



Western Forest Products Inc.

Tree Farm Licence 39

Timber Supply Analysis

MANAGEMENT PLAN 9

Addendum #2

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1. Background

The Ministry of Forests, Lands and Natural Resource Operations (FLNRO) is proposing to replace the 2007 South Central Coast Order (SCCO) and Central and North Coast Order (CNCO) and all amendments (2009 and 2013) with the proposed “2015 Great Bear Rainforest Order” (GBRO - June 2015). Only the SCCO applies to TFL 39 and only to supply blocks 3 and 5. At the request of Forest Analysis and Inventory Branch (FAIB) of FLNRO the objectives of the proposed GBRO were modeled.

The Management Plan (MP) #9 timber supply analysis (April 2014) includes netdowns and forest cover constraints that address the objectives of the SCCO (including the March 2009 amendments). Details are provided in the accompanying Timber Supply Analysis Information Package (refer to Section 7).

The proposed GBRO will significantly change the objectives for ecological representation (referred to as landscape level biodiversity in the SCCO). Over the past few years ecological inventories (either Terrestrial Ecosystem Mapping (TEM) or Predictive Ecosystem Mapping (PEM)) have been completed for those portions of the Great Bear Rainforest (GBR) for which such inventories were not available in 2007 when the original SCCO and CNCO were established. Having ecological mapping across the entire GBR allows old seral forest targets to be established for site-series groups (SSG) rather than site-series surrogates (SSS) as was done in the SCCO and CNCO. In addition, the intent of the proposed GBRO is to maintain old forest representation of each ecosystem at 70% of the range of natural variation (RONV) across the order area, with a few minor exceptions.

Objective 3 in Part 1 and Schedules ‘F’, ‘G’, ‘M’, ‘N’ and ‘U’ of the proposed GBRO relate to ecological representation and establishing short-term (Minimum Old Forest Retention Level - MOFRL) and long-term (Old Forest Representation Target - OFRT) old forest targets across the GBR. The target percentages listed in Schedule ‘G’ apply to the entire GBR. To assist licensees in implementing the ecological representation objectives, a guidance table (https://www.for.gov.bc.ca/tasb/SLRP/lrmp/nanaimo/EBM/GBR_BMTA/Schedules/GBR_OFTargetsLU_Impl_Guidance_20150609.pdf) was created that provides targets at the Landscape Unit / SSG level that, when combined, achieve the proposed site series group old forest requirements for the entire GBR.

Objective 4 in Part 1 of the proposed GBRO will establish timelines and requirements for preparing “Landscape Reserve Design” (LRD) that address the old forest targets and simultaneously contribute to the protection and stewardship of Aboriginal Heritage Features, Aboriginal Forest Resources, Cultural Cedar Use, Red and Blue-listed plant communities, and habitat important for species at risk and other specified wildlife species. To test the process for creating a Landscape Reserve Design, Western Forest Products (WFP) staff undertook a

review of TFL 39 Block 3, a portion of the Broughton Landscape Unit.

The other objectives in the SCCO have been incorporated into the proposed GBRO with little or no effective change; therefore, no other changes were made to the model set-up.

2. Analysis Approach

Three analyses were undertaken to test the impact of the proposed GBRO:

1. Aspatially apply the old forest target percentages by landscape unit listed in the guidance table with the Base Case model set-up (maximum 5,000 m³/year non-conventional harvest);
2. Aspatially apply the old forest target percentages by landscape unit listed in the guidance table with the increased non-conventional harvest model set-up that formed the basis for WFP's AAC recommendation (even-flow non-conventional old forest harvest level for first 40 years and mature and younger forest only thereafter); and,
3. Apply the draft Landscape Reserve Design for Block 3, aspatially apply the old forest target percentages for Block 5 (Phillips landscape unit) listed in the guidance table with the increased non-conventional harvest model set-up that formed the basis for WFP's AAC recommendation.

Table 1 lists the productive forest hectares by site-series group and the corresponding target percentages for OFRT (Column A) and MOFRL (Column B) for Block 3 (Broughton) and Block 5 (Phillips). The resulting MOFRL target hectares were set as minimum constraints within the model from the beginning of the analysis period (2012-2261). Where there is currently insufficient old forest to meet the minimum MOFRL the model "recruits" old forest to meet the target as quickly as possible.

The OFRT target hectares were set as minimum constraints within the model to be met by the start of the final decade in the model (i.e. 2252). This ensures the targets are achieved by 2264 as listed in Objective 3 of the proposed GBRO.

