bulkley valley - lakes district
airshed management society

Highway 16 (Burns Lake - Terrace)
Woody Debris Inventory

September 2009

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Acknowledgments

The research and writing team for this project wishes to thank all past and current supporters of the BVLD Airshed Management Society for providing encouragement and input into the Clean Air Plan and specifically this project and survey design. We'd also like to thank all the participants who completed a survey and took extra time to provide case studies and a deeper understanding of barriers and opportunities. Special gratitude also goes to Larry McCulloch, who performed some modeling for us using TIPSY during our analysis of available volumes of woody debris and Ben Weinstein for a careful review of our report.

Funding for this project was provided by:

- BC Ministry of Environment
- 16/37 Community Futures Development Corporation (Terrace), Norther Savings Credit Union (Terrace)
- Bulkley Valley Credit Union (Smithers)
- Northern Savings Credit Union (Terrace)
- Northwest Science and Innovation Society (Terrace).

In addition, the Regional Districts of Bulkley-Nechako and Kitimat-Stikine were invited to sponsor this report and have contributed in-kind resources with Kitimat-Stikine promising a financial contribution for a potential Phase 2 report emphasizing solutions for urban waste.

Lastly, we'd like to thank all the researchers and participants involved with the studies cited in our report - these background documents were most helpful in putting the BVLD Airshed project into a larger context and providing hope that wide-scale and profitable wood residue recovery is achievable.

Sincerely,

Laurie Gallant, BVLD AMS Facilitator (2002-2009)

and

Jeff Anderson, BVLD AMS Director (2008-2009)

Smithers BC, August 4, 2009

Executive Summary

The Highway 16 Woody Debris Inventory was developed in response to the annual BVLD Airshed Management Society (AMS) Burn Operators Forum (2003-present) and the 2008 Skeena Wood Residue conference where it was suggested that significant challenges exist for accessing woody debris, referred to as waste wood from this point forward. A literature search, interviews with select professionals in the field, and a market research survey were conducted to address this issue. In total ,35 participants representing Woodlots, Sawmills, Treefarm Licenses and Forest Licensees filled out the survey.

Data collected through this process indicates that approximately 800,000 cubic metres of logging slash and 250,000 cubic metres of mill waste is generated each year in the BVLD Airshed, most of which is burned and therefore, unavailable to end-market users. Considering this, successfully developing access to end-market users could effectively divert up to 1 million cubic metres of waste wood from being burned each year.

Two end-market users groups were identified in this report: (1) industrial and (2) local users. Industrial end-market users include pellet plants and alternative energy developments. These industrial end-market users are best aligned with large-scale sawmills operated by Forest Licensees who are able to offer a steady and consistent supply of waste wood. Small scale-sawmills and woodlots maintain small and inconsistent supplies of waste wood and make a suitable match for local community markets. Waste wood from these small operations could effectively supply mulch, compost and animal bedding to local/individual end-market users.

Recommendations stemming from the Woody Debris Inventory are intended to bridge the gap between woody debris generators and end-market users. Below are the top three recommendations identified in this report.

1. Identify infrastructure improvements required to develop end-market access;
2. Host discussions with MoE and MoFR Revenue Branch to assess liability and fire abatement issues;
3. Stakeholder and interest groups to develop regional economic strategy that favors efficient and wise use of waste wood. This strategy would build on existing efforts of the Omenica Beetle Action Coalition.

Copies of this report are available on the BVLD Airshed Management Society website at www.cleanairplan.ca. Questions regarding the methodology or content of this project can be directed to info@cleanairplan.ca .

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1. Introduction

Emissions from forest harvest debris burning have traditionally been the most significant source of particulate matter (PM2.5) in the BVLD airshed. A Woody Debris Working Group (formerly known as the Resource Management Burning Regional Working Group) was established in 2003 during a regional forum organized by the BVLD Airshed Management Society (AMS) and the BC Ministry of Environment. The accomplishments of this dedicated group have been many, including an annual forum for Burn Operators to review best practices and alternatives, the introduction of the very successful Custom Venting Forecast Service, and widespread awareness and education on the impacts of dense smoke from burning operations and how to reduce those impacts.

The Clean Air Plan explicitly states that the AMS will "**continually explore alternatives that directly target reductions in the amount of debris to be burned and/or emissions from debris being burned.**" Our 2006 and 2007 forums focused on this theme, but noted that there was very little to share or report on. Things turned around at the September 2008 Burn Operators Forum with two presentations - one from a local chipping company that feeds a pellet manufacturing plant and another from the general manager of a local fibreboard plant. Both managers moaned about the challenges of accessing woody debris, reporting that their businesses would flourish if material was easier to access, and asked if this situation could be addressed. Recalling the Skeena Wood Residue Conference held in April 2008 that focused on opportunities and political landscapes, AMS requested proceedings from that event to see if any outcomes such as producing a Woody Debris Inventory had resulted. Since no tangible outcomes were reported, funding was still available for beneficial projects. A short proposal was submitted and a $8.5K grant provided to fund the work of AMS and production of a Woody Debris Inventory.

The completion of the Highway 16 Woody Debris Inventory coincides with some interesting shifts in the global and regional economy including a new emphasis on resource efficiency and corporate responsibility for social and environmental impacts. This project also coincides with the marking of five years since the Bulkley Valley-Lakes District Five Year Community Action Plan for Clean Air was embraced in 2004. To better serve the residents of the BVLD communities, the Clean Air Plan is undergoing a review with the intention of producing an Addendum to the original Plan that will update the emission sources and available strategies to better manage air quality. The Addendum will be presented to the local residents for input over the next 12 months before being finalized as the new Action Plan to take us to 2015.

The AMS looks forward to another five years of creative clean air solutions and to working with the many partners that will help develop and implement these solutions.

Project Objectives and Organization of Report

The intention of this project is to provide a solid foundation for future research and analysis, public policy development, and sustainable business opportunities. Ideally, presenting this information on available woody debris will make it easier for generators and end markets to find each other, and for the flow of fibre to become more efficient and cost-effective.

To achieve these objectives, the following project deliverables were proposed:

- Compile past research and consultation efforts on woody debris recovery in the Skeena region.
- Develop a database of known woody debris generators.
- Produce an inventory of available woody debris from forestry operations, land-clearing operations, and sawmills; the inventory will specify, where possible, tree species, character and size of woody debris (i.e. tree tops versus sawdust), volume available, moisture content, instructions regarding access to woody debris and distance from Highway 16.
- Provide an overview of available markets for woody debris.
- Suggest a marketing plan for raising the profile of this project and matching up generators and users.
- Provide recommendations for improving woody debris recovery rates.

