Ministry of Forests, Lands and Natural Resource Operations

WILLIAMS LAKE
TIMBER SUPPLY AREA

Technical Working Group Final Report

November 28, 2011

Executive Summary

Timber supply analyses have shown significant mid-term timber supply shortfalls associated with the current mountain pine beetle infestation. These shortfalls are predicted to occur when salvage harvest opportunities are either eliminated or are unavailable due to merchantability or economic considerations. This is likely to occur within 20 years perhaps much earlier if either dead pine shelf life is shorter than expected or economic conditions worsen. There are expectations of significant economic and social ramifications to the forest industry and forestry-dependent rural communities associated with this predicted timber supply fall down. Fall downs are particularly exacerbated when compared with current uplifted harvest levels.

Attempts to mitigate this anticipated timber supply shortfall can be categorized in two broad groups; administrative changes to forest policy and changes in land use direction. In the Williams Lake Timber Supply Area (TSA) several model runs have been completed which test various changes in both forest policy and land use policy. The base case shows a decline during the mid-term which is approximately 1,000,000 m^3/yr lower than the pre-Mountain Pine Beetle (MPB) expected annual allowable cut (AAC).

Key Findings:

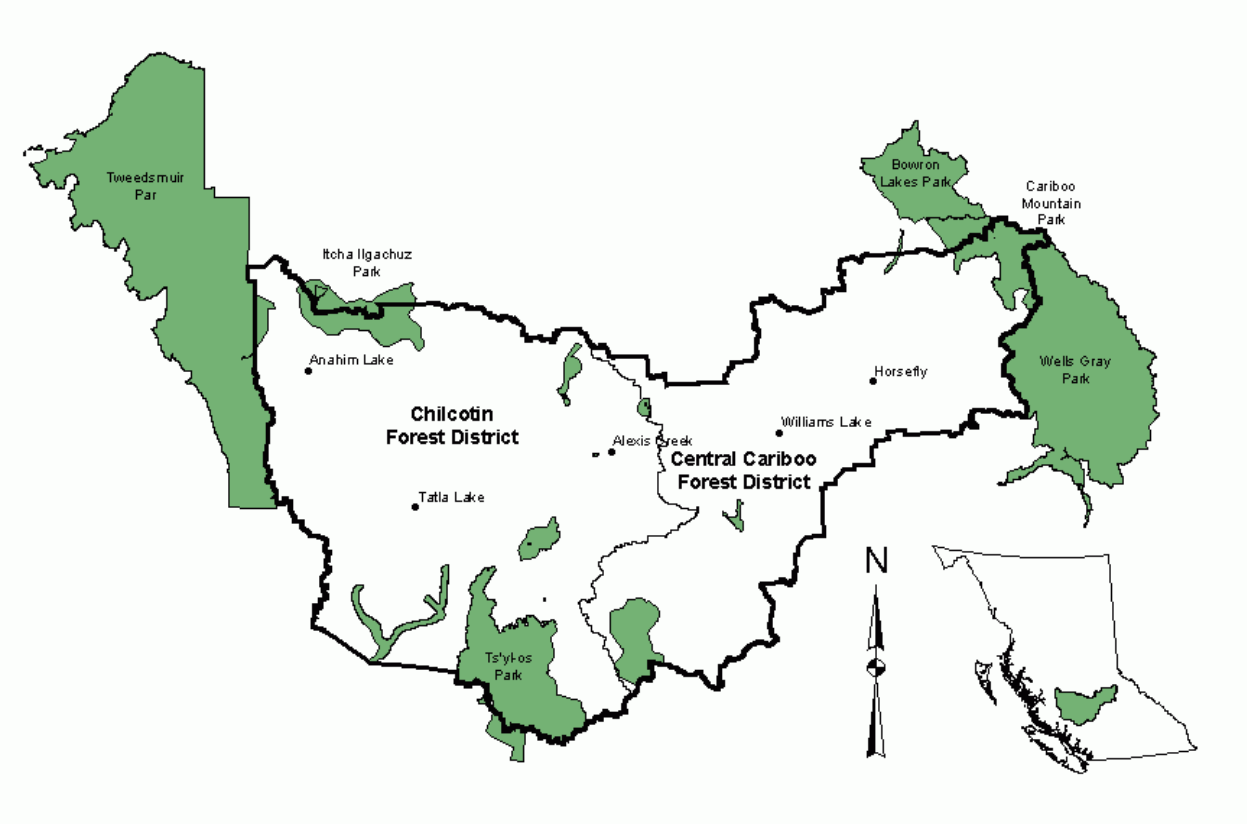
- Sufficient volume available in short-term at up-lifted harvest levels but is limited due to current economic conditions
- Shorter shelf life of dead pine may add mid-term pressures
- Retention of green timber in the short-term is necessary to mitigate mid-term supply issues.
- The mid-term supply may be better than predicted in the base case due to current operational practices (scenario 3)
- Mid-term timber availability could be close to pre-beetle forecast (2.85 million m^3/yr)
- Land Use Policy changes may not be required in the short-term to address mid-term timber supply issues
- Land Use and Administrative Policy changes could be required in the mid-term to help mitigate the falldown in timber supply

To test how changes in both broad groups would affect mid-term timber supply, scenarios were run which highlighted how the base case may not accurately reflect current practices, that there is a timber available in the short-term, that a vast amount of the timber available in the short-term is in the western portions of the TSA, that current harvest practices may actually already be

mitigating the mid-term supply and that changes in land-use policy provide small increments of volume during the mid-term.

Background

The Williams Lake TSA is one of the largest TSAs in the province, covering approximately 4.87 million hectares. It is located in the Fraser Basin and Interior Plateau between the Coast Mountains on the west and the Cariboo Mountains on the east. The TSA includes the communities of Williams Lake, Alexis Creek, Horsefly and several other small communities. The Williams Lake TSA is administered by the Cariboo-Chilcotin District.