Table 1 – Ecological Representation Targets

SSG	Phillips Productive Ha	Phillips Target %		Phillips Target Ha		Broughton Productive Ha	Broughton Target %		Broughton Target Ha	
		Column A	Column B	Column A	Column B		Column A	Column B	Column A	Column B
CWHvm1	7,611.9			3,799	1,915	4,117.3			2,126	871
00	147.5	93%	47%	137	69	6.6	63%	0%	4	0
02	28.3	78%	63%	22	18	25.8	73%	12%	19	3
03	1,554.2	59%	46%	917	715	2,239.0	48%	21%	1,075	470
04	837.2	30%	7%	251	59		N/A	N/A	N/A	N/A
09	205.7	94%	78%	193	160		N/A	N/A	N/A	N/A
14	9.7	95%	73%	9	7	41.8	63%	22%	26	9
01_06	2,476.1	42%	19%	1,040	470	1,729.6	55%	21%	951	363
05_07_08	2,237.5	50%	17%	1,119	380	23.5	73%	18%	17	4
10_11	113.5	95%	30%	108	34		N/A	N/A	N/A	N/A
12_13	2.2	98%	98%	2	2	51.0	66%	41%	34	21
CWHvm2	4,779.4			2,468	2,092					
00	100.7	83%	38%	84	38		N/A	N/A	N/A	N/A
02	1.5	0%	0%	0	0		N/A	N/A	N/A	N/A
03	2,288.1	61%	57%	1,396	1,304		N/A	N/A	N/A	N/A
04	222.7	30%	14%	67	31		N/A	N/A	N/A	N/A
11	19.5	62%	58%	12	11		N/A	N/A	N/A	N/A
01_06	1,571.4	42%	34%	660	534		N/A	N/A	N/A	N/A
05_07_08	554.1	42%	28%	233	155		N/A	N/A	N/A	N/A
09_10	21.5	81%	81%	17	17		N/A	N/A	N/A	N/A
MHm1	1,876.1			1,223	1,114					
00	56.4	94%	91%	53	51		N/A	N/A	N/A	N/A
02	1,179.8	74%	66%	873	779		N/A	N/A	N/A	N/A
01_04	633.7	46%	44%	292	279		N/A	N/A	N/A	N/A
03_05	5.2	90%	90%	5	5		N/A	N/A	N/A	N/A
06_07	1.0	93%	93%	1	1		N/A	N/A	N/A	N/A
Total	14,267.4			7,490	5,121	4,117.3			2,126	871

3. Results

A. Timber Harvesting Land Base

The Base Case and AAC recommendation model set-up included Strategic Level Reserve Design (SLRD) for both Blocks 3 and 5 that addressed the SCCO objectives. As discussed earlier, these scenarios test the timber supply impact of the proposed GBRO utilizing combinations of spatially defined LRD for Block 3 and aspatial SSG targets. The effect on timber harvesting land base (THLB) is indicated in Table 2. The LRD for Block 3 reduces the THLB by 713 hectares.

Table 2 – Blocks 3 and 5 Timber Harvesting Landbase

Scenario	Block 3 THLB (Ha)	Block 5 THLB (Ha)	Total THLB (Ha)
Base Case / AAC Recommendation	2,336	3,313	5,649
Aspatial SSG in both Blocks	2,866	6,708	9,574
Block 3 LRD, Block 5 aspatial SSG	2,153	6,708	8,861

B. Aspatial Site Series Group Targets for Blocks 3 and 5 with Restricted Non-conventional Harvest Contribution

Applying aspatial constraints to meet the old forest targets within the guidance table provided for the proposed GBRO while limiting non-conventional harvest to 5,000 m³/year (as per the Base Case) results in a short-term harvest level of 54,200 m³/year, a 31% increase from the Base Case and 19% increase from the AAC recommended in April 2014 (refer to Table 3 and Figure 1). Long-term harvest increases by 11,500 m³/year (roughly 25%). The increase in harvest level is due to the larger effective THLB used in this scenario.

Figure 2 indicates the THLB growing stock through time resulting from this harvest schedule. The THLB growing stock reported is significantly greater (2 – 2.5 times) than reported for the Base Case due to the elimination of the SLRD netdown (i.e. area designated as SLRD in the Base Case with no other applicable netdown is considered THLB in this scenario). The model manages old forest to meet the targets by not harvesting THLB. In this scenario, the initial forest has 3,044 ha of old forest THLB of which 1,368 ha remains at the end of the 250 year analysis period.