2. Review of Supporting Literature

Research into barriers and opportunities for woody debris recovery in BC has traditionally been linked to air quality and municipal waste management objectives. A quick literature review revealed feasibility studies and consultations tracing back to the early 1990s as a result of the phase out of beehive burners and waste management planning linked to a provincial target of 50% diversion from landfills by the year 2000. Our investigations into how the Bulkley Valley - Lakes District Clean Air Plan and Woody Debris Inventory fit into provincial and regional objectives resulted in few surprises, a few new allies, and some very useful information for furthering our objective of helping the airshed and the local economy. A summary of key documents surveyed is presented below; full references can be found in the Resources Cited section.

BC Clean Air Action Plan

There is a provincial target to meet or beat Canada-wide standard for fine particulate matter and ground-level ozone in communities province-wide as these are the two most harmful outdoor air contaminants. Burning of woody debris and inefficient use of fossil fuel based technologies for heating and transportation, in addition to road dust are some of the significant sources of fine particulate matter identified. Turning more wood waste into energy and promoting better burning techniques in the forest industry are listed as key actions. Making heavy duty vehicles cleaner is also top priority, as is cleaning up industry. The BC Energy Plan and the BC Bioenergy Strategy were developed with the Clean Air Action Plan objectives in mind.

OBAC Future Forest Products and Fibre Use Strategy

This document provides an insight analysis of the forestry industry and is an excellent companion read to this report. It contains information on forest sector initiatives and total fibre capacity, which is reported as 8.8 million cubic metres for fibre consuming mills in the OBAC region. There are four key recommendations support by action items that contribute to OBAC's overarching goal of community resilience as follows:

1. Increase the benefits that communities can rely upon from forest resources and forestry.
2. Ensure that the forest sector remains a strong economic contributor to the region.
3. Recognize the pine beetle killed stands as a valuable asset which should be used to full potential before their commercial value is depleted.
4. Increase awareness and understanding of the long-term viability of the forest sector.

While there are no specific references in this document to air quality or the BVLD Airshed Management Society, the tone is definitely one of cooperation and increasing benefits to communities. It seems likely that a stronger alliance would benefit both of our organizations as there is agreement that woody debris needs to be better managed and that public policy shifts are needed. As stated on page 16 of this report, ...currently there are few incentives for using woody biomass. High capital costs and lack of security over raw materials are barriers. Identifying a secure fibre source is difficult as most of the currentAAC has been allocated to existing tenure holders. Raising the price paid for biomass-generated energy to attract investment should be considered.

SIBAC Princeton Fibre Use and Supply Study

This study provides an in-depth analysis of available fibre and specific end uses for wood residue in the Princeton area, using a 20 year planning period and a 2-hour return trip from Princeton. The project also provided for the development of a web-based tool that provides a fibre cost summary by source over the 20-year time period. The conclusion is that a wood-fired heat producing bio-energy plant should be pursued to meet demands of the local sawmill, pellet plant and selected municipal facilities and a strategy forward is presented. This study is useful for its approach and the web tool may be useable for BVLD Airshed; it should be noted however that 85% of the fibre supply is from a single sawmill with the remainder being economically feasible to source from private land and crown harvest residue.

BVLD AMS Annual Burn Operators Forum

At the 2007 event a workshop was held to identify fibre uses to reduce total volumes in burn piles. Trial details, barriers and opportunities were identified for: Biomass energy systems, value-added products such as panel board and pellets, public firewood salvaging, leaving more coarse woody debris on the ground. Additional strategies for reducing smoke and being prepared for new opportunities were also identified and

included liaising with other agencies such as OBAC, other airshed groups, increased promotion and use of custom venting forecast service, and continuation of the annual Burn Operators Forum were also cited by participants as worth pursuing. Proceedings from the annual forums are posted at http://cleanairplan.ca/fhdb.shtml.

Wood Waste Management Study - Regional District of Bulkley-Nechako

This 2005 study looks at alternatives to open burning of woody debris typically managed at a regional district landfill or transfer station. A comparison of options examines material suitability (brush, clean lumber, treated lumber), preprocessing required, wood waste transport required, and reductions in air emissions over open burning. A financial comparison and environmental benefits are also provided. The report notes that the final strategy "...needs to reflect a balance between minimizing particulate dispersion in the airshed and keeping the costs of changing the way wood waste is managed to an acceptable level for local residents and businesses".

The author also concluded that markets and uses of ground urban wood waste are limited in the RDBN and that opportunities to partner with industry are very limited given the unsegregated nature of the woody debris at this time and available options (i.e. remaining phase 2 burners). The most promising partnership cited is with NEWPRO, a panel board plant based in Smithers, who indicated willingness to discuss preparing the urban wood waste to specifications suitable for their fibre board product. Regardless of the final strategy selected, the recommendations push for tipping fees at RDBN facilities to encourage a three-sort segregation of materials and provide for cost recovery as well as proceeding with a waste characterization study to more accurately account for the volume and type of available woody debris. RDBN officials report that this study will be completed by the end of 2009.

Wood Recycling: How to Process Materials for Profitable Markets

A collection of case studies that provides inspiration and practical advice on turning woody debris from all sources into a value-added commodity. The catalyst behind the business opportunities profiled range from bans on open burning to emerging new markets across the United States. The report is divided up into sections that cover off everything from handling construction and demolition debris to marketing and end product utilization and safety issues at wood recycling and composting operations.

Woody Biomass Desk Guide and Toolkit

This Woody Biomass Desk Guide and Toolkit provides an overview of woody biomass production and utilization in the U.S., tips on how to provide effective outreach for your clientele, and educational handouts to share with your audiences. The purpose of this guide is to equip natural resource professionals and outreach specialists with the information and tools needed to increase awareness of the use of woody biomass for energy in the U.S.

3. Sources and Distribution of Woody Debris

For the purposes of this inventory, three major sources of woody debris were targeted: 1. forestry operations producing slash piles, 2. forestry operations producing sawmill residuals, and 3. urban woody debris such as construction and demolition waste that is mostly managed by Regional Districts through their waste management systems (transfer stations and landfills). For Phase 1 of this project, woody debris from forestry operations was the primary focus, as this comprises the vast majority of available fibre and is the most significant contributer to air pollution. in the BVLD Airshed.

