Tree Species Harvested
In Areas Affected By Mountain Pine Beetles

Special Report

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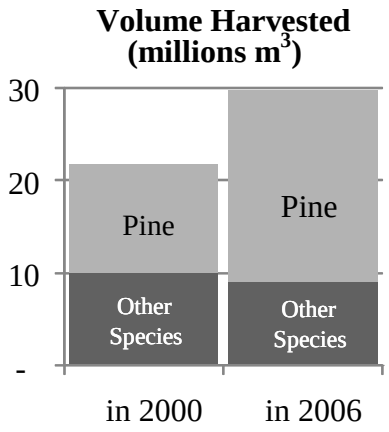
Executive Summary

British Columbia is in the midst of the most severe mountain pine beetle (MPB) outbreak on record. As a tool to help manage the outbreak, the allowable annual cut (AAC) in the interior of B.C. has been increased by 36 percent. This has helped efforts to try to control the MPB outbreak, as well as salvage the beetle-killed wood before it loses its value. However, the increase in harvest levels has raised concerns about the implications for mid-term and long-term timber supply, of harvesting tree species other than pine.

This report examines the harvest in areas with increases in the AAC related to managing the MPB outbreak, to answer the following questions:

Is the species profile harvested consistent with the expectations of the Ministry of Forests and Range (MFR)?

Since the first increase in the AAC in 2001, the chief forester has expressed the expectation that all of the increased AAC should be devoted to managing the outbreak. The investigation found that all of the additional harvest volume has been pine, and the total volume of tree species other than pine (mainly spruce and fir) harvested from 2000 to 2006 has not increased—and in fact has decreased slightly. The Board concludes that the forest industry is meeting the expectations of the MFR with respect to the profile of tree species being harvested.



Why are species other than pine being harvested?

The epidemic is killing pine much more quickly than it can be harvested. This fact begs the question, "Why are species other than pine being harvested at all?" The main reasons are:

1. not all wood products produced can be made from pine, and the forest industry requires species other than pine to satisfy the demands of the marketplace; and,
2. pine trees often occur in stands where there is a mixture of tree species and, because the principal method of harvesting is clear-cutting (with reserves), it is often not practical to harvest just pine in areas of mixed species.

There are a number of other less significant reasons why not all of the harvest is composed of pine, including managing forest health issues other than MPB and salvaging fire-damaged stands.

Will the current species profile of harvested timber influence the nature of the forest after the salvage harvesting is completed?

There is approximately 1.5 billion cubic metres of merchantable timber volume in the study area, and 43 percent of it is pine. One-third of the volume of this timber occurs in "pure pine" stands (those with 80 percent or more pine) and 13 percent is in stands with 60 to 79 percent pine. The remaining 54 percent of the volume is in stands with less than 60 percent pine.

Since the salvage harvesting began, 44 million cubic metres has been harvested (three percent of the total volume). If the entire AAC is harvested for another ten years using the species profile of the harvest to date, one-third of the "pure pine" stands will be harvested, but 80 percent of the stands with 60 to 79 percent pine will be harvested. This may be an undesirable outcome with respect to mid-term timber supply, because much of the forest with 60 to 79 percent pine may have sufficient live, non-pine volume in the overstory to contribute to the mid-term timber supply if reserved from harvest today.

This outcome may also be undesirable with respect to long-term timber supply, because most of the pine in the forest containing 80 to 100 percent pine will be dead. Harvesting as much of the "pure pine" part of the profile as is possible and reasonable (where there is no well-developed understory, and the harvesting does not compromise other values) will benefit the long-term timber supply because those areas would be available for harvest sooner if harvested and regenerated now, rather than if they are simply left un-harvested.

Board Commentary

One of the primary reasons the Board began this investigation was to respond to comments and concerns from people who saw logging trucks filled with spruce trees coming out of areas that have been heavily infested with mountain pine beetle. The investigation found that the forest industry is not using the increases in the AAC associated with the MPB outbreak to harvest more spruce and Douglas fir than they were before the outbreak—in fact they are harvesting slightly less non-pine volume than before the outbreak.

For a number of reasons, identified in this report, it is impossible for the forest industry to harvest only pine trees, and economic considerations are driving some of the decisions about what species to harvest. Pine trees in general, and dead pine trees in particular, are simply not as valuable to the forest industry as are spruce and fir trees. Some of the forest products B.C. currently produces can only be made from spruce and fir, and certain mills require those species to continue to operate—pine cannot be substituted. At the same time, it's important to conserve as much non-pine species as possible for the mid-term timber supply, when dead pine may no longer be useable. It is

difficult to find the balance between salvaging value from dead pine and maintaining a viable forest industry through the current MPB outbreak and beyond. In the Board's view, by devoting all of the uplift AAC to the harvest of pine, while maintaining the harvest of other species at pre-uplift levels, the forest industry is demonstrating its responsiveness to both forest management and economic imperatives.

Many of us are concerned about how the MPB outbreak, and our forest management response to it, will affect the future of forestry-dependent communities and the forest industry as a whole. This report draws some disturbing conclusions about the potential state of the B.C.'s forests in ten years, the main one being that approximately two-thirds of "pure pine" forests may remain unharvested. This large area of dead trees will present significant difficulties for forest managers in the future.

However, the report's conclusions are based on the assumption that the existing forest industry will continue unchanged for the next ten years. Whether or not that occurs depends on factors outside B.C.'s control, such as US demand for timber and the exchange rate between the US and Canadian dollars. Regardless of those factors, it is also clear that, as dead pine continues to deteriorate past its shelf-life for lumber production, continued harvesting of large quantities of dead pine will require the emergence of an "alternative forest industry."

The provincial government is encouraging this alternative forest industry in the form of bio-energy production. It is thought that bio-energy will use dead pine almost exclusively and, if this happens, the projections made in this investigation about the state of the forest in ten years may be pessimistic. However, whether a significantly expanded bio-energy industry or another form of alternative use for the dead pine will emerge remains to be seen.

Monitoring the species profile of harvest in MPB salvage areas is both important and complex. Therefore, in accordance with Section 131(2) of the *Forest and Range Practices Act* the Board makes the following recommendation:

- The Board recommends that the Ministry of Forests and Range develop and implement protocols for monitoring species profile of harvest that will enable district level managers and provincial level policy makers to incorporate appropriately detailed information in their decision making processes. This protocol needs to address both the topics examined in this investigation and the issues raised by the investigation.

In accordance with Section 132(1) of the *Forest and Range Practices Act* the Board requests that the Ministry of Forests and Range advise the Board by March 31, 2008 as to how this recommendation has been addressed.

Introduction and Objectives

British Columbia is in the midst of the most severe mountain pine beetle (MPB) outbreak on record. In 1999 the infestation was 160,000 hectares in size and by the summer of 2006 it had affected 9.2 million hectares of forest to varying degrees.[i] The Ministry of Forests and Range (MFR) projects that by the end of 2007, more than half of the merchantable pine volume in the province will be killed and, if the infestation continues to expand as it has in the past, nearly 80 percent of the merchantable pine will be dead by 2013.[ii]

In response to the outbreak, the allowable annual cut (AAC) in the interior of B.C. has been increased by 36 percent from 50 to 68 million cubic metres.[iii] From July 2001 until January 2004, the rationale for the uplifts was to facilitate attempts to control the expansion of the infestation. Beginning in October 2004, MFR began to acknowledge that control of the outbreak was not possible in many areas and further uplifts were determined primarily to salvage dead pine before it loses economic value.