Table 3 - Harvest Levels with Aspatial SSG Targets and Restricted Non-conventional Contribution

Period (Decade #)	Start Year	End Year	Blocks 3&5 Annual Harvest Volume (m ³)				
			Base Case	Recommended AAC	Aspatial SSG Targets with restricted Non-conventional Harvest		
					Conventional Harvest	Non-conventional Harvest	Total Harvest
1 - 4	2012	2051	41,300	45,400	49,200	5,000	54,200
5	2052	2061	41,300	36,300	49,200	5,000	54,200
6	2062	2071	41,300	37,000	49,200	5,000	54,200
7	2072	2081	41,300	37,300	49,200	5,000	54,200
8	2082	2091	45,000	41,500	51,500	5,000	56,500
9	2092	2101	45,000	42,200	51,500	5,000	56,500
10	2102	2111	45,000	43,300	51,500	5,000	56,500
11	2112	2121	45,000	45,000	51,500	5,000	56,500
12 - 25	2122	2261	45,000	45,100	51,500	5,000	56,500

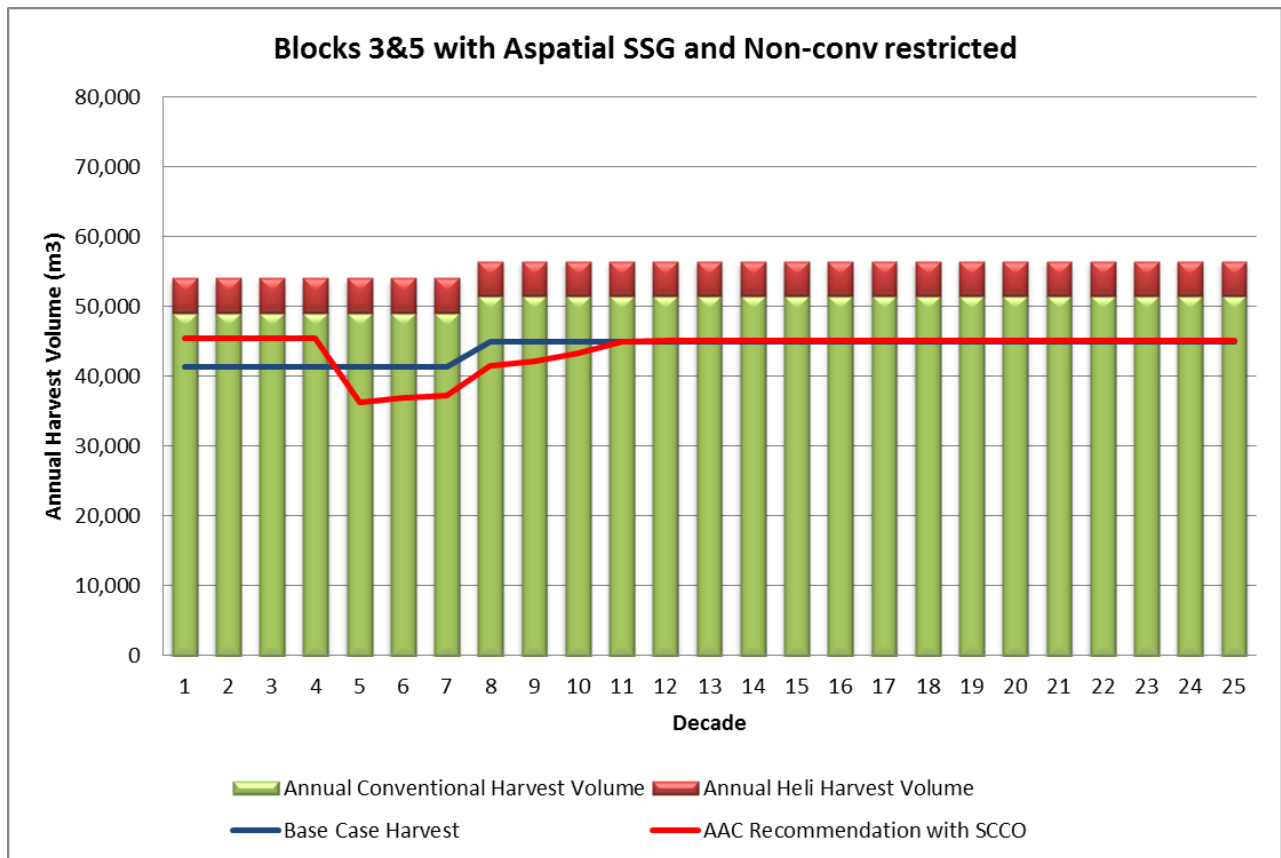


Figure 1 – Harvest Level with Aspatial SSG Targets and Restricted Non-conventional Contribution