A database of generators was developed by attaining and combining lists of forest licensees, woodlot owners, and small-scale sawmills operators. This database is attached as Appendix A.

Forestry Operations

Forestry is synonymous with the development of many communities in BC, and the forest industry has maintained these communities for decades. As mechanization of the forest industry has increased over time so too has the generation of waste wood. Thus, in order to sustain itself, and future generations, the forestry industry will require a more sustainable understanding of waste wood, which for the purpose of this report is defined as follows:

'Branches and tops' - once left in the forests offering ecological value are now brought to landings and burned as waste; 'low-grade logs' - once left standing offering wildlife habitat are now logged for pulp wood and left to be burned as waste if the grade is too low; and, as 'broken trees' not long enough for conventional use. Presently, forestry regulations mandate a licensee to abate fire hazards; and, open burning slash piles are the cheapest fire hazard abatement available. However, burning waste wood effectively diminishes all possibility of secondary markets.

A slash pile in the Bulkley TSA taken in April 2009. Note the high percentage of high value fibre.

Forestry Licensees - two main sources of wood waste wood are generated by forest licensees: (1) slash piles in the forest and (2) mill residuals from sawmills.

Slash Piles

Historically slash piles were composed of branches, tops and sections of the tree that were unsuitable to be milled. Currently, as a result of the mountain pine beetle attacking young stands, slash piles in the Bulkley, Morice and Lakes TSAs are often composed of sections of pine trees too small to be sent to the mill (< 10

cm), yet these slash piles offer a tremendous fibre value of waste wood (see photo above). Since pine trees have very uniform growth this waste wood tends to range from 4 to 7 metres in length and 7 and 9 cm in width. Under the current Waste and Residue Assessment system this wood would be considered waste wood and the licensee would not have to pay for it. Thus, it would be burned as per regulation.

This appears to be a residual - and unique - effect of the mountain pine beetle epidemic as licensees have been forced to increase the pine component of their Annual Allowable Cut (AAC). Therefore, slash piles are often composed of sub-mill quality (7 to 9 cm) pine. Given the uniform growth of pine and current focus on logging pine, particularly young pine stands, slash piles appear to have 'increased' in fibre value. These piles are set aside during logging (often during winter) and burned the following autumn when the soils are wet and atmospheric dispersion of resulting smoke is favorable.

Mill Residuals

Mill residuals can be broken down into two categories as well: (1) hog fuel and (2) pulpwood. Hog fuel is sawdust and ground wood waste or bark that yields a low fibre value. It is sometimes used on-site for generating energy (witness Pacific Inland Resource's system) or shipped to an off-site energy plant. Pulpwood is free of bark and debris and yields a higher fibre value from the pulp and paper industry.

Woodlots - Woodlots are a ubiquitous entity in all jurisdictions. In short, these are small-scale tenures provided to private citizens to manage the timber resources. Occasionally woodlot owners have their own sawmills but in most cases the logs are sold to forest licensees (ex. Canfor, West Fraser, etc.). As such, the primary source of woody debris is slash piles, similar to those discussed above. In the case of woodlots, waste is usually much less, as handling of wood is costly and the economic nature of woodlots requires reducing costs. Additionally, many woodlot owners practice selective cutting techniques with hand fallers and therefore, generate much less waste wood during harvesting.

Small/Private Sawmills - Many small/private sawmills exist throughout the Bulkley-Nechako and Kitimat-Stikine Regional Districts. These mills range in production between servicing intermittent cutting at woodlots, maintaining value-added markets such as specialty flooring, and supplying steady supplies of milled timber to local, provincial and international markets. Woody debris generated at small/private sawmills tends to be primarily sawdust and slabs (the outer half-moon edge bark on that results from milling a log).

Distribution of Woody Debris by TSA

The Lakes TSA has the largest AAC followed by the Morice and Kispiox TSAs (see table next page). The largest difference in AACs is between the Kalum (436,884 m^3) and the Lakes TSAs (3,162,000 m^3) which is seven-fold the AAC. Recently, however, as a response to the the Mountain Pine Beetle epidemic, the AAC of some TSAs has been increased to effectively manage infected stands. The volume of waste wood of waste wood varies between between TSAs and is roughly proportionate to the size of the AAC.

Woody debris generators such as Babine Forest Products, Canadian Forest Products and West Fraser, account for approximately 81 percent of the AAC for each of the TSAs in this region (see graph next page). In

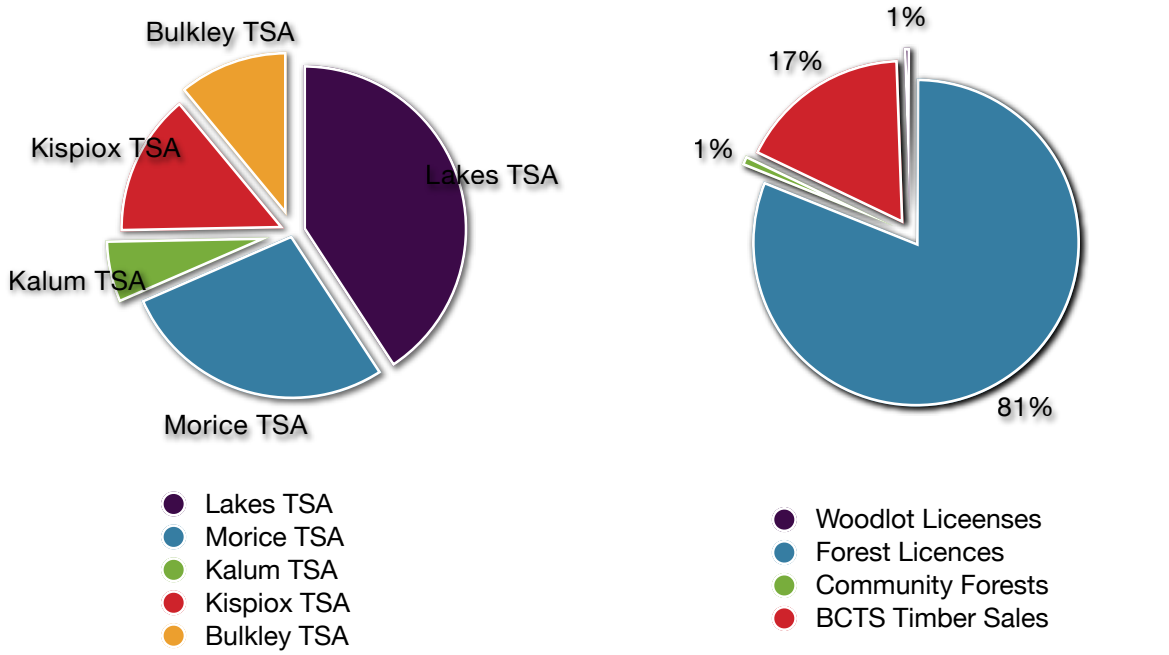
descending order, BC Timber Sales (17 %), community forests (1 %) and woodlots (1 %) account for the remaining 19 percent of these AACs. Collectively this suggests that larger TSAs such as the Morice and Lakes should generate greater quantities of waste wood since they have significantly larger AACs.