The significant increase in the allowable harvest has raised many concerns and the Board has addressed some of them by reporting on such issues as the effect of increased salvage efforts on stream flows and flooding[iv] and the effect of salvage on wildlife habitat.[v] However, this report's focus is on the profile of the tree species being harvested in MPB uplift areas. Species profile of the harvest is of concern because of its implications for mid- and long-term timber supply. While it may be desirable to recover as much value from MPB-killed pine as possible MFR has recognized that, "it is essential to ensure in the wake of this epidemic that non-pine stands are reserved for future timber supply,"[vi] and that it is important to, "question whether enough is being done to avoid harvesting non-pine trees within cutblocks."[vii]

The issue of non-pine harvest in MPB affected areas has been raised with the public through published reports on the topic.[viii] The topic has been raised with the Board through informal discussions with parties concerned with forest practices in B.C., and the question forms part of the basis of several public complaints the Board is currently investigating.

The report's primary objective is to discuss the following specific questions:

1. <u>In MPB uplift areas, are the species being harvested consistent with the profile expectations of the Ministry of Forests and Range (MFR)?</u>

   The chief forester is aware of the issues surrounding the harvest of non-pine species in MPB-affected areas. When determining AACs in the past, he has consistently stated, in a variety of different ways, that all of the <u>increased</u> harvest should be devoted to dealing with the epidemic,[ix] meaning that the harvest

increase should target pine.

2. What are the main reasons why non-pine species are being harvested?

   The expectations of the chief forester beg the question, "why is anything other than dead pine being harvested at all?" MFR acknowledges that, even given optimistic assumptions about the shelf-life of beetle killed wood (5 to 18 years) the, "epidemic is killing commercial [pine] much more quickly than it can be harvested."[x] If there is more dead pine than can be harvested, why is anything but pine being harvested?

3. How will the current harvest profile influence the nature of the forest after the beetle outbreak is over and salvage harvesting is completed?

   It is useful to ask, at a cursory level of detail at least, what effect our current behaviour will have on the nature of our future forests, because:
   a. There is considerable uncertainty about how the forest industry will respond to the increased AAC, even in the near future.
   b. We still do not know how long beetle-killed wood is useable for producing commodity grade lumber, nor do we know whether or not a significant industry will emerge to use the dead wood for other purposes, such as bio-energy or manufactured lumber (e.g. oriented strand board).
   c. Several factors unrelated to the outbreak, such as the number of US housing starts and the Canada/US exchange rate, will affect the ability of the industry to actually harvest what is allowed by the AAC.

Increases in the Allowable Annual Cut

This report examines six timber supply areas (TSAs) where there has been an increase in the allowable annual cut (AAC) in response to the current MPB outbreak: Kamloops, Lakes, Merritt, Okanagan, Prince George and Quesnel. Because of the sheer size of its AAC, the Prince George TSA is treated as a special case, and results are better presented separately for each district in the TSA.[xi] These areas will hereafter be referred to as "uplift units" (Figure 1). The uplift units cover approximately 16 million hectares in British Columbia's central and southern interior.

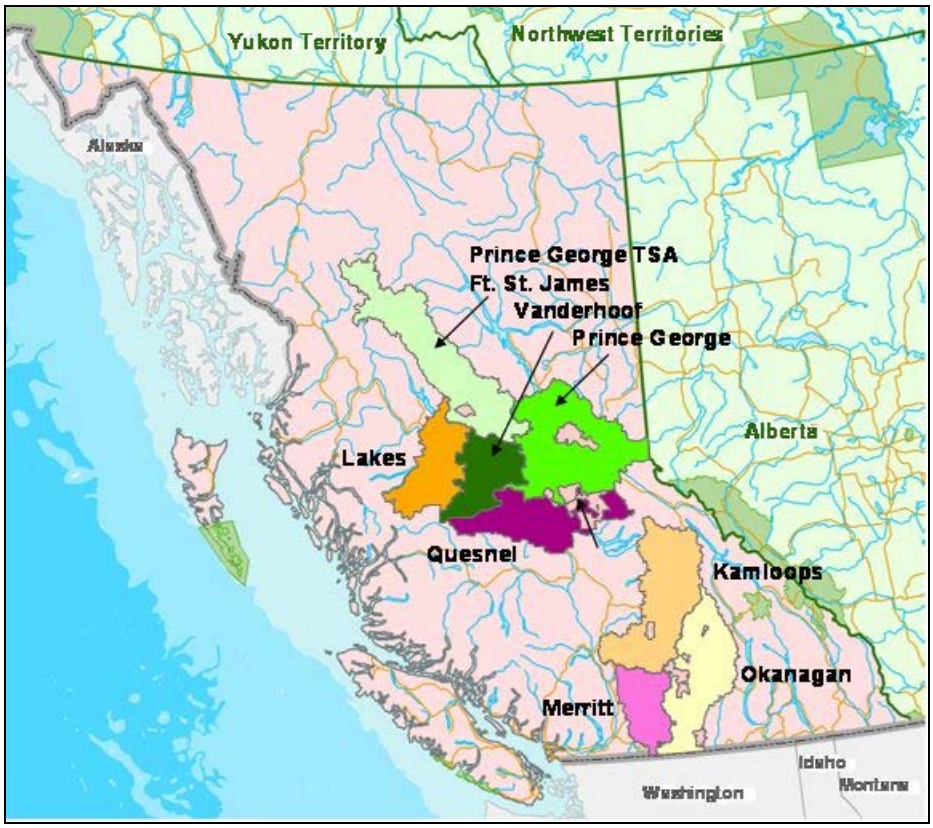


Figure 1. Location of the uplift units.

The increased AAC has been in place since at least January 2006 in all the uplift units which has allowed for a sufficient length of time to assess response to the increase.[xii]

The current MPB outbreak began around 1994. During the early years of the epidemic, forest health specialists attempted to stop its spread with "sanitation"[xiii] techniques that affected individual trees but did not affect the harvest volume.

In 2001 and 2002, AACs were increased in the Lakes and Quesnel TSAs and the Prince George TSA, respectively. These harvest increases were primarily to eradicate beetles in small patches of forest at the leading edge of the outbreak. In January 2004, MFR believed that, in the Kamloops TSA, it was "still possible that increased suppression efforts focussed at the infestation could reduce the spread of the infestation,"[xiv] so the AAC was increased for this purpose.

By the summer of 2004, it was clear that controlling the outbreak was no longer possible in the Lakes, Quesnel and Prince George TSAs. However, it was determined that these three uplift units required additional increases in AAC to expedite salvaging of the dead pine. In 2005 and 2006, the Merritt and Okanagan TSAs, respectively, received increases in the AAC to facilitate attempts to slow the infestation and to salvage beetle-killed timber.

The net effect has been to increase the AAC in the uplift units alone from 20 million cubic metres per year in 2000 to 34 million cubic metres per year in 2006 (a 66 percent increase).[xv] Forty-four percent of that (14.5 million cubic metres) can be harvested in the Prince George TSA. The remainder of the AAC is about evenly divided among the other five TSAs in the study area (Figure 2).

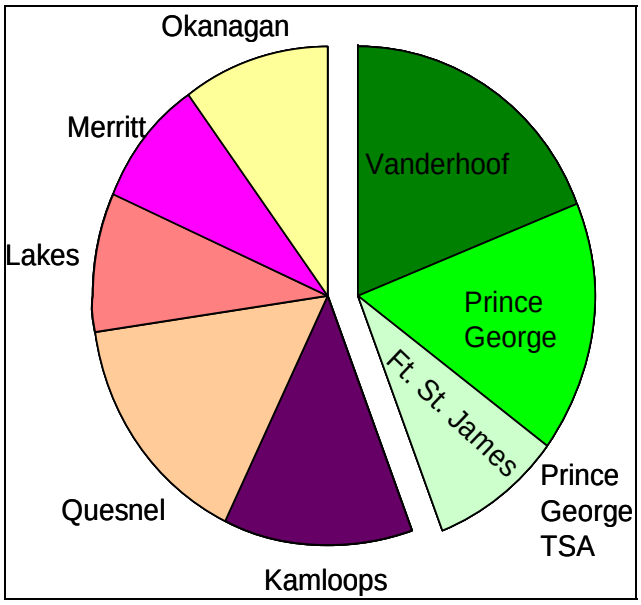


Figure 2. Proportion of the total Allowable Annual Cut for each Uplift Unit (the 3 forest districts for the very large Prince George TSA are shown separately.)