Forestry, mining and agriculture are the main economic drivers in the region while tourism continues to be an important player in portions of the region. The Williams Lake TSA, along with Quesnel and 100 Mile House, are covered by the Cariboo-Chilcotin Land Use Plan (CCLUP). That plan represents an economic, social and environmental balance which reflects the values of the people and communities in the region and protects the values found on the land. The CCLUP was established as a higher level plan by cabinet in 1996. Through extensive planning and consultation CCLUP objectives were further refined and mapped with key land use values established as legal objectives under the *Land Act* (LUOR) in June 2010. These objectives direct people working on the land base how several non-timber resources are to be managed through time and across the CCLUP planning area.

The Williams Lake TSA was severely affected by the MPB infestation. Throughout the past 10 years the majority of forest harvesting in this TSA has been directed at mountain pine beetle infested timber. During that time the AAC has been increased to allow for increased salvage harvesting. Licensees and BCTS continue to focus harvest in dead pine stands. Prior to the current MPB infestation the Williams Lake AAC was set at 2.5 million m^3/yr from green coniferous stands (Timber Supply Review 1996), 350,000 m^3/yr from the western supply block and 850,000 m^3/yr for MPB damaged stands which were the result of the 1980's MPB outbreak. In 2003 the AAC was re-visited and the cut was set at 3.7 million m^3/yr with 850,000 m^3 directly attributed toward MPB damaged stands and 2,810,000 m^3/yr (450,000 m^3/yr in the three western supply blocks and the remainder in the main TSA) to green coniferous stands. The allowable cut has been 5,700,000 m^3/yr since 2007. During the last ten years pine has accounted for an average of just under 90 percent of the volume harvested in the TSA. As a result of the MPB infestation the expected falldown in timber supply during the mid-term has been greatly exacerbated.

The MPB epidemic has caused a previously unanticipated problem which will not only affect timber supply but will likely impact the local economies through reduced timber harvesting and processing and the resulting reduction in spin-off economic activity. There may also be impacts to tourism in visually sensitive and backcountry areas. Also, the extensive reduction in mature timber cover has resulted in a loss of habitat for wildlife which may impact wildlife populations. This loss of mature timber may also affect hydrologic stability in some watersheds which would affect fish populations, habitat suitability, water supply, and quality.

This document contains a number of figures depicting the results of the modeling exercises. The vertical axis of the figures depict the AAC in millions of cubic meters. The horizontal axis are broken into periods with each period representing five years.

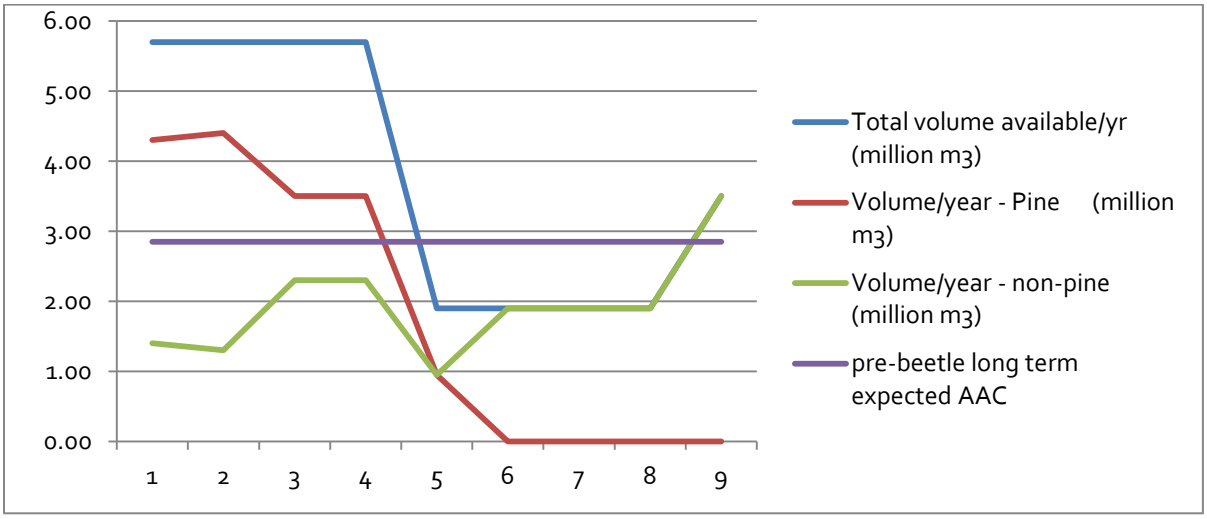


Figure 1 - Base Case

Base Case – Reflects Current Management Direction and Allowed Cut Levels

The graph shows the expected timber supply will be lower during the mid-term (20 – 40 years from present) than the pre-beetle expected AAC. The task of this technical working group was to explore alternate scenarios which could help to mitigate the mid-term reduction in supply. The base case shows an AAC of 5.7 million m^3 currently, after 20 years the supply of timber drops to 1.9 million m^3 during the mid-term period. Following the mid-term the model predicts that timber supply returns to the long-term level of 3.5 million m^3/yr. At the direction of the Provincial Mid-term Timber Supply Oversight Committee, the Williams Lake Technical Committee has undertaken to analyze the base case results, suggest scenarios which may shed light on mitigative measures available, and report the result of these analyses. The following scenarios demonstrate how changes to administrative practices or land-use policy may affect the current supply and help to mitigate the reduction of timber available in the mid-term.

This project has utilized the most up-to-date provincial timber supply review base case, analysis assumptions and data as a starting point for analysis. In addition to the base case several scenarios were run to test or analyze the effect of changes to administrative policy or land-use direction.

Base Case analysis shows a mid-term Allowable Annual Cut of 1.9 million m^3 for the Williams Lake Timber Supply Area, the pre-beetle forecast was 2.85 million m^3/yr

Scenario 1 – remove 9 and 11 hour cycle times from the base case model.

The purpose of scenario 1 is to focus on the timber supply which is closest to Williams Lake.