Data from Custom Venting Forecast (CVF) for registered burns indicates that approximately 60 percent of the burn piles in this region are produced by the four main Forest Licensees. The remaining 40 percent are an amalgamation of smaller forest licensees, private sawmills and woodlots. This is clearly outlined in the table and figures below.

Table indicates total AAC allotment for each TSA for each category of woody debris generation.

	Lakes TSA	Morice TSA	Bulkley TSA	Kispiox TSA	Kalum TSA
Forest Licenses (m^3)	2, 335, 661	1, 585, 482	630, 330	818, 500	356, 639
BCTS Timber Sales (m^3)	714, 873	339, 410	208, 976	242, 466	71, 493
Community Forests (m^3)	49, 918	20, 000	30, 000	0	0
Community Salvage (m^3)	25, 000	0	0	0	0
Woodlot Licenses (m^3)	10, 194	12, 225	10, 194	3, 611	2, 074
Total AAC	**3, 162, 000**	**2, 165, 000**	**882, 000**	**977, 000**	**436, 884**

Source: Ministry of Forests and Range - Appointment System - TSA Annual Allowable Cut, Apportionment and Commitments. Report Effective Date: 2009-01-09



Graph on left indicates proportionate total AAC for each TSA. Graph on right indicates the allotment of AAC between woody debris generator categories. Collectively these two charts suggest that Forest Licensees in the Morice and Lakes TSAs account for a vast majority of the forestry operations in the BVLD Airshed.

Urban Woody Debris

While this inventory covers off both the Regional Districts of Bulkley-Nechako and Kitimat-Stikine (see areas 2 and 15 respectively in Figure below), a detailed inventory for Urban Woody Debris is beyond the scope of this study and a tiny fraction of the total woody debris available for secondary use when stacked against the forestry sector volumes. Nonetheless, both Regional Districts manage large volumes of woody debris from land-clearing, construction and demolition, and yard maintenance operations and traditionally open burning has been the preferred route although some salvaging, chipping and composting take place for clean wood and yard and garden trimmings.

With open burning restrictions in effect to protect air quality, less polluting alternatives are urgently needed. The Regional District of Bulkley-Nechako has completed a Wood Waste Study identifying possible options and will be completing a waste composition study at the central landfill so that exact volumes and character can be determined. At this time, both Regional Districts do not have scales at their facilities nor are fees for handling materials in effect. Kitimat-Stikine has expressed interested in carrying out a Phase 2 of the Woody Debris Inventory to focus on their urban woody waste and a waste composition study is planned for Fall 2009.

Regional District boundaries in BC
(Kitimat-Stikine is 15, Bulkley-Nechako is 2)

4. Woody Debris Inventory

The following section describes the Woody Debris Inventory which was was conducted through a series of telephone interviews throughout the BVLD Airshed and into the eastern reaches of Kitimat-Stikine Regional District. The inventory focused on forestry operations and specifically included forest licensees (such as Canadian Forest Products and Pacific Inland Resources), woodlot owners and small-scale/private sawmill operations from within the BVLD Airshed. Throughout this section we refer to large and small-scale sawmills; for the context of this report large-scale sawmills are forest licensees such as Canadian Forest Products and Pacific Inland Resources and others who maintain AACs 350,000 m^3 per year. In contrast, small-scale sawmills are privately owned mills associated with either woodlots or BCTS programs ranging from 10,000 m^3 to 350,000 m^3 per year.

Survey Approach

This survey was established to identify where opportunities exist to find alternatives to burning waste wood within the forest industry. In addition detail was also desired regarding the general composition and volume of this waste wood for each source (Forest Licensee, Sawmill, Woodlot) and location TSA. Finally, a statement of barriers, if any, currently exist to finding alternatives to burning was sought from each survey participant. In order to provide recommendations for overcoming the current barriers, this survey examined the timing and quantity of waste wood, in each TSA, and how this best aligns with current regional markets available. To obtain a meaningful understanding of available wood waste this survey was developed with the help of a woodlot owner, a small sawmill operator and two forest licensees.

To accomplish our objective of identifying opportunities for alternatives to burning wood waste we investigated the the distribution of waste wood for both logging and mill operations throughout this region. A database of generators was developed and is attached as Appendix A; the survey questions and compiled responses are attached as Appendix B.

In total, 91 woody debris generators were contacted and 35 agreed to participate in this survey (see Appendix A). In some cases, multiple categories of woody debris generators were represented by a single participant. As an example, the categories ‘tree farm licenses’ and ‘landfill’ and ‘land clearing’ were only filled out by one participant each. As observed below, woodlots were the main participant, followed by several forest licensees and a handful of private sawmills. Therefore, the information contained within this report does not represent all available woody debris generators in each TSA. Significantly however, this report provides a valuable tool for identifying where diverting waste wood from burning will have the greatest impact on the BVLD Airshed.