Discussion

1. In MPB uplift areas, are the tree species being harvested consistent with the profile expectations of the Ministry of Forests and Range?

The expectations of MFR are outlined in the documents that describe the rationales for the increases in the AACs. Where the AAC was increased to facilitate control of the outbreak, the chief forester expected that:

> "to the extent possible, the [harvest] be completely dedicated to removing, as a first priority, timber that has already been affected"[xvi] by MPB.

Where attempts at control have been abandoned and harvesting is focussed on salvage MFR has stated that:

> "it is essential to ensure in the wake of this epidemic that non-pine stands are reserved for future timber supply."[xvii]

We interpret these expectations meaning that the harvest increase should target only pine.

The harvesting response to the increases in the AAC is summarized in Figure 3.[xviii] In 1999, just less than half the harvest in the uplift units was pine and the remainder was primarily spruce, Douglas fir and balsam (true fir). A small amount of western red cedar, hemlock and aspen were also harvested. As the AAC increased, the amount of pine harvested increased, and the total amount of other species harvested decreased slightly. This indicates that the expectation that all of the increased harvest be devoted to harvesting MPB-killed pine is being met.

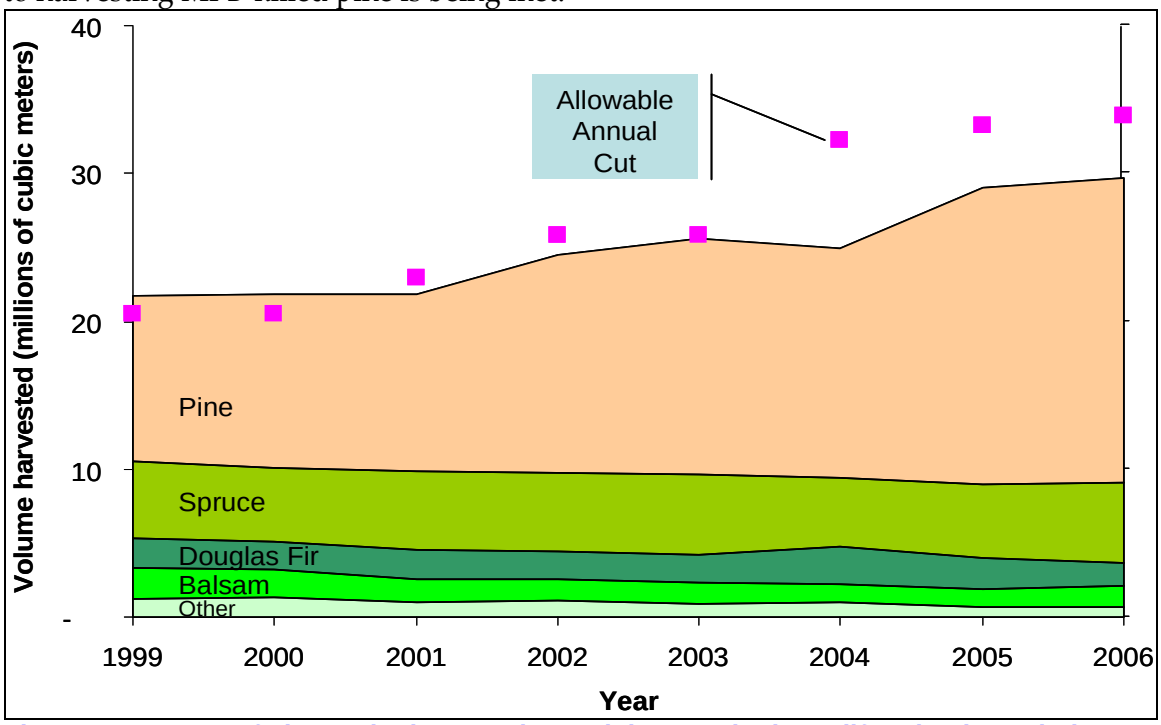


Figure 3. Harvest of pine and other species and the AAC in the uplift units through time.

A notable variation in the amount of other species harvested was the substantial increase in the harvest of Douglas fir in 2004. This increase was due almost entirely to efforts to salvage fir volume that had been killed during 2003's fire storm. Coincidentally, this increase was offset by a substantial decline in the 2004 spruce harvest in the Fort St. James and Prince George Forest Districts (in the Prince George TSA). Harvest volumes of balsam (true fir) and other species have generally declined since 1999. In 2006, 60 percent of the volume of other species harvested was spruce.

An issue illustrated by Figure 3 is that since the 2004 uplifts the forest industry has not harvested the entire AAC, and in 2006 only 88 percent of the AAC in the uplift units was actually cut. The principal reason for undercutting is that some of the harvest volume has been allocated to First Nations and alternative industries, such as manufactured wood and bio-energy producers, but these allocations have largely not been acted upon.

The undercut is a concern for several reasons, not the least of which is that much of the planning around the MPB issue is predicated on harvesting the entire AAC in affected areas. If this undercut continues, larger amounts of pine than expected will deteriorate to the point where they will no longer be usable for lumber production (i.e., they will pass their shelf-life for lumber production). This will further exacerbate the issue of non-recovered losses. Additionally, more area than anticipated will need to be rehabilitated by provincially-funded programs.

2. Why are species other than pine being harvested?

Notwithstanding the expectations of the chief forester, one might ask the question, "why is anything other than dead pine being harvested in the uplift units?" MFR acknowledges that, even given very optimistic assumptions about the shelf-life of beetle killed wood (5 to 18 years) the "epidemic is killing commercial timber [pine] much more quickly than it can be harvested."[xix] Given the anticipated volume of dead pine, not all the beetle killed pine trees can be harvested before they lose their value for lumber production.[xx] In the short term, one might assume that it would be reasonable to harvest only the dead pine trees until their shelf life has past. At that point, harvesting would resume in stands with species other than pine, and eventually, new forests of pine, and other species, will grow and contribute to the timber supply again.

There are two main reasons why 30 percent of the harvested volume consists of non-pine species:

First the interior forestry industry consists of a diversity of companies with numerous milling facilities designed to manufacture a wide variety of wood and paper products to supply a wide range of markets. Not all of those wood and paper products can be made from beetle killed pine. For example, six percent of milling capacity in the interior is composed of mills that make plywood and laminated veneer lumber.[xxi] The thin sheets of veneer required for these products are produced by peeling logs in a lathe-like device. In many parts of the province, pine was not a preferred species for this process prior to the outbreak because pine trees are generally smaller than other species. Now, because beetle-killed pine cracks as it dries out, it simply can not be used in this process. For the same reason, beetle killed pine cannot be used to manufacture large dimension lumber (long, wide boards). Additionally, the blue staining, that is a feature of beetle killed pine, makes it unacceptable to some markets that require "bright white" wood products. This is true of the Japanese and some European market places.