To facilitate the modeling process the TSA was broken up into area's defined by their distance from the main processing facilities in the region. The result of this is a map of the TSA showing cycle times defined as 3 hour, 5 hour, 7 hour, 9 hour and 11 hour (see map on next page). This scenario reports on the amount of timber which was available in cycle time zones 3, 5, and 7 and to exclude cycle time 9 and 11. This was done for two reasons; it was felt that most harvesting was being done in areas closer to Williams Lake and this would help to define that availability and also, it would highlight the amount of volume which is currently available in areas 9 and 11.

Cycle time 9 and 11 areas are confined to the western portion of the TSA. It is important to note that cycle time is not the only factor which determines economic availability but it is the only factor modeled. Currently, due to economic conditions in the lumber industry there is very little harvesting taking place in these two cycle time zones.

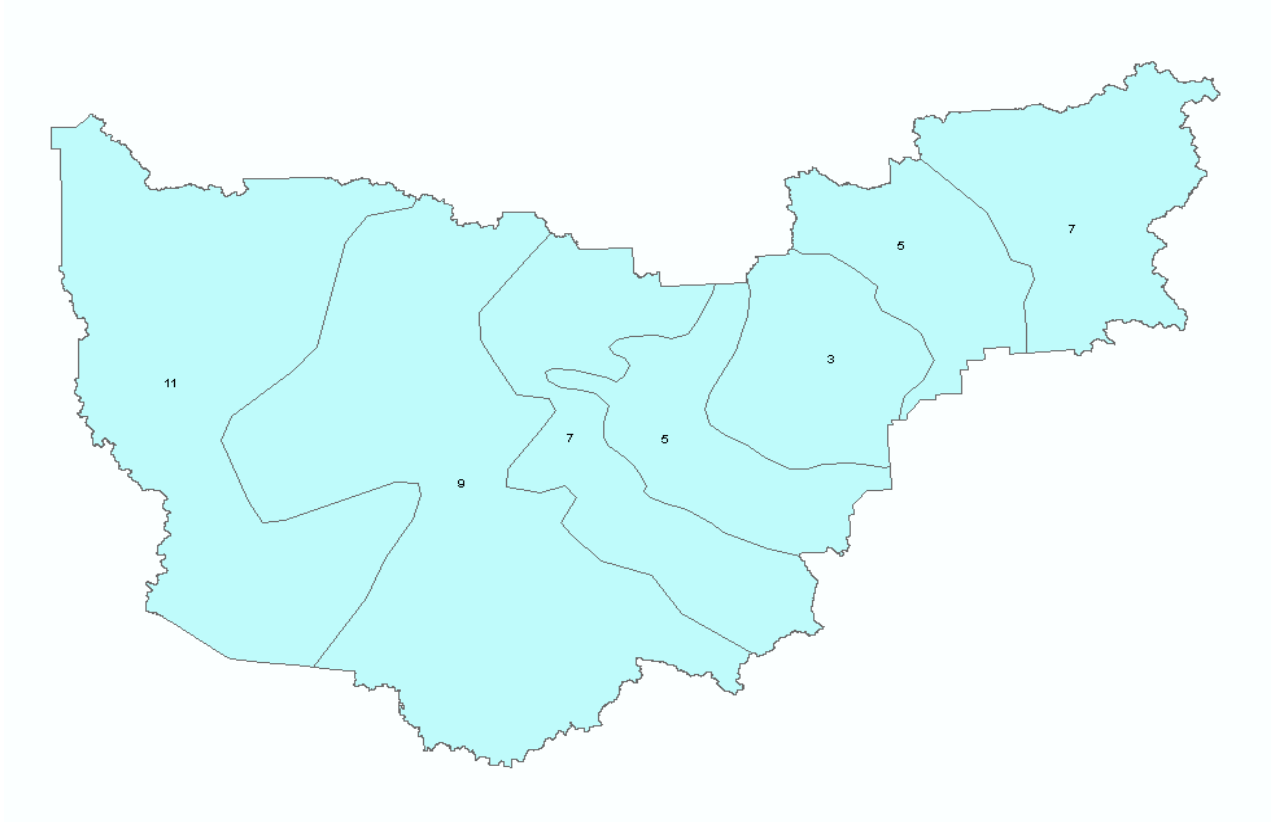


Figure 2 - Cycle Times For the Williams Lake TSA

The result of this model run demonstrated that the western portions of the TSA are capable of supplying a large amount of volume in the short-term (2.5 million m³/yr). Also, this reduction in area available during the short-term had little effect on the supply of non-pine in the mid-term. Mid-term harvest in the base case is projected to be 1.9 million m³/yr.

Scenario 1 highlights the area where most harvest is currently occurring and demonstrates availability in areas far from Williams Lake.

In scenario 1, the mid-term is projected to be 1.7 million m³/yr. The long-term AAC is projected to be 2.4 million m³/yr. This model run highlighted two things: 1) that the cycle times-9 –11 contribute a large amount of volume to the base case, and 2) that non-pine contributions to the mid-term were not affected much even though a huge amount of timber harvesting land base was removed from the model run. (The cycle times 9 and 11 are dominated by pine).