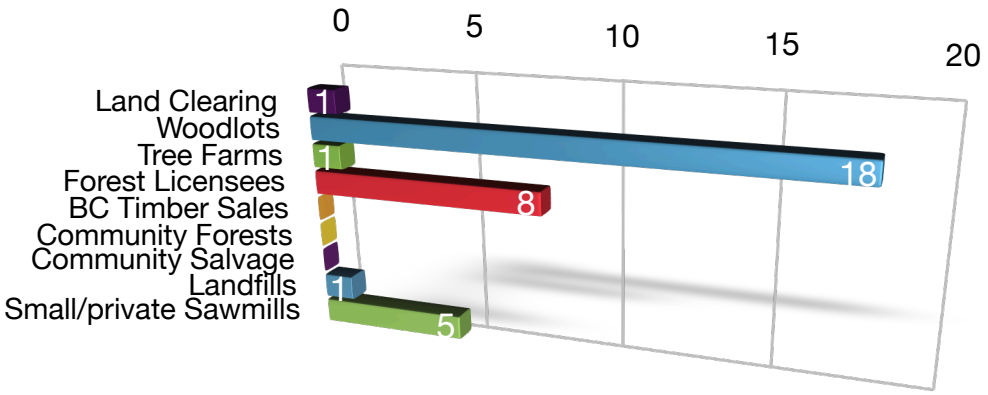


Chart above indicates total participants from each category of woody debris generators.

Survey Scope

The scope of the survey was intended to represent woody debris generation from forestry operations throughout the BVLD Airshed and as far west as Terrace. This geographic scope was chosen as it represents an economic region as well as encompassing several regulatory jurisidictions. All interviews were conducted with the intention of generating interest and alternatives to burning in such a way that these alternatives would also: (1) result in environmental and economic community benefits, (2) strengthen the forest sector and (3) develop value-added solutions to beetle-killed pine wood.

Volume Calculations, Limitations and Gaps

In order to develop a survey that would generate interest and evoke participation it was necessary to minimize the amount of time required for a woody debris generator to complete the survey. It is therefore important to recognize that these are only general numbers and are not intended to represent exact quantities available; moreover, they are an approximation of relative composition, volume and timing of available waste wood. This may result in inaccuracies but should not in any way detract from the main objective - to find alternatives to burning waste wood.

Excluded from this survey was BC Timber Sales (BCTS). Although BCTS accounts for an average of 17 % of AACs in this region, the nature of BCTS is to administer many small-scale non-renewable forest licenses. As such, it was not possible to obtain lists of who the successful bidders were for these forest licenses. Therefore, the slash piles generated under this program (BCTS) are not part of this report; however, wood from BCTS forest licenses are either milled by the bidder or sold to a Forest Licensee. Thus, this survey may have captured a majority of the mill waste associated with BCTS logging.

Also excluded from this survey were woodlots from the Morice TSA, as we were not able to obtain a list of woodlot owners for this TSA.

Volume Calculations

Throughout the survey, participants were encouraged to take a general approach to estimating pile quantity and size. A conservative calculation (see next page) was applied to the pile size categories so as to not over-estimate available waste wood. It has been noted that all TSAs have an average of 15 % waste wood from

these calculations whereas the Bulkley has about 25 %. This higher percentage may have been an artifact of the survey or may be an artifact forestry practices.

To establish the volume of available waste wood from logging operations a calculation was applied to convert the quantity of slash piles reported into available volume of woody debris. The quantity of slash piles were reported as separate categories in the survey. To apply a conservative approach the lowest value for each category was used to calculate the volume of waste wood. For example, if a survey participant answered to generating between 1000 and 3000 slash piles each year then 1000 piles would be used in the calculation.

Additionally, survey participants reported what percentage of their slash piles were in each size categories. For example, a participant may have suggested they generate between 1000-3000 piles and of that 50 percent were 5m x 8m, 40 percent were between 10m x 8m and 10 percent were windrows.

To represent usable fibre from each slash pile 15 percent of the dimensional volume was retained as fibre volume, to account for air space, fine woody debris and, finally, to generate conservative estimates. This calculation was based on discussions of expected quantity of waste per hectare with Forest Licensees and the Forest Service. Additionally, we performed some basic modeling in TIPSY (Forest Stand Model endorsed by forest industry) to identify total waste wood produced in stands with similar stand profiles to the TSAs we are reporting on. This approach agrees with the suggestion that an average amount of waste wood for a Forest Licensee is about 8 percent; this, in addition to 7 percent wood fibre addition (sub mill-quality fibre in slash piles) represents a combined total of 15 percent waste wood from the AAC. In the Bulkley TSA the calculated waste wood worked out to 27 percent of the AAC. All other TSAs were 15 percent or less. The volume calculation for the above example would be as follows:

1000 piles * 50% (size category) * fibre volume (5m x 8m = 6 m^3) = 3,000 m^3

1000 piles * 40% (size category) * fibre volume (8m x 10m = 16 m^3) = 6,400 m^3

1000 piles * 10% * (size category) * fibre volume (Windrow = 45 m^3) = 450 m^3

Total 9, 850 m^3

In this example the woody debris generator would produce 9,850 m^3 of waste wood from logging slash each year. We feel that by using both a conservative volume formula (85 percent reduction of slash pile volume to represent usable fibre) and by using the lowest reported value for each category of piles that the numbers reported here represent a reasonable example of available waste wood for each TSA, particularly considering that only a portion of all woody debris generators participated in the survey.

Available Woody Debris - *Waste Wood*

Quantities of available *waste wood* varied between TSAs for both mill waste and logging waste. Of the seven regions that were surveyed the Morice, Lakes and Bulkley TSAs each produced significant quantities logging slash. Collectively, these three TSAs generate approximately 800,000 cubic metres of waste wood each year; representing 95 percent of the waste wood identified through this survey. Each of these three TSAs reported that in the future logging waste would be reduced to nearly 400,000 cubic metres in ten years time. Therefore, finding alternatives to burning this logging slash would likely have a significant positive impact on the BVLD airshed.

Mill waste produced throughout the seven TSAs was also variable. Interestingly, no *waste wood* was reported for the Morice TSA, while the Bulkley and Lakes TSAs each reported greater than 100,000 cubic metres of *waste wood* generated each year. Of that, the Bulkley TSA reported to having current end markets in place such that their realized mill waste is currently less than 1000 cubic metres. In comparison the Lakes TSA has end markets in place for 40 percent of its mill waste and reported a realized mill waste of 60,000 cubic metres generated each year. Both of these generators also reported that in ten years time realized mill waste would likely be less than 100 cubic metres per year.

The table below indicates total *waste wood* generated in each TSA presently and in 10 years along with average distance of this *waste wood* to Highway 16.