The second main reason why trees other than pine are being harvested is that pine trees often occur in stands where there is a mixture of tree species. Because the principal method of harvesting in the uplift units is clear-cutting (with reserves) it is often not practical to harvest just pine in areas of mixed species. As shown in Figure 4, there is

substantial variability in the proportion of pine on the land base among the uplift units with as much as 75 percent pine in the Vanderhoof Forest District (of the Prince George TSA) to as little as 29 percent in the Okanagan TSA.[xxii]

Figure 4 shows that as the proportion of pine on the land base increases there is an increase in the proportion of pine in the harvest.[xxiii] This supports the assertion that the amount of pine harvested is at least partially a function of the nature of the land base rather than just a reaction to market forces.

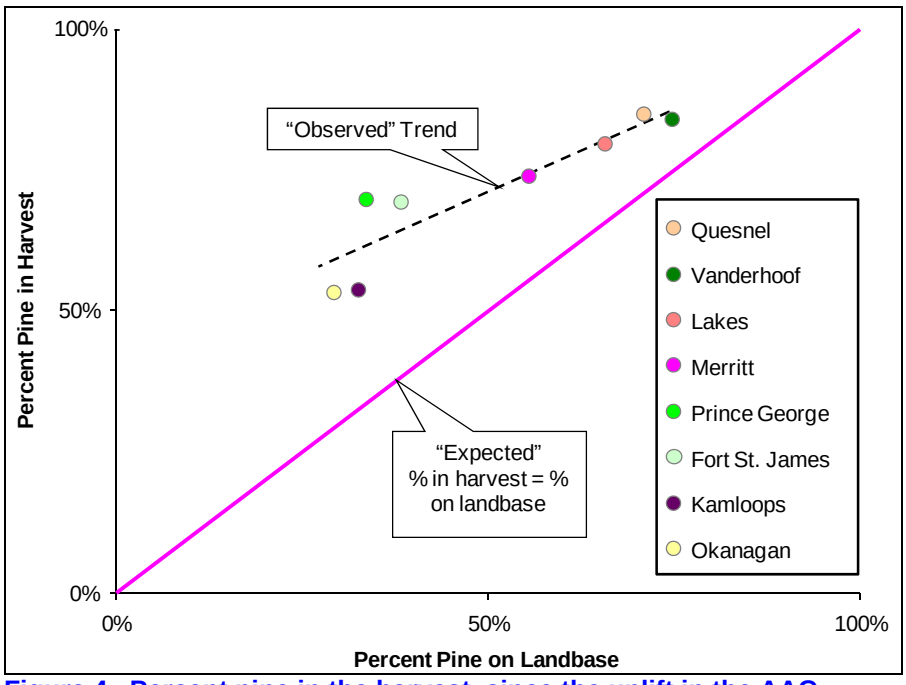


Figure 4. Percent pine in the harvest, since the uplift in the AAC, compared to the profile on the land base for all uplift units.

The results shown in Figure 4 indicate that, at a management unit scale, the average behaviour of the forest industry is to harvest pine in a higher percentage than it exists on the land base. A similar relationship was noted by MFR for all the timber supply areas throughout the beetle affected area of the province. They concluded that, "licensees were targeting heavily pine-dominated stands."[xxiv] However, a closer examination of the information indicates that there is substantial variability in harvest performance depending on the type of licence under which the harvesting is conducted and the details of the pine profile on the land base. The nature of that variability helps us understand the species profile of the harvest.

Below is a discussion of the interaction and relationship between licence types and the pine profile.

Licence Types

As of December 31, 2006 a total of 44 million cubic metres of timber has been harvested in the uplift units from cutting permits acted on since the most recent uplifts began in each TSA. This harvesting was done under a wide variety of licensing arrangements, but 93 percent of it was harvested under three major licence types.

1. Replaceable Forest Licences (RFLs) harvested 23 million cubic metres of the total volume harvested since the uplifts began (52 percent of the total harvest). In general these licences are held by the same corporations that operate timber milling facilities.[xxv] RFLs are long-term and renewable, and provide some certainty to forestry corporations.

2. Non-Replaceable Forest Licences (NRFLs) harvested 8 million cubic metres (18 percent of the total harvest). These licences may be held by the same corporations that hold RFLs, but, more commonly, are held by companies that conduct logging operations but do not own milling facilities. NRFLs are licences that are issued for a specific time period and are a tool available to MFR to achieve specific forest management goals such as directing harvest to specific areas or types of wood. There has been a relatively large volume apportioned specifically for the purpose of managing the effects of the MPB outbreak, however, only 3.6 million cubic metres have been harvested in the uplift units under NRFLs that have been issued since the uplifts began. The remaining 4.4 million cubic metres was harvested under NRFLs issued before the uplifts began that have not yet expired.

3. BC Timber Sales (BCTS) was responsible for issuing licences for 10 million cubic metres (23 percent of the total harvest). BC Timber Sales is an independent organization within the MFR created to develop Crown timber for auction, to establish market price and to capture the value of the asset for the public. Harvesting under BCTS licences is allocated through a competitive process and is typically conducted by small firms, with the harvested wood sold to mills.

Pine Profile

There is approximately 1.5 billion cubic metres of merchantable timber volume in the uplift units and 43 percent of that is pine. A description of the pine profile on the land base in each uplift unit (Table 1)[xxvi] was used to categorize the volume into five classes varying in percent pine from "pure pine" (80 to 100 percent pine) through three "mixed species" categories to "pure non-pine" (0 to 19 percent pine).

Overall, in the uplift units, about one-third of the volume is in the "pure pine" category, one-third is in the "pure non-pine" category and the remaining one-third is distributed among the three "mixed species" categories.

Table 1 shows the distribution of pine on the land base and demonstrates that there is substantial variability in pine distribution among the uplift units. The two units with

the highest overall percentage of pine, Vanderhoof Forest District and Quesnel TSA, have 60 percent of their volume in the "pure pine" category. By contrast, the Okanagan TSA, with the lowest overall percentage of pine, has 60 percent of its volume in the "pure non-pine" category.

	Percent Pine Category				
	"Pure" Non-pine"	Mixed Species			"Pure Pine"
Uplift Unit	0-19%	20-39%	40-59%	60-79%	80-100%
Okanagan TSA	115	21	13	14	39
Kamloops TSA	94	22	18	18	37
Prince George District	123	24	19	25	52
Ft. St. James District	123	37	29	44	63
Merritt TSA	26	14	11	13	47
Lakes TSA	14	11	12	26	56
Quesnel TSA	21	11	9	17	97
Vanderhoof District	8	10	10	31	89
Total for all units	525	150	120	188	481

Table 1. Merchantable timber volume (millions of metres^3) on the land base in 20% pine categories.

Harvest Performance by Licence Type within the Pine Profile

We examined the amounts harvested, within each segment of the pine profile (harvest performance), by the different licence types.

Where the profile is heavily dominated by "pure pine," such as in the Quesnel TSA and the Vanderhoof Forest District, the performance among all licence types was similar and was what might be expected given the pine profile on the land base. (Figure 5)

There was virtually no harvesting in the "pure non-pine" category, and there was limited activity in the "mixed species" part of the profile, with the amount of harvest increasing according to the amount of pine. The bulk of the harvesting by all licence types was in the "pure pine" category.

In the other uplift units,[xxvii] which are not as heavily dominated by pure pine, there was more variability in the performance of different licence types.[xxviii] However, the total response, shown in (Figure 6), presents a very different picture of the harvest performance by different licence types within the profile than is seen in the Quesnel and Vanderhoof areas (Figure 5.)