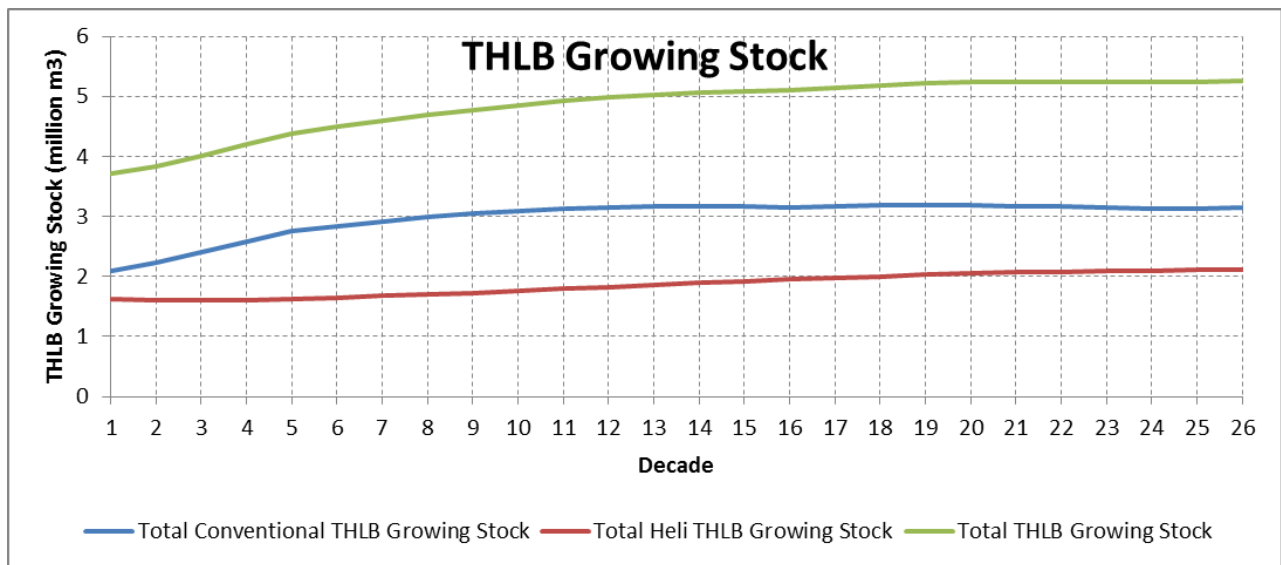


Figure 2 – THLB Growing Stock with Aspatial SSG Targets and Restricted Non-conventional Contribution

C. Aspatial Site Series Group Targets for Blocks 3 and 5 with Increased Non-conventional Harvest Contribution

Relative to the Base Case, the April 2014 AAC recommendation was based on an increased contribution from the non-conventional THLB. To investigate potential harvest levels this scenario was run using the aspatial SSG targets and requiring an even-flow of non-conventional old growth volume over the first 40 years after which only immature non-conventional timber was available. Table 4 and Figure 3 indicate the resulting harvest schedule. Initial harvest can be 37,200 m³/year greater (90%) than the Base Case or 33,100 m³/year greater (73%) than the April 2014 AAC recommendation. Relative to the recommended AAC, the additional volume is due to a 9,700 m³/year increase in conventional harvest and a 23,400 m³/year increase in non-conventional harvest (refer to Table 1 in Addendum #1 for a breakdown of the split in the recommended AAC harvest schedule). Long-term harvest is increased by 16,200 m³/year, or 36%.

The increased short-term old forest harvest creates a decline in the total THLB growing stock over the first 50 years after which the reduction in harvest combined with vigorously growing immature stands results in an increase in growing stock such that the THLB inventory levels are nearly identical to those in the scenario described in section B above (refer to Figure 4). In this scenario, the initial forest has 3,044 ha of old forest THLB of which 539 ha remains at the end of the 250 year analysis period in order to meet the old forest retention targets.

Table 4 - Harvest Levels with Aspatial SSG Targets and Increased Non-conventional Contribution

Period (Decade #)	Start Year	End Year	Blocks 3&5 Annual Harvest Volume (m ³)				
			Base Case	Recommended AAC	Aspatial SSG Targets with increased Non-conventional Harvest		
					Conventional Harvest	Non- conventional Harvest	Total Harvest
1 - 4	2012	2051	41,300	45,400	46,000	32,500	78,500
5	2052	2061	41,300	36,300	46,000	0	46,000
6	2062	2071	41,300	37,000	46,000	300	46,300
7	2072	2081	41,300	37,300	46,000	500	46,500
8	2082	2091	45,000	41,500	51,000	700	51,700
9	2092	2101	45,000	42,200	51,700	1,000	52,700
10	2102	2111	45,000	43,300	51,700	1,500	53,200
11	2112	2121	45,000	45,000	51,700	2,300	54,000
12	2122	2131	45,000	45,100	51,700	3,500	55,200
13	2132	2141	45,000	45,100	51,700	5,200	56,900
14	2142	2151	45,000	45,100	51,700	7,800	59,500
15 - 25	2152	2261	45,000	45,100	51,700	9,500	61,200