	Vanderhoof TSA	Lakes TSA	Morice TSA	Bulkley TSA	Kispiox TSA	Kalum TSA	Kitimat Area
Logging Waste (m^3) (currently)	5, 400	**291, 720**	**254, 400**	**242, 545**	9, 160	2, 213	18, 750
Logging Waste (m^3) (10 years)	8, 100	**137, 020**	**143, 100**	**119, 035**	8, 015	2, 213	18, 750
Mean Pile Size (m^3)	27	22	16	18	23	15	98
Distance to Hwy 16 (currently)	100% <50km	50% <100km 20% <50km	60% <100km 20% <50km	80% <100km 60% <50 km	90% <100km 70% <50km	90% <100km 80% <50km	100% <100km
Distance to Hwy 16 (10 years)	50% <25km 50% >150km	55% <100km 30% <50km	55% <100km 35% <50km	50% <100km 35% <50 km	90% <100km 70% <50km	90% <100km 80% <50km	100% <100km
Mill Waste (m^3)	nil	**>100, 000**	1000	**>100, 000**	20000	650	nil

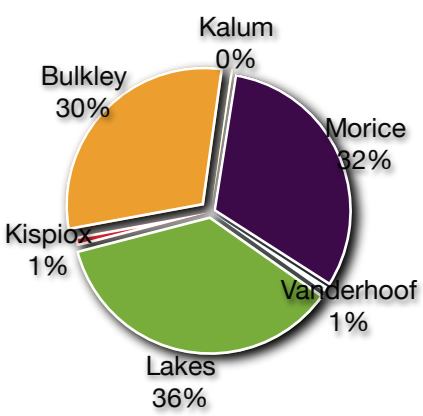
Slash pile volume calculations were as follows: Wood waste was reported in number of piles per year. Piles were then allocated into three different size categories. The number of piles in each size category was multiplied by its volume. Bold type indicates those source materials and TSA that may have a significant impact on the BVLD Airshed.

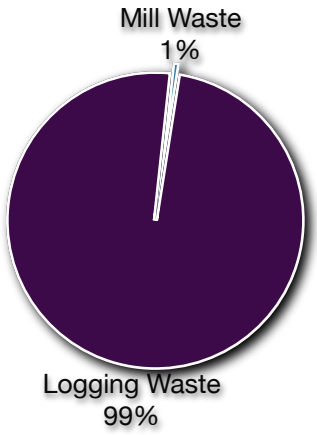
It is evident that there is a financial incentive for Forest Licensees to find or develop end markets for mill waste. Whether this end market is an onsite pellet plant, energy recovery system or distant market the licensee is able to profit from mill waste. However, when compared to logging waste, mill waste accounts for a small percentage of the logging slash generated each year. Unfortunately, end markets for logging waste - such as slash piles - have yet to catch on in this region, despite the overwhelming quantity of *waste wood* available.

Alternatives to Burning

Small Scale Sawmills & Woodlots

Many of the woodlots and small/private sawmills that participated in this survey have tried alternatives to burning *waste wood* in the past (45 %). Of those that have historically engaged alternatives to burning 72 percent found it to be successful to their operation. Whereas currently 57 percent of those currently engaged in alternatives feel this is successful.





The chart on left indicates the proportion of total waste wood generated in each TSA. Chart on right indicates the average proportion of waste wood generated from logging operation compared to mill operations. Collectively these charts suggest that reducing logging waste in the Lakes, Morice and Bulkley TSAs will account for greater than 90 % of the waste wood in the BVLD Airshed.

Given that these are small-scale operations, alternatives have often been relatively inexpensive. For example, some small-scale sawmills are able to distribute sawdust to local farmers and slabs to either their own wood stoves or those of near by neighbors. Invariably, *wood waste* does pile up and get burned using these 'loose' agreements for end-user access.

In the western portion of this project (Kispiox and Kalum TSAs) an additional complication to finding end-users for sawdust is the acidic nature of cedar, which is unsuitable for the agriculture market. Similarly, a planer mill operator commented that the sawdust produced was too fine for the needs of most farmers. By default, either distributing this on his garden or burning this *waste* wood has been the simplest and most cost effective method.

Recently NEWPRO has acquired a chipper and has engaged nearby woodlots to chip their logging waste. Several respondents to this survey are currently involved with NEWPRO and are happy that an alternative to burning *waste wood* is available. The limitation to this alternative strategy is the cost of running the chipper. As a result, NEWPRO has a relatively close operating range and also requires a certain quantity of *waste wood* to meet their economic threshold. Nonetheless a precedent is being set and the equipment is being tested to define chipping as one alternative to burning *waste wood* in the BVLD Airshed.

Outlined in the table below are summarized results for the historic and present success of small/ private sawmills and woodlots finding alternatives to burning waste wood.

	Has Your Organization Engaged Alternatives To Burning?		Was This Deemed Successful For Your Operation?	
	Yes	No	Yes	No
Historically	11	13	8 (72 %)	8 (28 %)
Presently	14	10	10 (71 %)	11 (29 %)

***Note, not all participants answered the second component of this question.**

Forest Licensees & Tree Farm Licenses (Large-Scale Sawmills)

Half of the Forest Licensees and Tree Farm operators that participated in this survey have historically, or are presently, engaged in alternatives to burning *waste wood*. Of those participants that historically engaged alternatives to burning only 40 percent felt that it was a success to their operation. In contrast, 75 percent of those currently engaged in alternatives to burning feel that their efforts are a success to the operation.

Some of the respondents reported retaining wildlife piles as a successful alternative to burning *waste wood,* resulting in a 5 percent reduction of burned slash piles. While others have reported chipping a small portion of *waste logs* when close to Highway 16, diverting 6,500 cubic metres of *waste wood* from burning. Similarly, one operation was successfully chipping log yard debris for an onsite energy recovery system.

Overall, the collective response from Forest Licensees was that successful alternatives to burning only relate to *waste wood* produced on-site (in a mill yard), ultimately reducing shipping and handling costs. It has not been considered a success, on average, to haul *waste wood* from logging blocks to an end-market. However, given the vast quantity of *waste wood* burned after logging operations it would increase the carrying capacity of the airshed if viable alternatives were supported. It should be noted that a significant improvement to air quality during the burning season has resulted from use of the Custom Venting Forecast system and by use of best practices in the field (most of which are covered off by the BC Open Burning Smoke Control Regulation). The issue is the cumulative impacts of many sources of particulate matter during thermal inversions, a meteorological condition that is very common during Bulkley Valley winters and shoulder seasons. Given this, the ***precautionary principle***[i] should be applied to all emission sources.