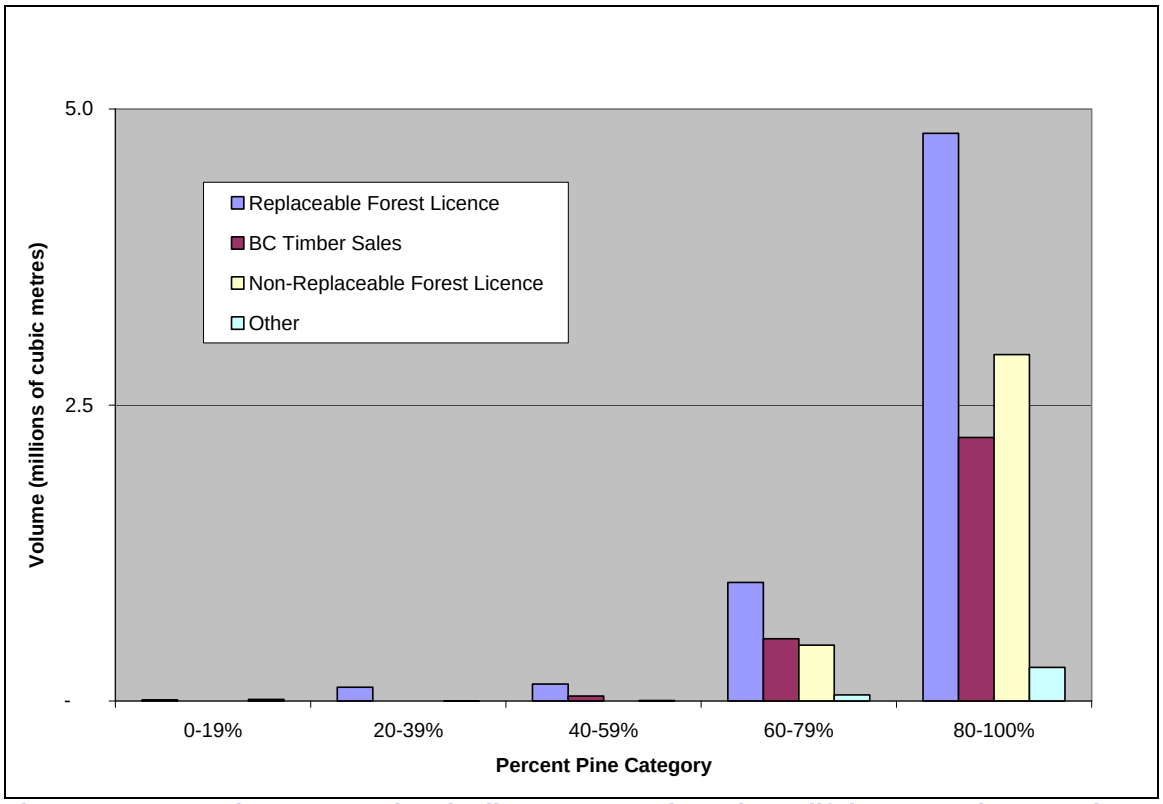


Figure 5. Harvest by percent pine, by licence type, since the uplift in Quesnel TSA and Vanderhoof Forest District.

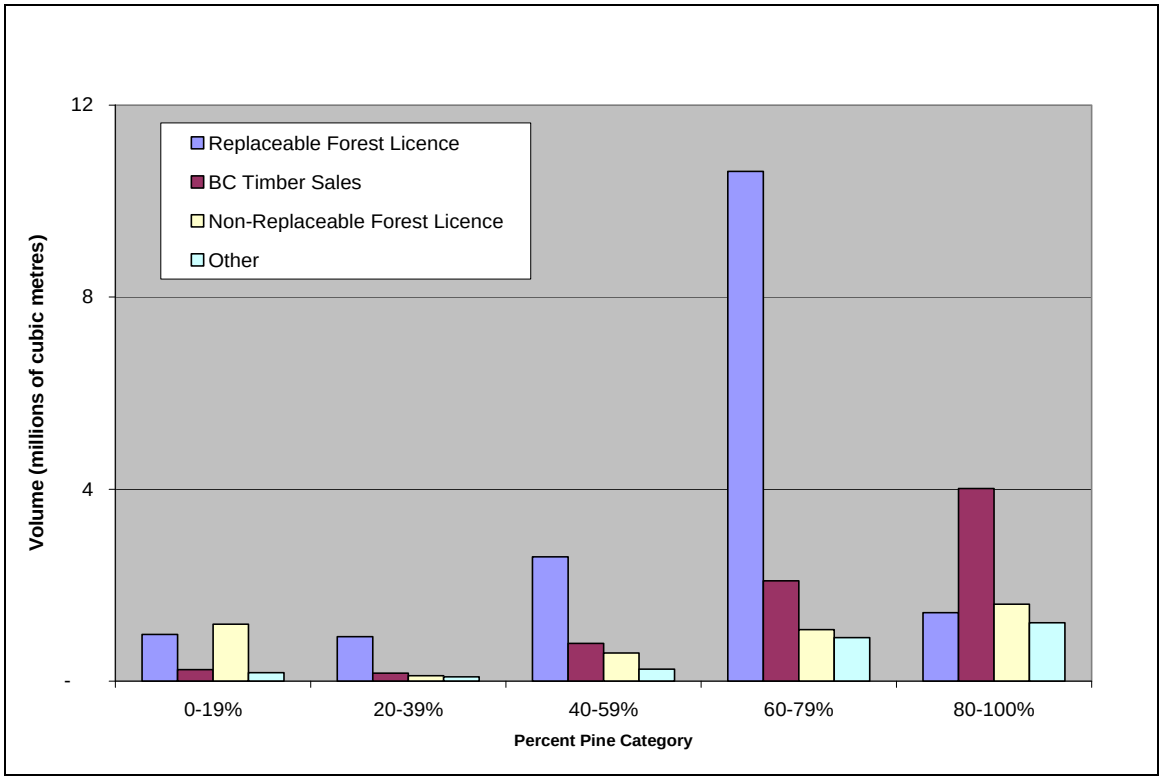


Figure 6. Harvest by percent pine, by licence type, since the uplift in uplift units *other than* Quesnel TSA and Vanderhoof Forest District.

The non-replaceable forest licences (NRFLs) harvested about 25 percent of their volume in "pure non-pine" in these units, whereas there was virtually no NRFL harvest in this category in Quesnel and Vanderhoof. A large proportion of the NRFL volume harvested in 2004 and 2005 was harvested by NRFLs issued in the Kamloops TSA specifically to salvage Douglas fir damaged by the fires of 2003. A substantial portion of the remaining NRFL volume was harvested under NRFLs issued prior to the MPB outbreak, some of which include terms that specify that harvest must occur in areas with very little pine. These NRFLs deal with forest management issues other than the MPB outbreak.

It is more difficult to explain the difference between the performance of the replaceable forest licences (RFLs) shown in Figure 5 and Figure 6. In Figure 5 RFLs show a performance similar to the other licence types, while in Figure 6, RFLs show an increased harvest with an increasing percentage of pine—up to 60 to 79 percent pine category; however, they harvest very little (9 percent of the total) in the "pure pine" category.

This is in sharp contrast to BC Timber Sales, which shows a response in Figure 6 similar to that seen in Figure 5— that is, their harvest with increasing percent pine increases, and over half their harvest is in the "pure pine" part of the profile.

When asked, staff from BCTS indicated that the profile of their harvest is, to the extent possible, a response to the beetle problem. They are targeting for harvest stands that have high percentages of pine as well as high percentages of active beetle infestation. They are able to do this because they do not have any direct requirement to provide mills with the mix of species and timber specifications that mills require.

In contrast, the holders of RFLs are almost always responsible for providing one or more mills with specific timber requirements by harvesting wood from their RFL and purchasing wood from a variety of other sources including BCTS, NRFLs, small scale salvage operations, woodlots and harvest from private land. Wood from other sources is desirable as it is often less expensive than wood from the licensees' own RFL; however the vast majority of available purchased wood is pine.