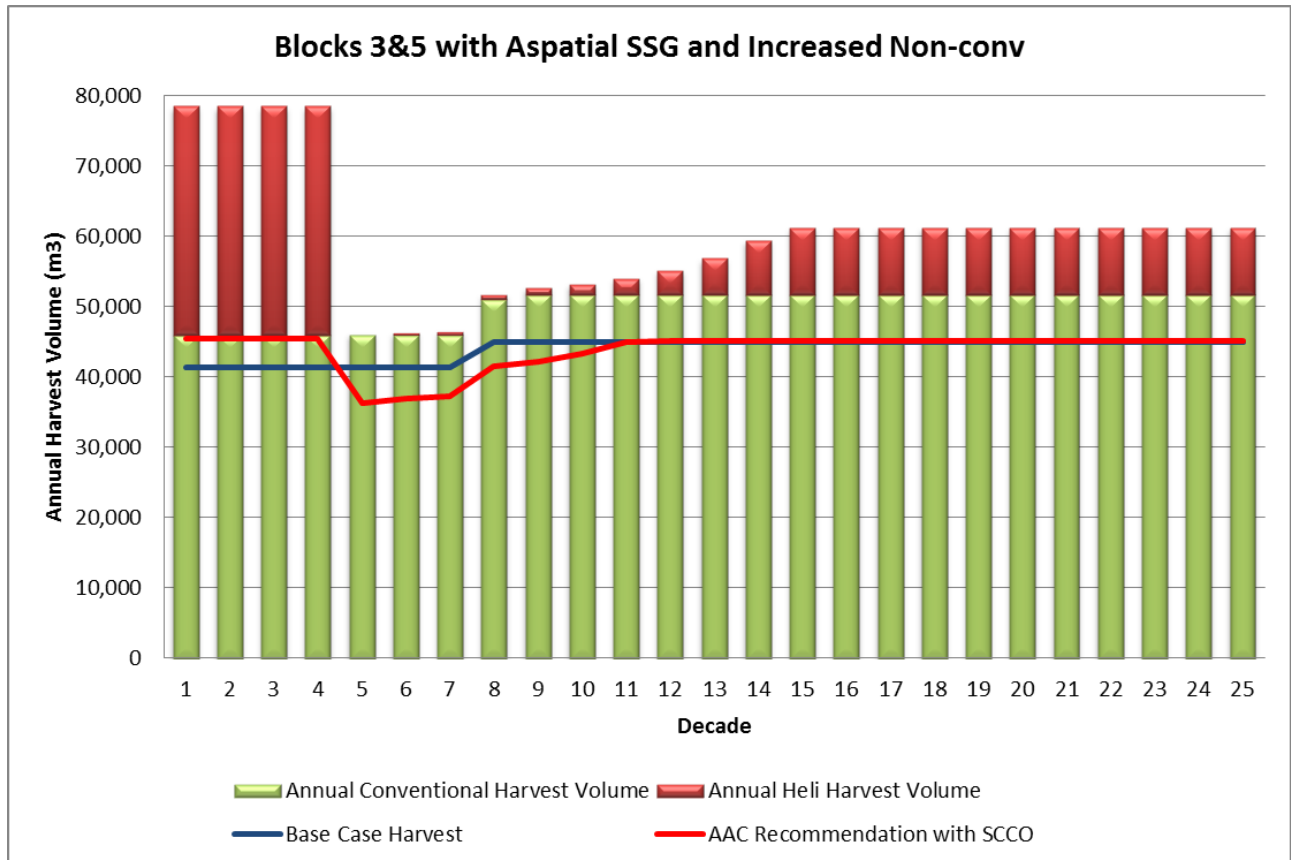


Figure 3 – Harvest Level with Aspatial SSG Targets and Increased Non-conventional Contribution