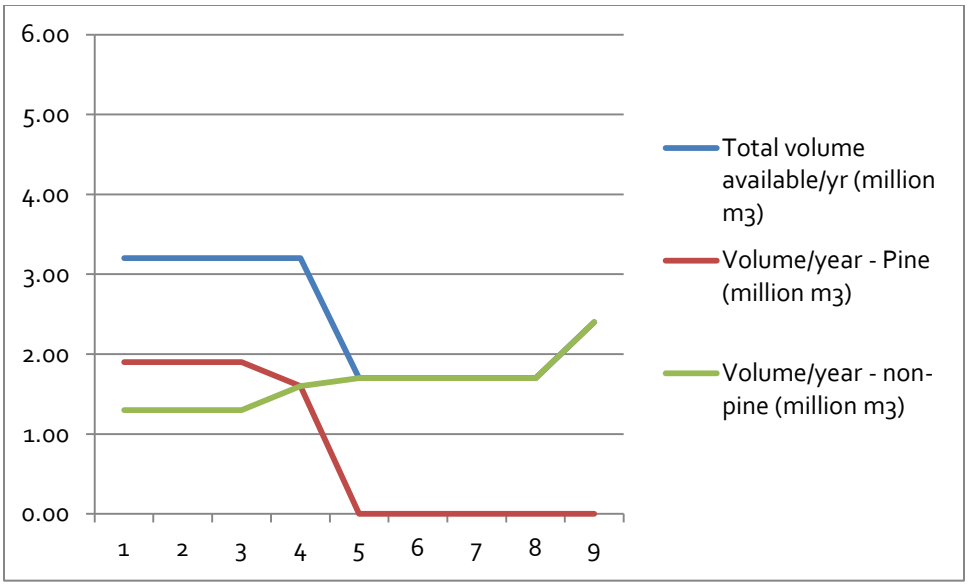


Figure 3 - Exclude cycle times 9 and 11 from the model

	Short-term AAC	Mid-term AAC	Long-term AAC
Base Case	5.77 million m^3 x 20 yrs	1.9 million m^3 X 20 yrs	3.5 million m^3/yr
Scenario 1	3.2 million m^3 x 20 yrs	1.7 million m^3 X 20 yrs	2.4 million m^3/yr

Scenario 2 – Pine Harvest – Direct harvest to dead pine stands during the short-term (same land base as Scenario 1)

The result of Scenario 1 raised an obvious question "If we made the model harvest pine stands preferentially, what would that do to mid-term supply?" The results of scenario 1 showed a level of cut during the short-term which is close to current performance. However, the model harvested non-pine stands and pine stands without differentiation. It seemed clear that if we could save the non-pine (which is assumed to be living versus the pine being assumed to be largely dead) that it would result in an increase in availability during the mid-term. Scenario 2 tests the effect of focusing short-term harvest on pine in order to save more greens stands for the mid-term.

Scenario 2 shows that directing harvest to pine in the short-term provides benefit to mid-term timber supply.

The result of scenario 2 shows an increase in mid-term availability of 200,000 m³/yr which is attributed to saving non-pine stands for harvest during the mid-term. Mid-term supply as modeled is 2.1 million m³/yr (all from non-pine stands).

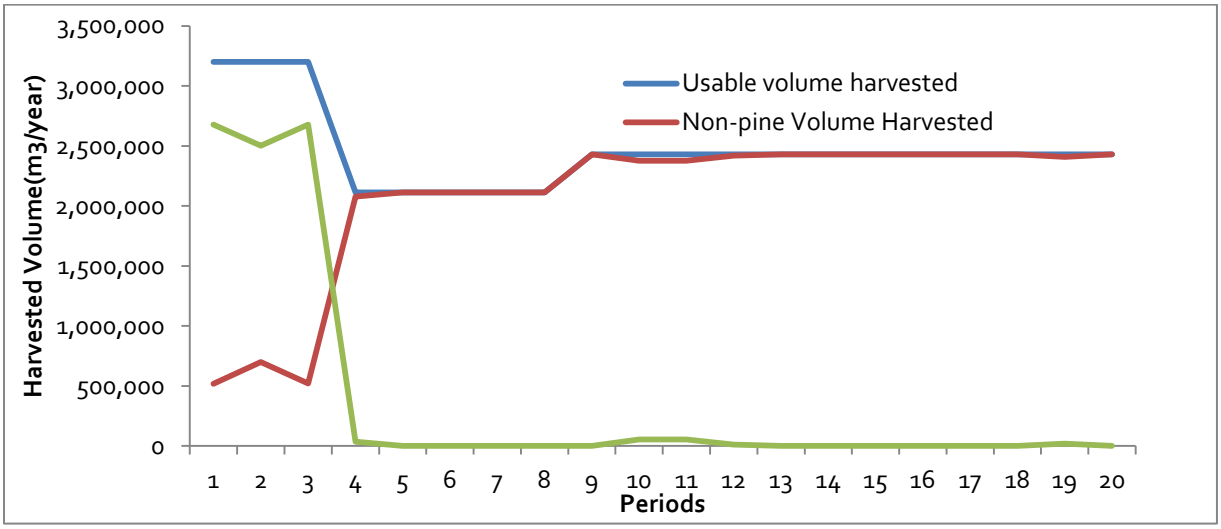


Figure 4- same land base as Scenario 1 but direct harvest to pine stands during short-term

	Short-term AAC	Mid-term AAC	Long-term AAC
Base case	5.77 million m³ x 20 yrs	1.9 million m³ x 20 yrs	3.5 million m³/yr
Scenario 2	3.2 million m³ x 20 yrs	2.1 million m³ x 20 yrs	2.4 million m³/yr

Scenario 3 – Test Effect of Future Growing Stock Requirement on Mid-Term supply (same land base as Base Case)

There may also be some modeling constraints built into the base case which cause an unintended reduction in mid-term timber availability. The specific constraint the team felt was most likely to cause a reduction during the mid-term was the requirement built into the model for there to be 186 million m³ of growing stock available at the end of the modeling period. This volume represents 53 years of AAC at the base cases expected long-term level of 3.5 million m³/yr. To test this the modeling requirement was dropped to 100 million m³ of growing stock available at the end of the modeling period. All other modeling assumptions were the same as the base case. 100 million m³ represents over 28 years of AAC at the long-term harvest level of 3.5 million m³/yr.