Outlined in the table below are summarized results for the historic and present success of Tree Farms and Forest Licensees finding alternatives to burning *waste wood.*

	Has Your Organization Engaged Alternatives To Burning?		Was This Deemed Successful For Your Operation?	
	Yes	No	Yes	No
Historically	5	4	2 (40 %)	6 (60 %)
Presently	4	5	3 (75 %)	5 (25 %)

***Note, not all participants answered the second component of this question.**

[i] ***Precautionary Principle*** states that "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically. In this context the proponent of an activity, rather than the public, should bear the burden of proof. The process of applying the precautionary principle must be open, informed and democratic and must include potentially affected parties. It must also involve an examination of the full range of alternatives, including no action." http://www.sehn.org/precaution.html

Barriers to Adopting Alternatives to Burning

Barriers to adopting alternative approaches are dominantly economic. However, economic barriers for Forest Licensees are different than those economic barriers for small-scale/private sawmills and woodlot owners.

Woodlots and Small-Scale/Private Sawmills

The overwhelming response from woodlot and sawmill operators concerning barriers to finding alternatives to burning *waste* wood was economics; handling woody debris requires machinery and machinery is expensive. Currently, alternatives to burning require handling, processing and finally, shipping to end-markets which, is a prohibitive cost. End-markets often require a consistent quality and supply of woody debris, which is difficult for woodlot and small sawmill owners to offer.

Recently NEWPRO has purchased a chipper and has been able to provide a mobile service for chipping *waste wood*. Although NEWPRO is not currently paying for *waste wood* they are providing an alternative to burning it for those within an economic operating area. The limitation of this service is the cost of operating; in order to pay the operating costs the woodlot or sawmill must be able to offer a minimum quantity and quality of *waste wood*. As such, this is not an option for several woody debris generators within the operating area of NEWPRO's chipper. Thus, the economics of NEWPRO's chipping requirements is a limiting factor.

In discussion with woodlot and small/private sawmill owners is was expressed that there was an interest in finding alternatives to burning *waste wood*. This was however, conditional: if the end-user was going to make money from the *waste wood* then so, too, so should the woodlot or sawmill owner; if however, the end-user was going to use the *waste wood* for personal use (farming, gardening, heating) then the woodlot and sawmill owners were willing to provide free access to this *waste wood*. This essentially speaks towards two markets, industrial and local. When asked directly what some of the barriers to finding alternatives to burning *waste wood* were we heard the following:

What Barriers, If Any, Prevent Finding Alternatives to Burning *Waste Wood*?

- Economics
- Unaware of any company offering alternatives
- Road systems and seasonal access will confound end-user access
- Cost, only log about 2 of every 5 years - inconsistent supply
- Distance to market, value of raw material does not justify shipping
- Not many options/markets available to purchase woody debris
- Cost of processing is high - NEWPRO wants a certain quality
- Woody debris removal requires high quality roads, logging can access material on winter roads
- Cost is prohibitive
- Road maintenance costs, public access *waste wood* may damage road, in the end the woodlot owner endures this cost
- Currently no market for material, even if someone owned their own chipper

Source: Interviews with woodlot and small/private sawmill owners

Forest Licensees (Large-Scale Sawmills)

Liability is a barrier to carrying out increased activities that would support alternatives to burning. There are five factors, three of which types of liabilities, to be considered. A description of each and potential solutions are provided below:

1. *Prime Contractor.* Worksafe BC requires a prime contractor to be designated for each worksite who is responsible for coordinating all safety related activities for all work activities undertaken on that site.[ii] Typically, the 'stump to dump' harvest contractor is the prime contractor; but, in the case of smaller contractors, or multiple – employer worksites, the timber licensee may need to assume that responsibility. In these cases, the forest road systems needed to transport logs/workers/etc are also considered a worksite. The prime contractor is the entity holding the road permit, or that is designated as the prime maintainer under contract to the entity holding the road permit; this is typically the timber licensee.

It is because of this responsibility that there is a necessity to have third party contractors wanting to use wood waste from active harvest blocks, or using active road systems, to enter into contractual agreements with the prime contractor. This can entail some form of charge to cover off this responsibility (a portion of the road maintenance charge is an example of this).

If the third party contractor wanted debris piles once harvest activities were completed, the contractor would then become the prime contractor, and similarly, with non-active roads, the prime maintainer, with all the legal responsibilities (and costs) that go with it. This would bring with it other issues such as reactivating deactivated roads and creek crossings. Accessing these blocks post-harvest simply may not be possible without completely rebuilding the road – winter roads for example.

2. Post treatment liabilities: Timber licensees are required to reforest all productive areas of a harvest site, except roads. There would need to be a mechanism in place to ensure that third party contractors using debris piles would not impact the ability of the timber licensee to meet its reforestation obligations(i.e. if debris was still left on site it would need to be cleaned up). Similarly, fire hazard abatement implications would also need to be considered.

3. Environmental liabilities: Similar to 2, timber licensees would have regulatory (i.e. water quality, soil disturbance targets) and FSP (Forest Stewardship Plan)/ SP (Site Plan) obligations for a particular harvest block. Other contractors using the site would need to be educated on these issues and be willing to meet or exceed site targets during their operations.

4. Competition/market pricing/cost recovery: As the wood residue (waste wood) becomes more valuable to industry, competition will likely emerge as an issue. Companies utilizing waste wood may be competing with other types of companies (we currently see this with the chip market) wishing to use the woody debris. And woody debris generators, wanting to offset losses in deteriorating MPB salvage stands, will want to gain incremental value from the fibre that can no longer be used. This is where public policy coordination will become imperative to ensure that the highest benefits are realized for the communities within the TSAs.

[ii] Worksites are the individual harvest blocks

5. Infrastructure issues: Some forest road systems and abandoned mill sites will require a significant and immediate upgrade to accommodate new traffic related to debris recovery and processing. Specifically, some forest roads may need road graders, all weather surfacing, and pullout dimension upgrades to accommodate chip trucks. Pullout adequacy is a big issue with Worksafe; most pullouts on forest roads are designed to accommodate an empty log truck and are too short for a long tractor/full trailer combination. The current BC government emphasis on infrastructure should include taking a look at these types of upgrades as part of the economic revitalization strategy. This would bridge the gap between current infrastructure initiatives and current alternative energy programs.