During interviews with holders of RFLs, many of them indicated that, when selecting forest stands to harvest under the RFL, they need to balance dealing with the beetle epidemic with their mill's timber requirements for other species.

Beyond mill requirements, a number of other reasons were provided to explain why there is an apparent under-performance of RFL holders in the "pure pine" part of the profile.

The most commonly cited reason is that some of the RFL holders consider themselves restricted to "operating areas" that have little pure pine, even though the management unit has considerable volumes of pure pine. In any given uplift unit, there are at least two, and often more, RFL holders. As a matter of expedience, these licence holders, along with BCTS, divide each uplift unit into non-overlapping operating areas. While these operating areas have no legal status, they are adhered to because they greatly simplify the planning of forestry operations. There is substantial variability in the distribution of pine within each management unit and, as a result, there can be substantial variability in the distribution of pine within an operating area.

While this explanation may be applicable in some limited and specific circumstances, it is not sufficient to explain the overall result. BCTS operating areas were specifically chosen to be representative of the timber available so that their sales could be used to establish market-based prices for stumpage. Therefore, the performance demonstrated by BCTS should be possible by RFLs collectively, all other things being equal. Additionally, as mentioned above, the operating areas have no legal status. Therefore licensees can decide, and in some cases have decided, to cooperate within an operating area in order to address the beetle problem.

Several other reasons, besides mill requirements and operating area restrictions, were suggested to explain the apparent under-performance in the "pure pine" stands. These reasons apply in specific circumstances only:

- There is a need to deal with other forest health issues, such as spruce beetle and Douglas fir beetle, particularly in the Quesnel and Okanagan TSAs.
- There was a need to salvage Douglas fir damaged by the fires of 2003, particularly in the Kamloops TSA.
- In some of the uplift units, there are partitions[xxix] of the AAC specifically for the harvest of non-pine species:
    - Cedar/hemlock partitions totalling 310,000 cubic metres per year.
    - Deciduous species partitions totalling 220,000 cubic metres per year.
- In the Okanagan TSA, the beetle infestation is concentrated in the central portion of the management unit and there is a predominance of mixed stands there.
- In the Kamloops TSA, a decision has been made that the highest priority stands to salvage are those that have high productivity (allowing rapid re-growth). In general, pure pine stands are found on lower productivity sites.
- In the Lakes TSA, the infestation has been active for so long that all of the pure pine stands are already harvested or are past their shelf life.
- During the period of this study, the shift from non-pine to pine harvest was complicated by an administrative requirement that entire cutting permits be completed within four years of starting them. This procedure has now been modified.

3. How will the current harvest profile influence the nature of the forest after the salvage harvesting is completed?

It is important to ask the question: will the current species profile of harvest make any difference to the nature of the forest after the beetle outbreak is over and salvage harvesting is completed?

There is approximately 1.5 billion cubic metres of merchantable timber volume in the study area. One third of that is in "pure pine" stands (those with 80 percent or more pine) and 13 percent is in stands with 60 to 79 percent pine. The remaining 54 percent of the volume is in stands with less than 60 percent pine (Figure 7).

Since the salvage harvesting began, 44 million cubic metres has been harvested (three percent of the total volume). Forty-two percent of the harvest has been in "pure pine" stands, 38 percent of the harvest has been in stands with 60 to 79 percent pine and the remaining 20 percent of the harvest has been in stands with less than 60 percent pine (Figure 7).

If the entire AAC is harvested for another 10 years with the species profile demonstrated to date, two-thirds of the "pure pine" stands will remain unharvested, but only 20 percent of the stands with 60 to 79 percent pine will remain unharvested (Figure 7).

This result is less than desirable because it is likely that a large proportion of the "pure pine" of the profile will be killed and that the remaining stands will have insufficient volume to contribute to mid-term (after shelf life) timber supply. Those areas would be available for harvest sooner if harvested and regenerated now, rather than simply left unharvested. Harvesting as much of the "pure pine" part of the profile as possible and reasonable (where there is no well developed understory[xxx] and the harvesting does not compromise other values) will have a benefit on the long-term timber supply.

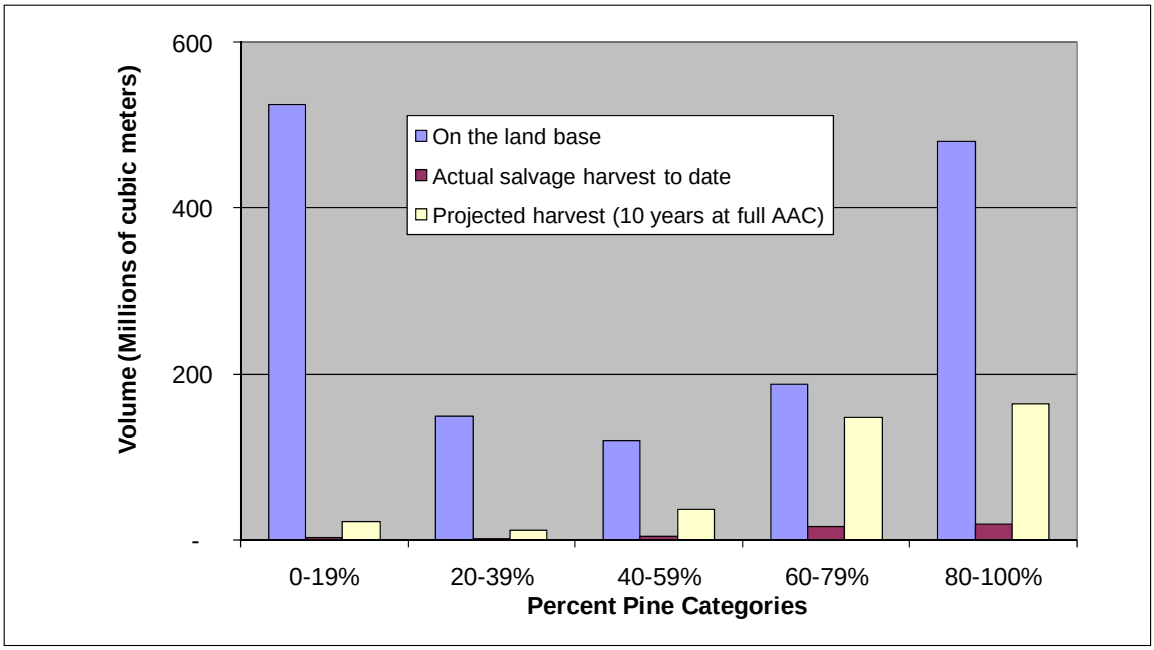


Figure 7. Comparison of volumes on the land base and volumes that have been, and might be, harvested.

The stands in the 60 to 79 percent part of the profile are different from the "pure pine" stands and it is not reasonable to endorse the harvesting of almost all of them because:

- there is uncertainty about how the beetle infestation will progress outside of the areas of "pure pine"—it may be the case that a portion of these stands will survive the epidemic more-or-less intact;
- even if all of the pine is killed in these stands, the remaining live volume may be sufficient now, or after a relatively brief period of further growth, to contribute to mid-term timber supply; and,
- the precautionary approach alone would indicate that we should consider harvesting a smaller proportion of this part of the profile, in order to leave more options for the future.

This projection of the impact that salvage harvesting may have in the future is based on a cursory analysis. This is appropriate because there is significant uncertainty in all aspects of the beetle outbreak and our response to it. In particular, this analysis assumes that the entire current AAC will be harvested over the next ten years. There is uncertainty about this assumption given that only 88 percent of the AAC was harvested in 2006 and it is not possible to precisely project the economic trends which will drive the activity in the existing and potential emerging forest industries.