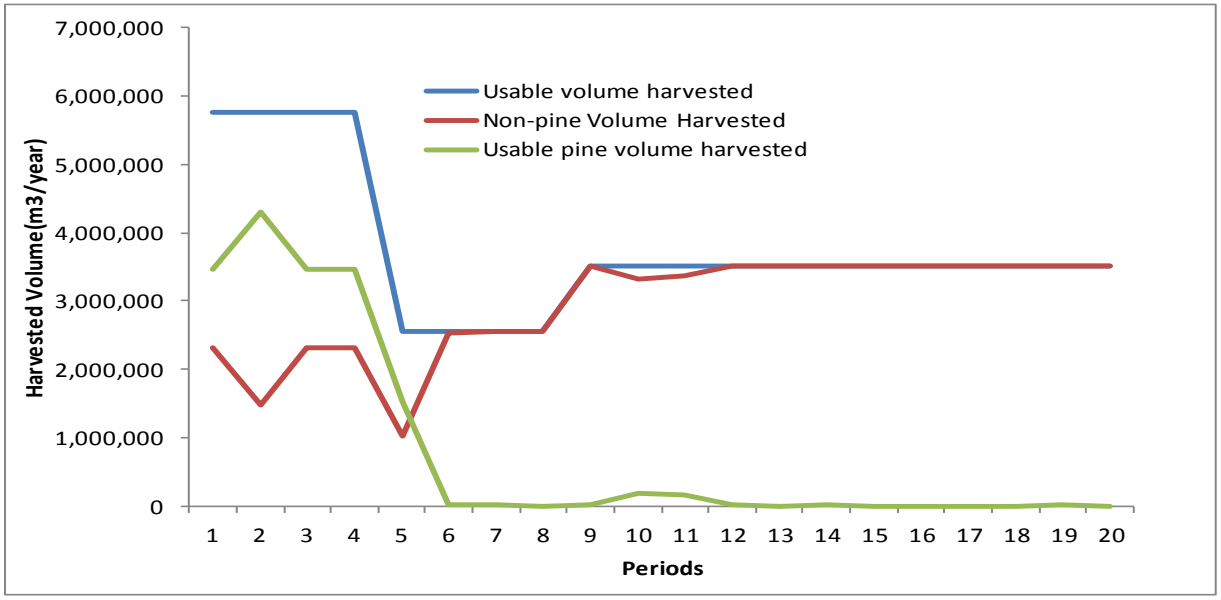


Figure 5 - Future Growing Stock requirement reduced to 100 million m³

	Short-term AAC	Mid-term AAC	Long-term AAC
Base Case	5.77 million m³ x 20 yrs	1.9 million m³ x 20 yrs	3.5 million m³/yr
Scenario 3	5.7 million m³ x 20 yrs	2.5 million m³ x 20 yrs	3.5 million m³/yr

Scenario 3 shows that reducing the growing stock requirement can significantly increase the mid-term timber supply.

The result of this reduction in future growing stock was an increase in mid-term availability of approximately 600,000 m³/yr.

Discussions with the technical team suggested that this model run may more accurately reflect operational practice. The future growing stock is not currently considered in specific harvest decisions. Either a stand meets the minimum harvest requirements or it does not. The future growing stock requirement (at year 100) is a constraint required in the current model. In past timber supply discussions it was noted that the Williams Lake TSA had a large volume of mature timber. This will not be the case in future determinations.

Scenario 4 - Dead Pine Shelf Life – limit MPB harvesting to the first 10 years of the model run.

Throughout the MPB infestation there has been discussion around the length of time the dead trees would be viable from a lumber mill perspective (i.e. shelf-life). Licensee's have seen reductions in quality the longer the tree has been dead. There is not a specific length of time which can be used as an average length of time that the trees are useful for producing lumber across the region.

The mid-term fall-down may occur sooner if shelf-life of the dead pine is shorter than predicted in the base case.

Complicating this factor is the fact that as lumber prices increase, the quality of tree which is useful for producing lumber also changes. During periods of high lumber prices it would be likely that lower quality stands would meet the economic harvest test. Therefore, this scenario is designed to test the effect of a shorter "shelf life" for MPB stands. The specific change is to assume that the 5.7 million m³/yr can only be maintained for the first 2 periods. The result is that the mid-term occurs sooner.

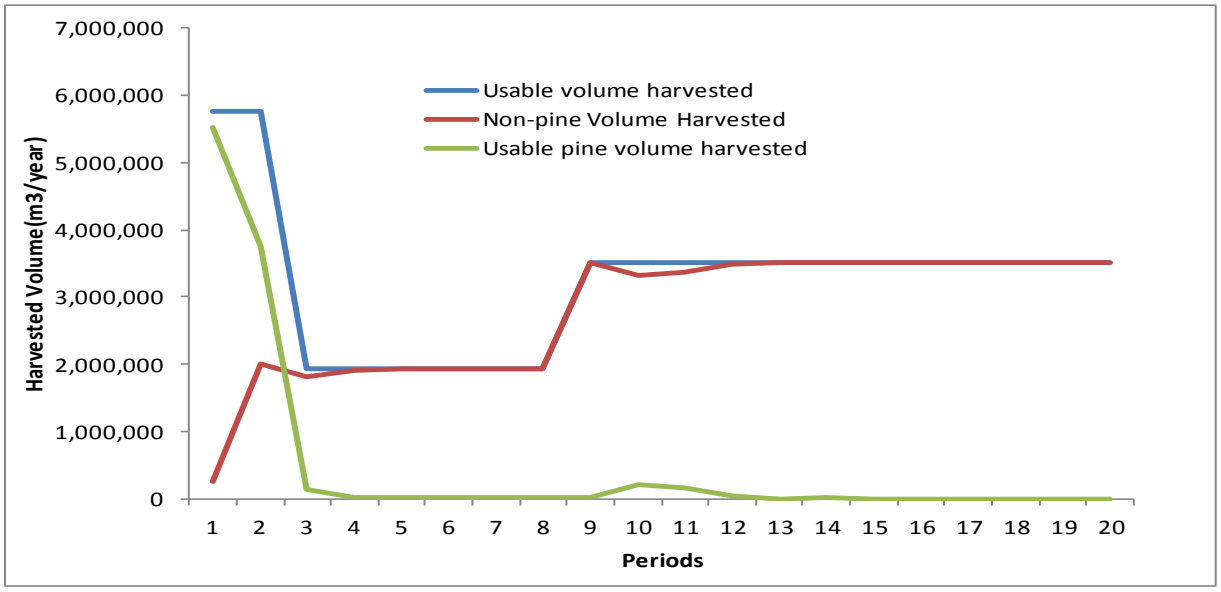


Figure 6 - Shelf-Life reduced

	Short-term AAC	Mid-term AAC	Long-term AAC
Base Case	5.77 million m³ x 20 yrs	1.9 million m³ x 20 yrs	3.5 million m³/yr
Scenario 4	5.7 million m³ x 10 yrs	1.9 million m³ x 30 yrs	3.5 million m³/yr

As can be seen in Figure 6 the reduced shelf-life has a dramatic effect on the expected timber availability during the period before the modeled mid-term. In this model run the base case mid-term timber supply is advanced 2 periods. This model run predicts the mid-term to start in ten years and continue for 30 years. The AAC during the mid-term is projected to be 1.9 million m³/yr.