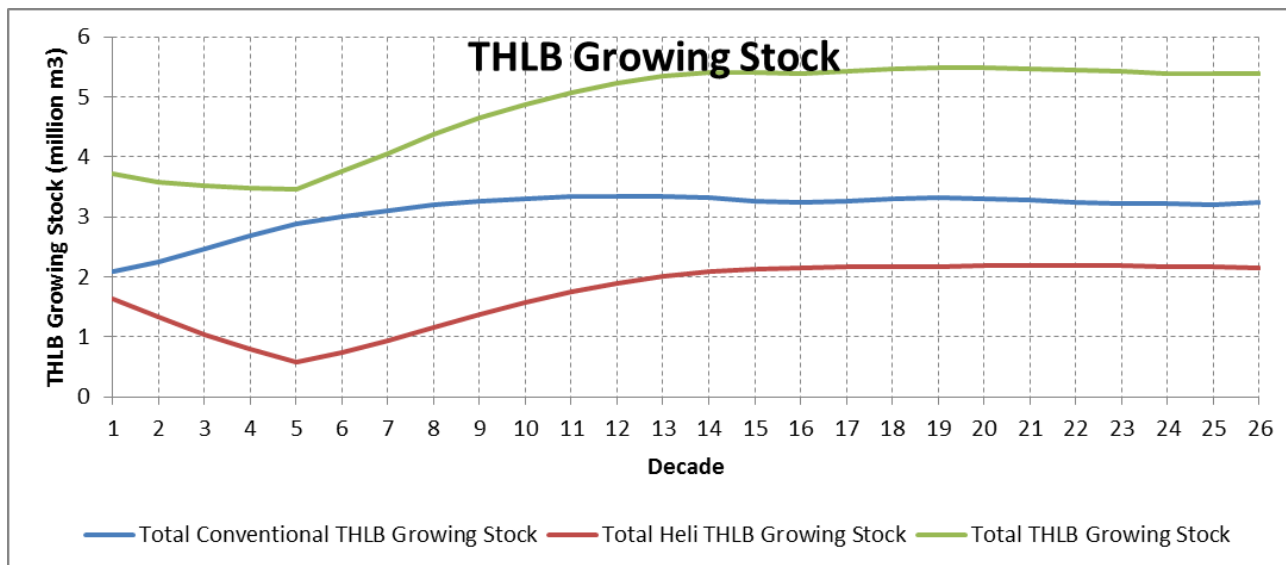


Figure 4 – THLB Growing Stock with Aspatial SSG Targets and Increased Non-conventional Contribution

D. Landscape Reserve Design for Block 3, Aspatial Site Series Group Targets for Block 5 with Increased Non-conventional Harvest Contribution

To test the process for creating a Landscape Reserve Design (Objective 4 in Part 1 of the proposed GBRO), WFP staff undertook a review of TFL 39 Block 3, a portion of the Broughton Landscape Unit. The draft LRD was incorporated into the timber supply analysis data and designated as a 100% netdown. The resulting THLB for Block 3 is 713 ha smaller than when aspatial SSG targets are applied and is 183 ha smaller than the THLB used in the Base Case and April 2014 AAC recommendation.

Compared to meeting the SSG targets aspatially, the LRD-reduced THLB within Block 3 results in a 2,300 m³/year lower initial conventional harvest contribution (there is no non-conventional THLB within Block 3). The model is able to offset this reduction with an increase in short-term non-conventional harvesting of 3,700 m³/year such that the initial harvest level when using the draft LRD for Block 3 is 1,400 m³/year higher (1.8%) than when not. Long-term, conventional harvest is reduced by an insignificant 200 m³/year (0.4%) and non-conventional harvest is increased by 1,000 m³/year (10.5%). This increase in long-term non-conventional harvest is a result of more old forest being harvested in the short-term and thus increasing the amount of regenerated forest harvestable in the long-term. See Table 5 and Figure 5 for further details.

Table 5 - Harvest Level with Block 3 LRD, Block 5 Aspatial SSG Targets and Increased Non-conventional Contribution

Period (Decade #)	Start Year	End Year	Blocks 3&5 Annual Harvest Volume (m ³)				
			Base Case	Recommended AAC	Block 3 LRD, Block 5 Aspatial SSG, increased Non-conventional Harvest		
					Conventional Harvest	Non-conventional Harvest	Total Harvest
1 - 4	2012	2051	41,300	45,400	43,700	36,200	79,900
5	2052	2061	41,300	36,300	43,700	0	43,700
6	2062	2071	41,300	37,000	43,700	300	44,000
7	2072	2081	41,300	37,300	43,700	500	44,200
8	2082	2091	45,000	41,500	48,700	800	49,500
9	2092	2101	45,000	42,200	51,500	1,200	52,700
10	2102	2111	45,000	43,300	51,500	1,700	53,200
11	2112	2121	45,000	45,000	51,500	2,600	54,100
12	2122	2131	45,000	45,100	51,500	3,900	55,400
13	2132	2141	45,000	45,100	51,500	5,800	57,300
14	2142	2151	45,000	45,100	51,500	8,700	60,200
15 - 25	2152	2261	45,000	45,100	51,500	10,500	62,000

