the contribution of the total harvest from natural and managed stands for the composite scenario, incorporating all of the above factors. The shift from natural stands to managed stands occurs approximately 20 years earlier in this scenario. This clearly shows the effect on harvest availability associated with the higher managed yields and earlier minimum harvest ages associated with the IFPA scenario. Figure 8 illustrates the harvest flows from the smallwood and Douglas-fir selection systems

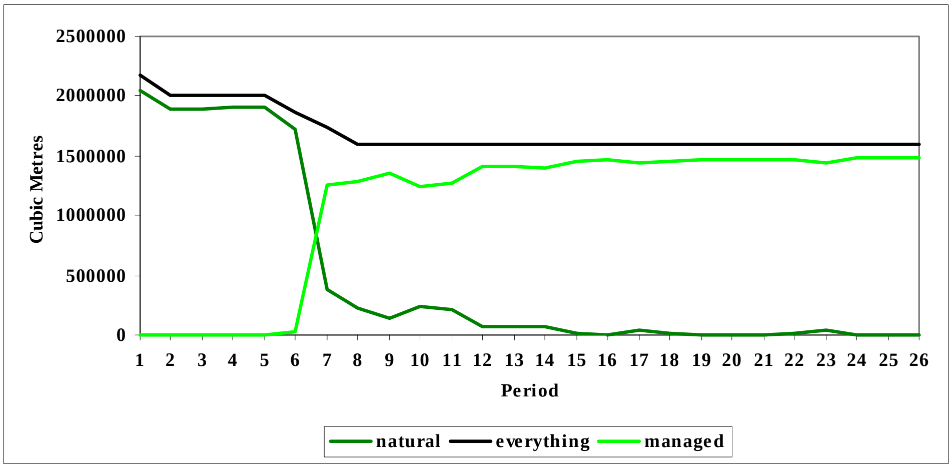

Figure 7. Overall timber supply - composite scenario

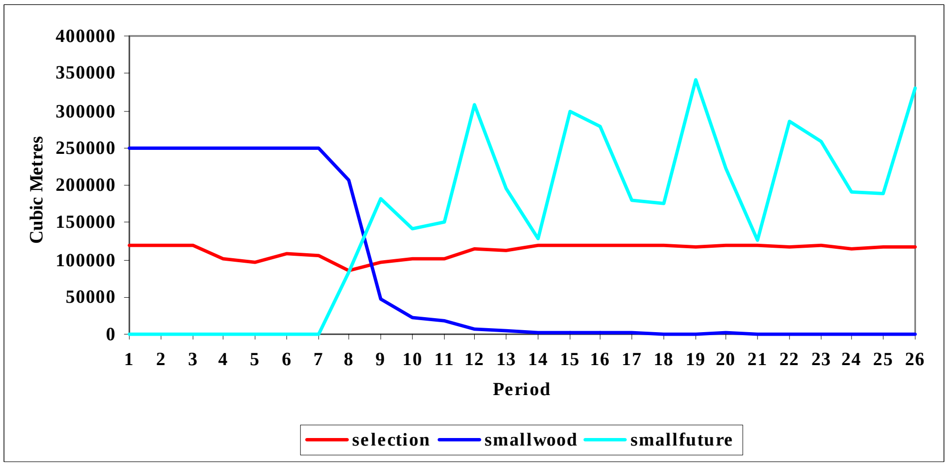

Figure 8. Smallwood and selection harvest forecasts – composite scenario

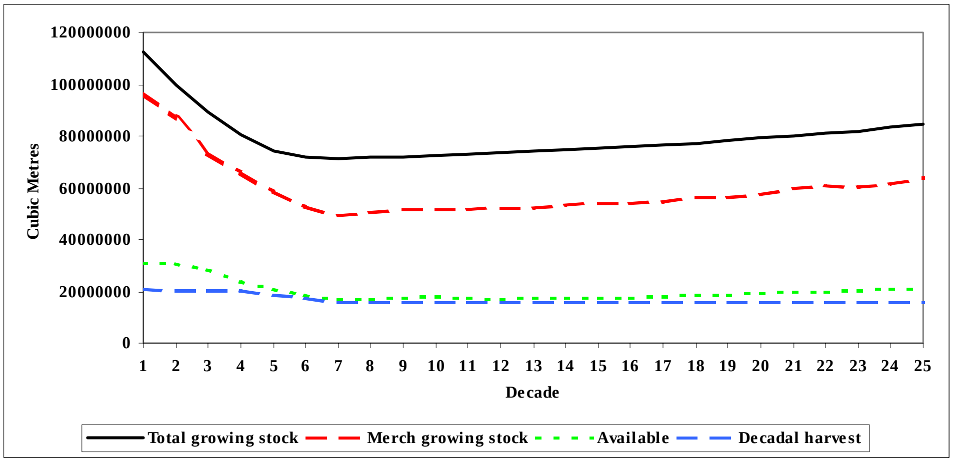

Figure 9. Growing stock forecast – composite scenario

In Figure 8 it is important to recognize that the realization of the increase associated with the Douglas-fir yield scenario is predicated on an aggressive and sustained level of selection harvesting in these types. This harvest level averages 112,000 cubic metres annually for the composite scenario.

On the basis of the above analysis, the composite scenario demonstrates a level of harvest that can be maintained for four decades. However, as indicated earlier, this is subjected to the same downward pressures associated with environmental impacts and block level spatial constraints not currently incorporated into the analysis. These are illustrated in Table 6.

Table 6. Expected further impacts on the stepdown timing for the composite scenario

Timber flow	**Composite scenario**	**+4% environmental impact**	**+Spatial blocking constraints**
+430,000 cubic metres	Year 41	year 31	year 21

3. DISCUSSION

Based on the analyses described above, an AAC increase of 430,000 cubic metres per year is considered reasonable for the following reasons.

1. It is built directly upon the results of the MoF TSR#2 base case analysis, and the attendant assumptions deemed to be defensible and representative of current practices.

2. It is based on additional defensible growth and yield information that indicates higher yields in both managed stands and natural Douglas-fir types

3. It results in a harvest level that can be sustained for at least two decades, after consideration of the additional downward pressures shown in Table 6.

4. The growing stock indicators shown in Figure 9 are stable and sustainable in the long term.

5. The growing stock availability shown in figure 9 indicates a short-term surplus to accommodate spatial constraints over at least the first 20 years.

Notwithstanding the above, the growing stock availability in the mid-term shows very little volume surplus when compared to the actual decadal harvest. In other words, it will be sensitive to any further downward pressures not yet accounted for. For example, it is possible that the additional environmental impacts discussed above could exceed 4%, and in fact be as much as 8%. To mitigate this impact, the proposed harvest flow would have to be stepped down after decade 1. Given that this may not be acceptable, the alternative would be to reduce the proposed AAC to account for this additional downward pressure. It is critical therefore, that the effects of the IFPA environmental programs be incorporated and assessed in the upcoming IFPA spatial analysis, to ensure that they are adequately addressed.