Implementation of Scenarios 5, 6 and 7 would require LUOR amendments.

Scenario 5 - Dead Pine Shelf Life and reduce Visual Quality Objectives (VQO's) – same as scenario 4 plus reduce VQO's one class.

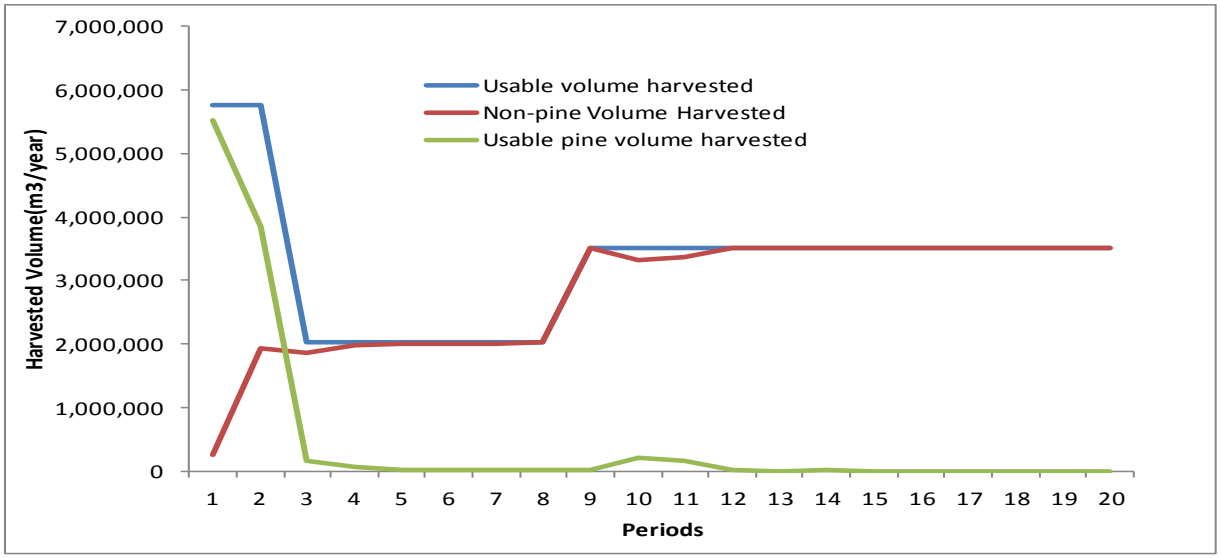


Figure 7 – same as figure 6 plus VQO objective reduced one class.

Scenario 5 is the same as S4 but with VQO's reduced by one class (e.g. Retention reduced to partial retention). The model results in the short-term are the same as the previous run. During the mid-term there is an increase in availability of approximately 4 percent (86,500 m³/yr) from Scenario 4. The mid-term AAC as modeled is just over 2 million m³/yr.

Scenario 5 provides 4 percent more timber than Scenario 4 through the mid-term.

Scenario 6 - Eliminate Mature plus Old seral targets

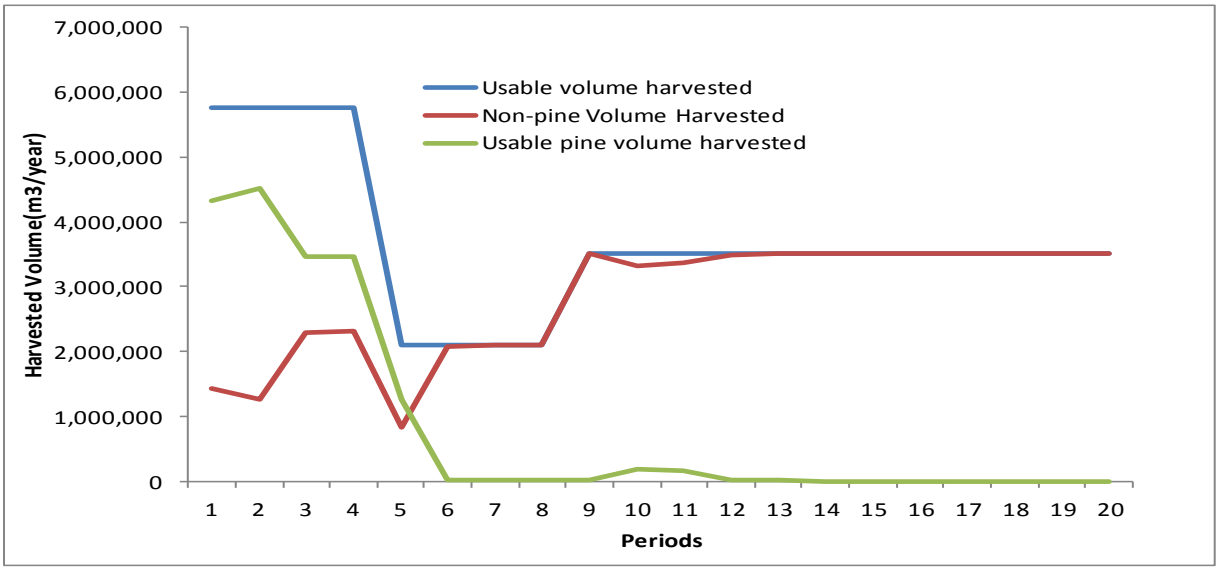


Figure 8 – Base Case plus elimination of Mature (M) plus Old (O) seral targets

	Short-term AAC	Mid-term AAC	Long-term AAC
Base case	5.77 million m³ x 20 yrs	1.9 million m³ x 20 yrs	3.5 million m³/yr
Scenario 6	5.77 million m³ x 20 yrs	2.1 million m³ x 20 yrs	3.5 million m³/yr