Conclusions

We sought to answer three questions with this report:

- Is the species profile of harvest consistent with the expectations of MFR?
- Why are species other than pine being harvested?
- What effect will the current harvest profile have if it is continued?

We found that the species profile of the harvest is largely meeting the expectations of MFR. The chief forester has consistently stated that the increased harvesting be dedicated to addressing the mountain pine beetle epidemic. We found that, over the past six years, since the increases in the AAC began, all of the additional harvest volume has been pine. The volume of tree species other than pine that was harvested from 2001 to 2006 has not increased—in fact it has decreased slightly.

There are two main reasons why 30 percent of the harvested volume consists of other tree species:

1. not all of the wood products produced can be made from pine, and the forest industry requires species other than pine to satisfy the demands of the marketplace; and,
2. pine trees often occur in stands where there is a mixture of tree species and, because the principal method of harvesting in the uplift units is clear-cutting (with reserves), it is often not possible to harvest only pine in areas of mixed species.

There are a number of other reasons why not all of the harvest is composed of pine, including managing forest health issues other than MPB and salvaging fire damaged stands.

Unfortunately, tension is created by the conflicting desire of MFR to have harvesting concentrated in stands with a high percentage of pine and the need of the forest industry to have substantial volumes of non-pine species delivered to their mills. This tension appears to result in a large portion of the harvest being done in mixed stands that have a relatively high proportion of pine, rather than in "pure pine" stands.

We note that, since the salvage uplifts began, about three percent of the total merchantable volume on the land base has been harvested. If the harvest continues for ten more years with the species profile that has been demonstrated since the uplifts began, and the entire AAC is harvested, 80 percent of the forest with 60 to 79 percent pine will be harvested and less than one-third of the forest with 80 to 100 percent pine will be harvested.

This outcome will be less than desirable from the point of view of the mid- and long-term timber supply because much of the forest with 60 to 79 percent pine would contribute to the mid-term timber supply if it were reserved from harvest. This outcome may also be undesirable with respect to long-term timber supply because most of the pine in the forest with 80 to 100 percent pine will be dead. Harvesting as much of the "pure pine" part of the profile as possible and reasonable (where there is no well developed understory and the harvesting does not compromise other values) will have a benefit on the long-term timber supply because those areas would be available for harvest sooner if harvested and regenerated now, rather than if simply left unharvested.

Recommendations

Two issues arose during the course of this study that may warrant further investigation.

The investigation sought to answer questions about the species profile in the harvest. The best data available is from the harvest billing system (HBS); unfortunately, that system records the volumes that are brought into the mills rather than the total volume harvested. Volume that is harvested but left in the woods is not recorded in HBS unless it is considered to be waste of merchantable volume. Waste recorded in HBS represented less than two percent of the volume harvested in 2006. Yet MFR estimates that, the "mass of roadside biomass accumulations from forest harvesting operations measured on stands harvested in the summer of 2006 near Quesnel indicated on average, roadside waste biomass was 24 percent of the standing volume."[xxxi] The discrepancy between these two amounts is a result of three factors:

1. There is a "benchmark" volume of four to ten cubic metres/hectare that can be left on the site and not recorded as "waste."[xxxii]
2. Waste surveys do not record certain grades[xxxiii] of logs that can be left in the woods at the discretion of the licensee if they are uneconomical to haul into the mill.
3. Waste surveys done to support HBS do not record any of the volume of residue (tree tops, branches, etc.). We assume that all of these volumes are included in the estimates of roadside biomass accumulation.

Whether or not a full accounting for volume left in the woods would have any effect on the results of this study remains to be seen. More importantly, an accurate accounting of the depletion of the standing inventory through harvesting is a required component of sound forest stewardship.

Another issue arises with using HBS data to enumerate the species mix in the forests that are harvested—that is, the finest level of spatial resolution available in HBS is the cutting permit. Cutting permits are made up of one or more blocks, or areas, that are harvested separately. We know the species mix for the cutting permits but not for the individual blocks, which could have wide variation in species mixes. For example, two

cutting permits could both show 80 percent pine harvest in HBS when one of the permits was made up of ten blocks each with 80 percent pine and the other was made up of ten blocks, eight with 100 percent pine and two with 100 percent spruce. This issue might be addressed by examining timber cruise data that is available through the Electronic Commerce and Appraisal System of MFR.

These two issues complicate the already complex topic of species profile of harvest in MPB salvage areas. Therefore, in accordance with Section 131(2) of the *Forest and Range Practices Act* the Board makes the following recommendation:

- The Board recommends that the Ministry of Forests and Range develop and implement protocols for monitoring species profile of harvest that will enable district level managers and provincial level policy makers to incorporate appropriately detailed information in their decision making processes. This protocol needs to address both the topics examined in this investigation and the issues raised by the investigation.

In accordance with Section 132(1) of the *Forest and Range Practices Act* the Board requests that the Ministry of Forests and Range advise the Board by March 31, 2008 as to how this recommendation has been addressed.

[i] Forest Health – Aerial Overview Survey, MFR Forest Practices Branch Web Page. http://www.for.gov.bc.ca/hfp/health/overview/overview.htm

[ii] Walton, A., J. Hughes, M. Eng, A. Fall, T. Shore, B. Riel, and P. Hall.2007 Provincial-Level Projection of the Current Mountain Pine Beetle Outbreak: Update of the infestation projection based on the 2006 Provincial Aerial Overview of Forest Health and revisions to the "Model" (BCMPB.v4) http://www.for.gov.bc.ca/hre/bcmpb/BCMPB.v4.BeetleProjection.Update.pdf

[iii] As of May 25, 2007 http://www.for.gov.bc.ca/hts/aac.htm

[iv] Forest Practices Board 2007. The Effect of Mountain Pine Beetle Attack and Salvage Harvesting On Streamflows - Special Investigation. http://www.fpb.gov.bc.ca/news/releases/2007/03.16.07.htm

[v] Forest Practices Board. 2006. Habitat Retention and Mountain Pine Beetle Salvage in the Fly Hills Complaint Investigation 050634 http://www.fpb.gov.bc.ca/complaints/IRC122/IRC122.pdf

[vi] Benskin, H. 2005. Tree Farm Licence 53 Dunkley Lumber Ltd. Rationale for Allowable Annual Cut (AAC) Determination, MFR Victoria, B.C. http://www.for.gov.bc.ca/hts/tfl/tfl53/tsr3/53tf05ra.pdf

[vii] Ministry of Forests and Range. 2005. Management of Species Composition in Cutblocks in Beetle-impacted TSAs, MFR, Victoria BC. http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/SpeciesManagement.pdf

[viii] Parfitt, B. 2007. Over-cutting and Waste in B.C.'s Interior: A Call to Rethink B.C.'s Pine Beetle Logging Strategy, Canadian Centre for Policy Alternatives http://policyalternatives.ca/documents/BC_Office_Pubs/bc_2007/bc_overcutting_woodwaste.pdf

[ix] Pedersen, L. 2004. Prince George Timber Supply Area Rationale for Allowable Annual Cut (AAC) Determination, MFR Victoria, B.C. http://www.for.gov.bc.ca/hts/tsa/tsa24/tsr3/rationale.pdf

[x] Government of British Columbia, 2006. Mountain Pine Beetle Action Plan Sustainable Forests, Sustainable Communities: 2006-2011. Victoria BC. http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/actionplan/2006/Beetle_Action_Plan.pdf

[xi] B.C. Ministry of Forests and Range. 2007. Monitoring Harvest Activity across 16 Mountain Pine Beetle Impacted Timber Supply Areas. MFR, Victoria, BC. http://www.for.gov.bc.ca/hts/MPB_Harvest_2007.pdf

[xii] We do not include 100 Mile House and Williams Lake TSAs that have had increases in AAC after January 1, 2006 as a result of the current MPB outbreak. There have been MPB-related increases in the AAC, which fit the timeframe outlined above, in five tree farm licences (TFLs 5, 35, 42, 49 and 53), but these management units are not included in the analysis because they are small compared to the uplift units. In total, they represent less than six percent of the volume harvested in the uplift units.