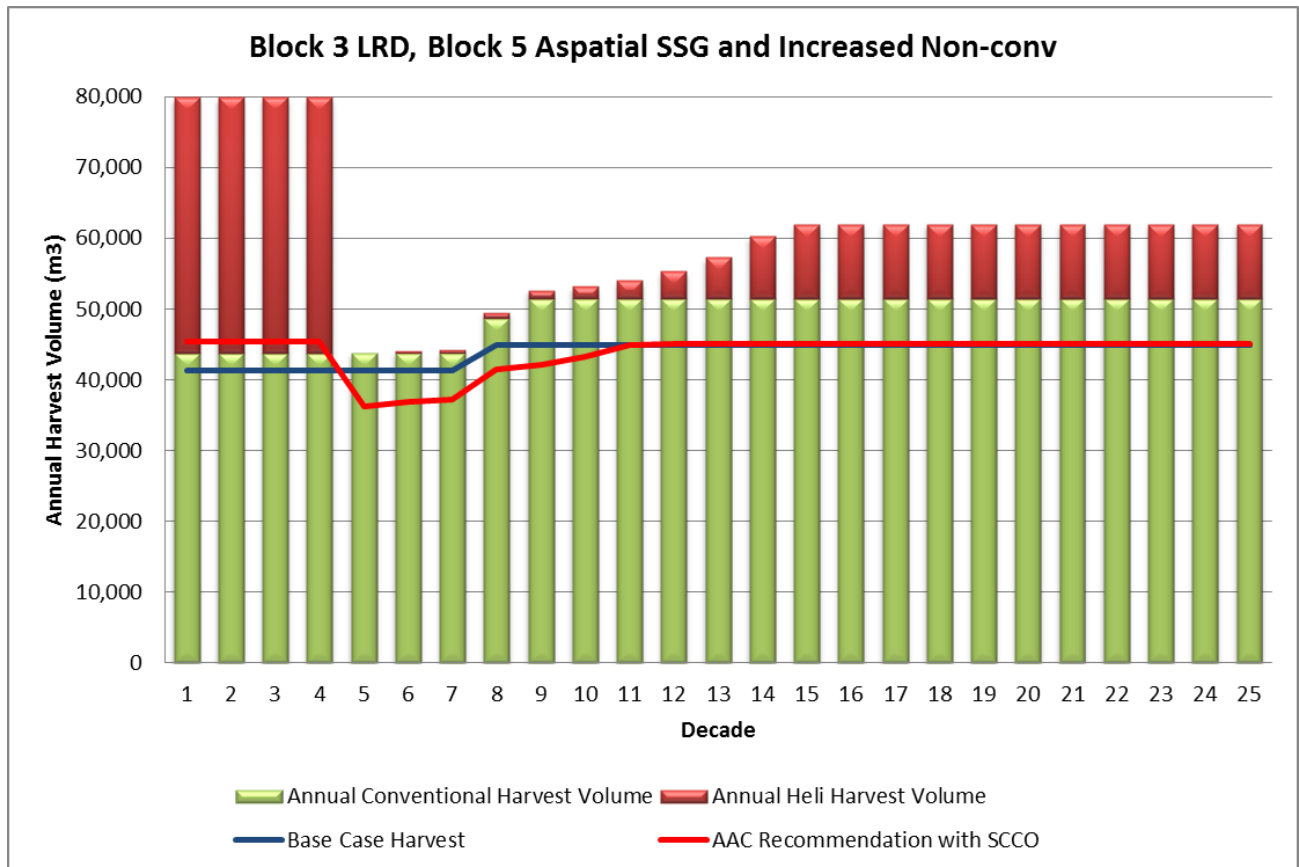


Figure 5 – Harvest Level with Block 3 LRD, Block 5 Aspatial SSG Targets and Increased Non-conventional Contribution

The LRD for Block 3 reduces the initial conventional, and therefore total, THLB growing stock by roughly 425,000 m³ (11.4% - refer to Figure 6); however, as discussed in section B not all THLB is available for harvest as the SSG targets require THLB to be reserved. In this scenario, the initial forest has 2,841 ha of old forest THLB of which 230 ha remains at the end of the 250 year analysis period in order to meet the old forest retention targets within Block 5.