Scenario 6 is the same as the base case except the non-spatial M + O seral targets are turned off. These targets are part of the biodiversity objectives established in the CCLUP regional plan. The result of this model run shows an increase in mid-term availability of approximately 11 percent to a total of 2.1 million m³/yr. In addition there would be impacts to habitat supply and forest connectivity. Removal of the M + O targets would have significant implications to some species and overall biodiversity representation. M+O provides the matrix of forest habitat in which other fish, wildlife, and biodiversity values exist as islands. In addition there would be ongoing impacts to habitat supply and forest connectivity.

Calculations

In addition to the model runs already described two separate sets of calculations were completed. One calculation determined the amount of volume in OGMAs (scenario 7) with no other constraints that could be made available for harvest if the OGMA constraint was eliminated. The other calculation determined the amount of volume currently constrained by slope (area has been taken out of the timber harvesting land base because the slope is greater than 40 percent).

1. <u>OGMAs (no other overlaps)</u>

Cycle time	Volume (m^3)	Pine	Non pine
3 hours	2,470,956	570,546	1,900,410
5 hours	6,626,311	2,222,743	4,403,568
7 hours	7,753,582	2,629,039	5,124,543
9 hours	2,678,936	2,019,002	659,934
11 hours	1,923,226	1,570,382	352,843
	21,453,011	**9,011,712**	**12,441,298**

Only the non-pine volume was used to increase the mid-term AAC because the pine volume will not be economic in 20 years. For this exercise **all of the pine in the OGMAs is assumed to die** and be of no value in 20 years.

2. Slope

4,265,082 m^3 has been taken out of the timber harvesting land base to account for areas of steep slope. Licensees argue that one half of this volume should actually be made available for mid-term harvest opportunities. One half of the volume is 2,132,541 m^3.

<u>BASE CASE</u>

Mid-term AAC = 1,900,000 m^3 /yr

Pre-Beetle forecast AAC = 2,850,000 m^3/yr (including the western supply block; 2.5 million m^3/yr without the western supply blocks contribution)

Long-term AAC* = 3,500,000 m^3/yr

Volume gap = 1,600,000 m^3 for 20 years

a) Utilizing the OGMA non-pine volume 12,441,298 m^3/20 yrs = 622,064 m^3/yr
b) Utilizing ½ of the slope volume (4,265,082 m^3/2)/20 yrs = 106,000 m^3/yr

Utilizing the non-pine volume in OGMAs and one half of the slope volume increases the mid-term to 2,628,000 m^3/yr.

Scenario 1 – remove 9 and 11 hour cycle times from base case model.

Mid-term AAC =1,700,000 m³/yr

Pre-beetle AAC = 2,500,000 m³/yr

Long-term AAC* = 2,500,000 m³/yr

Volume Gap of 800,000 m³/yr for 20 years.

a) Utilizing the non pine volume from the OGMAs (excluding the 9 and 11 hour cycle time OGMAs) =11,428,521 m³/20 yrs = 571,426 m³/yr
b) Utilizing the slope volume = (3,712,600 m³/2)/20 yrs = 93,000 m³/yr

Utilizing the non-pine volume in OGMAs and one half of the slope volume increases the mid-term to 2,364,000 m³/yr.

Scenario 2 - Pine Harvest – Direct harvest to dead pine stands during the short-term (same land base as Scenario 1)

Mid-term AAC = 2,110,000 m³/yr

Pre-beetle AAC = 2,500,000 m³/yr

Long-term AAC* = 2,430,000 m³/yr

Volume gap of 320,000 m³/yr for 25 years

a) Utilizing the slope volume =75,000 m³/yr
b) Utilizing some of the OGMA volume = 245,000 m³/yr

This completely fills the mid-term 'trough' and only requires 'using' approximately one half of the non-pine OGMA volume (6,125,000 m³).

Scenario 3 - Test Effect of Future Growing Stock requirement on Mid-Term supply (same land base as Base Case)

Mid-term AAC = 2,500,000 m³/yr

Pre-beetle AAC = 2,850,000 m³/yr

Long-term AAC* = 3,500,000 m³/yr

Volume gap =1,000,000 m³/yr for 20 years

a) Utilizing OGMA volume = 12,441,298 m³/20 yrs =622,000 m³/yr
b) Utilizing Slope volume = 106,000 m³/yr

Utilizing the non-pine volume in OGMAs and one half of the slope volume increases the mid-term supply to 3,228,000 m³yr.

Scenario 4 - Dead Pine Shelf Life – limit MPB harvesting to the first 10 yrs of the model run

Mid-term AAC = 1,900,000 m³/yr

Pre-beetle AAC = 2,850,000 m³/yr

Long-term AAC* = 3,500,000 m³/yr

Volume gap is 1,600,000 m³ for 30 years

a) Utilizing the OGMA volume = 414,709 m³/yr
b) Utilizing the slope volume = 70,000 m³/yr

Utilizing the non-pine volume in OGMAs and one half of the slope volume increases the mid-term supply to 2,384,000 m³yr.

Scenario 5 - Dead Pine Shelf Life and reduce Visual Quality Objectives – same as scenario 4 plus reduce VQO's one class.