[xiii] Treatments such as "fell and burn" and the application of the pesticide MSMA.

[xiv] Pedersen, L. 2004. Kamloops Timber Supply Area In response to a request for a temporary increase Rationale for Allowable Annual Cut (AAC) MFR, Victoria, BC. http://www.for.gov.bc.ca/hts/tsa/tsa11/tsr3/rationale.pdf

[xv] In the entire interior of BC the AAC has been increased by 36% from 50 to 68 million cubic meters.

[xvi] Pedersen, L. 2004. Prince George Timber Supply Area Rationale for Allowable Annual Cut (AAC) Determination, MFR Victoria, B.C. http://www.for.gov.bc.ca/hts/tsa/tsa24/tsr3/rationale.pdf
The quotation is repeated in rationales for TSAs 14 and 26 and similar statements can be found in rationales for other management units where increases for control have been put in place, e.g. Kamloops, 2004, "At present, and to the extent possible, harvesting activities are aimed at managing the current mountain pine beetle infestation."

[xvii] Benskin, H. 2005. Tree Farm Licence 53 Dunkley Lumber Ltd. Rationale for Allowable Annual Cut (AAC) Determination, MFR Victoria, B.C. http://www.for.gov.bc.ca/hts/tfl/tfl53/tsr3/53tf05ra.pdf.
There is an expectation that this is occurring in other management units where harvest is focused on salvage, e.g. in the Lakes, Quesnel, and Prince George TSAs "harvesting is heavily concentrated on removing at risk pine with only incidental harvesting of other species." *Ibid.* and repeated in rationales for the Lakes and Quesnel TSAs.

[xviii] All data on volumes harvested were obtained from special queries of the Harvest Billing System (HBS) (http://www.for.gov.bc.ca/hva/hbs/index.htm) performed for us by staff at the MFR. We used the Harvest Billing System data to summarise, for each cutting permit, the dates of harvest and the volume harvested by species. Additional information included the licensee that did the harvesting and the Uplift Unit in which

the harvesting was done. Some issues related to the use of HBS for this purpose are outlined in the section titled "Recommendations ".

[xix] Government of British Columbia, 2006. Mountain Pine Beetle Action Plan Sustainable Forests, Sustainable Communities: 2006-2011. Victoria BC. http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/actionplan/2006/Beetle_Action_Plan.pdf

[xx] Approximately 950 million m^3 of merchantable pine is expected to be killed. Even assuming an optimistic average shelf life of ten years, the AAC in the interior of the province would have to increase by another 40 percent (from 68 to 95 million m^3), maintain that level for ten years and be completely devoted to harvesting pine.

[xxi] Economics and Trade Branch, Ministry of Forests and Range. 2005. Major Primary Timber Processing Facilities in British Columbia2005. MFR, Victoria, BC. http://www.for.gov.bc.ca/ftp/HET/external/!publish/Web/Mill%20List/Public%20Mill%20Report%202005.pdf

[xxii] We obtained data from the Forest Analysis and Inventory Branch that describes the species profile on the Timber Harvesting Land base in each of the uplift units.

[xxiii] Harvest to December 31, 2006 from cutting permits issued since the most recent uplift in each TSA.

[xxiv] B.C. Ministry of Forests and Range. 2007. Monitoring Harvest Activity across 16 Mountain Pine Beetle Impacted Timber Supply Areas. MFR, Victoria, BC. http://www.for.gov.bc.ca/hts/MPB_Harvest_2007.pdf

[xxv] There are a small number of exceptions. For example Stuwix Resources Ltd. holds an RFL in the Merritt TSA but it is a "market logger" with no dedicated milling facility.

[xxvi] Obtained from MFR Forest Analysis and Inventory Branch.

[xxvii] Okanagan TSA, Kamloops TSA, Prince George District, Ft. St. James District, Merritt TSA and Lakes TSA.

[xxviii] Note that there is some variability among licences within each licence type that is not entirely reflected in the figures. For example, two percent of the volume harvested by RFLs was harvested from licences that averaged over 80 percent pine and four percent of the volume harvested by RFLs was harvested by licences that averaged less than 40 percent pine. Sixty-eight percent of the volume harvested by RFLs was harvested by licences that averaged 60 to 79 percent pine.

[xxix] A portion of the AAC that is attributed or constrained to specific timber types and/or terrain.

[xxx] There is some evidence that a substantial proportion of these stands may have a well-developed understory that will hasten their contribution to the mid-term supply. http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/stewardship/report.pdf.

6[xxxi] Ministry of Forests and Range Web Site. 2007. Bioenergy Opportunities Using Wood Resources. http://www.for.gov.bc.ca/hts/bioenergy/biofuel_supply.htm

[xxxii] Ministry of Forests and Range. 2007. Amendment No. 8 Prov. Log. Residue & Waste Measure. Proced. Manual http://www.for.gov.bc.ca/hva/manuals/rwprocedures/2005/RWProceduresAmendNo8.pdf

[xxxiii] Dry Grade 4, Grade 6 and Grade Z may be left on site without incurring a waste bill and are not recorded in waste surveys, but if they are brought into the scale they are entered into HBS and appropriate stumpage rates and cut control apply.

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NEWS RELEASE

For Immediate Release
November 30, 2007

Pine beetle logging takes mostly pine, study says

VICTORIA – All additional harvesting allowed by the Ministry of Forests and Range to deal with the current mountain pine beetle infestation has been directed at pine, according to a Forest Practices Board report released today.

"The increase in the allowable annual cut to deal with the mountain pine beetle epidemic has raised concerns about whether non-pine species of trees were also being harvested," said board chair Bruce Fraser. "We found that all of the new allowable harvest consists of pine, and that industry has not increased its harvest of other species."

A board investigation into species composition of MPB harvest in B.C.'s Interior was prompted by a 36 per cent increase in the allowable annual cut. The increased harvest is helping to try to control the outbreak and salvage beetle-killed wood before it loses its value. Other species continue to be logged to make wood products for which pine is not suitable, or when clear-cutting mixed species stands.

The board found that industry is balancing the need to salvage value from dead pine with the need to maintain the commercial viability of existing mills. The board remains concerned, however, that the trend toward harvesting in mixed stands while avoiding pure (80 to 100 percent) pine stands could reduce the mid-term timber supply and limit reforestation, which could affect the long-term timber supply.

If uses for the dead pine – such as for bio-energy or for non-lumber wood products – turn out to be viable, more pure pine may well be harvested and those sites replanted for the future, reducing the long-term concern.

The Forest Practices Board is B.C.'s independent watchdog for sound forest and range practices, reporting its findings and recommendations directly to the public and government. The board:

- audits forest and range practices on public lands;
- audits appropriateness of government enforcement;
- investigates public complaints;
- undertakes special investigations of current forestry issues;
- participates in administrative appeals; and
- makes recommendations for improvement to practices and legislation.

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Tree Species Harvested In Areas Affected By Mountain Pine Beetles

This report profiles species harvested in response to the MPB infestation in six timber supply areas damaged by beetle, looking at whether the harvested timber is consistent with government objectives, what the reasons are for harvesting non-pine species, and what the implications of the harvesting pattern are for the mid- and long-term timber supply.

Download Full Report

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