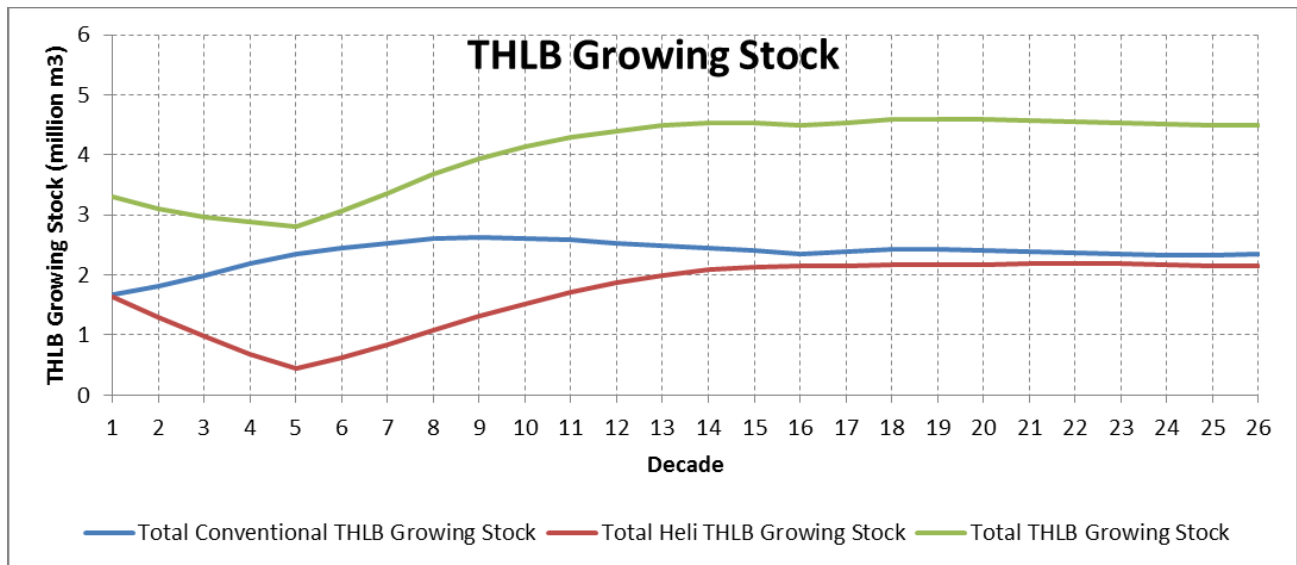


Figure 6 – THLB Growing Stock with Block 3 LRD, Block 5 Aspatial SSG Targets and Increased Non-conventional Contribution

4. Summary and Conclusions

The proposed Great Bear Rainforest Order (GBRO) will revise the objectives for ecological representation within the area currently subject to the South Central Coast Order (and the Central and North Coast Order), including Blocks 3 and 5 of TFL 39. The most significant modifications to management within TFL 39 would be a reduction in long-term old forest reserve requirements in Block 5 (relative to the SCCO 70% Range of Natural Variation (RONV) requirements) that recognizes the harvest history within the Phillips watershed. The old forest retention targets for Block 3 (a portion of the Broughton landscape unit) would increase from the 30% RONV targets in the SCCO.

Timber supply analyses were conducted both with aspatial old forest targets (as detailed in a guidance table provided with the draft GBRO) and draft Landscape Reserve Design (spatially defined reserves designed to meet all landscape-level objectives within the proposed GBRO) for Block 3. The analyses were modeled with non-conventional harvest constraints as per the Base Case analysis and with increased contribution that formed the basis for WFP’s recommended AAC in April 2014.

Allowing the timber supply model to meet the old forest retention targets aspatially and limiting non-conventional harvest to 5,000 m³/year, as in the Base Case, results in an initial harvest level of 54,200 m³/year, an increase of 12,900 m³/year (31%) from the Base Case initial harvest level. Changing the non-conventional constraint to even-flow of old forest harvest for the first 40 years and only immature forest thereafter (as per the April 2014 AAC recommendation) while meeting the old forest retention targets aspatially results in an initial harvest level of 78,500 m³/year, 33,100 m³/year (73%) greater than the April 2014 AAC recommendation.

Objective 4 of Part 1 of the proposed GBRO requires that for each Landscape Unit in the order area, a Landscape Reserve Design (LRD) must, in time, be prepared that addresses the old forest retention targets and to the extent reasonably practicable address the protection and stewardship of Aboriginal Heritage Features, Aboriginal Forest Resources, Cultural Cedar Use, Red and Blue-listed Plant Communities and habitat important for wildlife. WFP staff has created a draft Landscape Reserve Design for TFL 39 Block 3, a portion of the Broughton landscape unit. A scenario was run that used this draft LRD for Block 3, aspatial old forest targets for Block 5 and the even-flow of old non-conventional forest described above. This scenario resulted in an initial harvest level of 79,900 m³/year, an increase of 34,500 m³/year (76%) from the April 2014 AAC recommendation.

In conclusion, the proposed Great Bear Rainforest Order will increase timber supply within TFL 39 Blocks 3 and 5 when compared to the requirements of the South Central Coast Order that were modeled in the April 2014 timber supply analysis. This is mainly due to a reduction in old forest retention requirements within Block 5 (Phillips landscape unit). Under the GBRO, the AAC contribution from Blocks 3 and 5 is roughly 79,000 m³/year, compared to 45,000 m³/year in April 2014 AAC recommendation.

Block 4 was deleted from TFL 39 and added to TFL 6 on January 1, 2015. As such the recommended AAC for TFL 39 is now 1,427,000 m³/year, a reduction of 202,000 m³/year attributed to the former Block 4. With this adjustment, the proposed GBRO increases the recommended AAC for TFL 39 from 1,427,000 m³/year to 1,461,000 m³/year, an increase of 34,000 m³/year or 2.4%.