No difference from Scenario 4

Scenario 6 - Base Case plus eliminate Mature plus Old seral targets

Mid-term AAC = 2,092,600 m³/yr

Pre-beetle AAC = 2,850,000 m³/yr

Long-term AAC* = 3,500,000 m³/yr

Volume gap = 1,400,000 m³ for 20 years.

a) Utilizing OGMA volume = 622,000 m³/yr
b) Utilizing Slope volume = 106,000 m³/yr

Utilizing the non-pine volume in OGMAs and one half of the slope volume increases the mid-term supply to 2,820,000 m³/yr

*the referenced long-term AAC is derived from this modeling exercise. The most recent TSR process set the cut at: 2,810,000 m³/yr from green coniferous stands.

Scenario	Harvest (million m^3 per year)	Period for which Volume is Available for Harvest	Cycle time Zones	Change to Volume Available for Harvest Compared to Base Case	Harvest Gap Compared to Pre-Beetle Forecast	Length of mid-term	Difference between mid-term and long-term AAC of 3,500,000 m3/yr	Non-Timber Value Implications
Pre-Beetle Forecast	2.85	All	All	n/a	n/a	n/a		n/a
Base Case	5.7	Short-term	All	n/a	+200 %			Meets current management requirements
	1.9	Mid-term	All	n/a	-34 %	20 yrs	1,600,000 m^3	Meets current management requirements
Scenario 1 – remove cycle times 9 and 11 from base case	3.2	Short-term	3 - 7	-44 %	+112 %			Meets current management requirements
	1.7	Mid-Term	3 - 7	-11 %	-40 %	20 yrs	1,800,000 m^3	N/A
Scenario 2- same as 1 but harvest only pine in short-term	3.2	Short-term	3 - 7	-44 %	+12 %			Meets current management requirements
	2.1	Mid-term	3 - 7	+11 %	-26 %	25 yrs	1,320,000 m^3	Meets current management requirements

Scenario 3 – same as base case but reduce future growing stock to 100 million	5.7	Short-term	All	0 %	+200 %			Meets current management requirements
	2.5	Mid-Term	All	+24 %	-13 %	20 yrs	1,000,000 m^3	Meets current management requirements
Scenario 4 – reduce shelf-life of pine to 10 years	5.7*	Short-Term*	All	+0 %	+200 %			N/A
	1.9	Mid-Term	All	+0 %	-34 %	30 yrs	1,600,000 m^3	N/A
Scenario 5 – VQO's reduced by one class	5.7	Short-Term*	All	+0 %	+200 %			Yes, Legal amendment and consultation required
	2.0	Mid-Term	All	+5 %	-30 %	30 yrs	1,500,000 m^3	Yes, Legal amendment and consultation required
Scenario 6 – Mature + Old seral targets turned off	5.7	Short-Term	All	+0 %	+200 %			Yes, Legal amendment and consultation required
	2.1	Mid-Term	All	+11 %	-26 %	20 yrs	1,400,000 m^3	Yes, Legal amendment and consultation required

Summary

There are a few points which are highlighted by the analysis we have completed. Each scenario demonstrates that the short-term supply of timber is in excess of the current demand, even at the current uplifted AAC. By ensuring that short-term harvest is directed at dead-pine stands as much as possible is a mitigative practice which will help to buffer the depth of the mid-term trough.

Timber supply in the short-term is not problematic. In the mid-term, relaxation of land-use values would help to mitigate timber supply. Reducing VQO's by one class and removing M+O seral targets both benefit mid-term timber supply.

The scenario which best addressed the mid-term trough, was the adjustment to total growing stock. In Scenario 3 we asked the question "What happens if we reduce the future grow stock requirement 186 million m^3 to 100 million m^3 but leave all other land-use constraints on?" This resulted in an improvement in mid-term supply of 600,000 m^3/yr over the base case supply (more than double the benefit of any other change modeled). The pre-beetle forecast AAC for the Williams Lake TSA was 2.85 million m^3/yr which is very close to what the model suggests is available during the mid-term given the reduction in future growing stock. The operational significance of this result is not completely clear, but initial investigation indicates this option may actually reflect the existing operational practices better than the base case.

Cariboo-Chilcotin Land Use Plan implications

Apart from FRPA requirements, land use values in the Quesnel, Williams Lake and 100 Mile House TSAs are derived from the CCLUP. The CCLUP was established as a higher level plan through a legal order under the Forest Practices Code in January, 1996. This declaration made the CCLUP zones, objectives, targets and strategies legal requirements as they applied to operational forestry planning. Since then, extensive planning was done at the sub-regional level (SRMPs) to further refine and map the various land use values in consultation with interest groups and First Nations. CCLUP remains in force under the *Forest and Range Practices Act*. It has been supplemented by numerous legal objectives for tourism, recreation, and conservation (fish, wildlife and biodiversity) under the Land Use Objectives Regulation and the Government Actions Regulation. Any significant change to these legal objectives requires full consultation with stakeholders and First Nations before amendments can be made.

The legal land use objectives represent a careful balance among all the interests in the region. Assessments were done with respect to the complete package of values and reflect foremost, the achievement of targets across the region. As a result, changes in one location can affect the achievement of targets overall. Many of the LUP values were mapped and achievement of the

CCLUP timber target required non-timber values be overlapped where-ever possible. This is especially true for OGMAs. As a result of the overlapping, removal or relaxation of one LU value may not provide much timber benefit because the underlying value would still apply. Changing land use values may also affect embedded site specific environmental and FN cultural values, many of which are not documented.

Because the land use plan involved trade-offs to reach a social balance, the targets for non-timber values represent a reduction in historic levels of habitat. As an example, the biodiversity targets for retention of old and mature forest represent only a portion of the estimated old and mature forest that existed on the land prior to industrial development. MPB has further affected forest condition in pine stands for both the constrained and unconstrained land base. Impacts to non-timber values from pine mortality vary by stand type, understory condition, LU value, and mortality level. Nevertheless, ecological values do remain, including residual green trees, intact understory soils and shrubs, snags and coarse woody debris. For conservation values like biodiversity and some wildlife species, retention of original stands, including dead trees can be especially important in a landscape that is increasingly moving towards greater fibre utilization and a more managed forest estate.