What Barriers, If Any, Prevent Finding Alternatives to Burning *Waste Wood*?

- Economics of removing debris from logging blocks is high
- No infrastructure to chip material
- Need investors in Biomass use
- Cost of staff time
- Burning is less expensive than most (if not all) alternatives
- Regulatory - Hazard abatement/ disposal timelines / waste assessment / WorkSafe BC requirements
- Prime contractor relationship - road use on active operations
- Legislation requires disposal within 18 months of harvest, as do Fire Control interests
- Alternatives require high quality fibre
- Cost of shipping to mill
- Liabilities for licensees
- Road deactivation/ access to end-users
- Could spread pine beetles
- Structure of stumpage fees
- BCTS has to burn asap or they do not get paid
- Legislative changes needed

Source: Interviews with Forest Licensees

5. End-User Markets

In light of the tremendous amount of work recently completed on end markets for wood residue (see Resources Cited), we are highlighting the most obvious options for our region and refer readers to the many recent reports that provide a detailed analysis of market options. Both ***industrial*** and ***local*** markets are emerging and a closer look at what products we are importing that can be replaced with locally processed wood residue is warranted (i.e. residential and commercial landscaping products, agricultural uses, energy, heat, landfill cover material etc.). Some market opportunities are scale dependent - distance from highway and volume available are key variables but can be counteracted by effective public policy and education. The table below contains insights on how to attract and retain these markets.

	Market insights
Pellets	Marketing of this product demands that we avoid the term "waste wood"; it is illegal in Europe to sell pellets made from municipal solid waste as this goes against the public's sensitivity towards sustainable management of our resource (i.e. much of our municipal solid waste is derived from fossil fuel based products and conversion to energy eliminates the possibility of reduce, reuse, and recycle as well as design for environment - all intrinsic principles of a Zero Waste approach. A new plant would need 5000 tonnes/year of woody debris - bark is okay. Debris would need to be ground up first. Citing of a new facility is based on economics - if RDKS for example, could provide landfill diversion credits at $25-$30/tonne a plant in Terrace is feasible or at least material could be picked up and transported to a more easterly location is likely. Need to be able to load up an ore truck in under one hour. Local markets for pellets are possible - a pilot project to determine local demand is possible. i.e. a company can generate 1800 tonnes per day which would heat 600 homes for one year. Sustainable harvesting practices must be guaranteed. Need to upgrade overall forest operations infrastructure i.e. sawmills and roads. Cherry picking in the recent past makes it expensive to start up new forestry-based ventures. Need to provide locations and volumes to get project moving.
Energy from waste	Has proven successful when using mill residues; Caution needed when considering for mixed waste from urban sources (i.e. woody debris plus residential garbage) Local proponents exist for new facilities in Terrace area
Mulch	Build on 100 mile diet trend and replace imported mulching materials sold at garden centres. Coloured mulch is a good value-added opportunity. Bypasses regulations regarding organic matter recycling. Diversion credits offered by Regional Districts combined with tipping fees and education campaigns can easily guarantee steady supply from urban sources. Larger volumes can be used for infrastructure and erosion control projects.

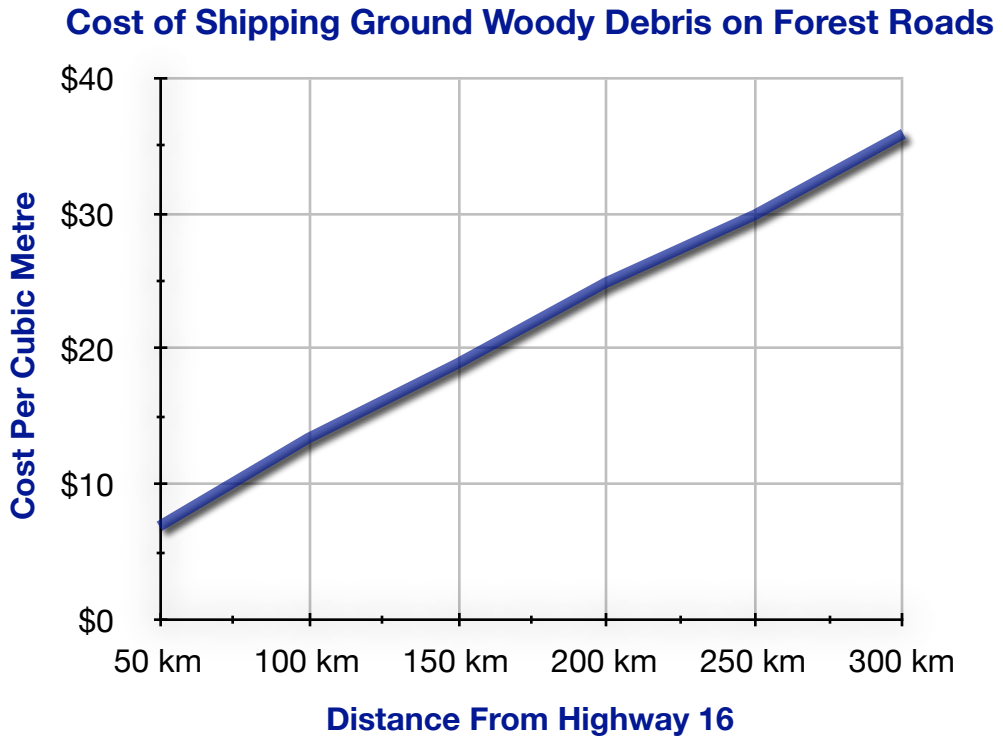
	Market insights
Composting	Chipped material can be used as a carbon source for composting operations; must be mixed with nitrogen rich sources such as food waste or sewage sludge. Bark is problematic for composting but general brush waste is suitable. Can be used as topsoil for regional landfills and landscaping projects. Carefully processed compost can be used for food production - more expensive to produce but also yields higher market value. Diversion credits offered by Regional Districts combined with tipping fees and education campaigns can easily guarantee steady supply from urban sources. Can replace imported compost and other soil amendment products.
Animal bedding	Planer shavings, ships, sawdust, and shredded wood are suitable. Absorption capacity is a primary characteristic - 15% or less moisture content desirable. Source of material must be disclosed; must be clean, untreated wood.

Economic Viability and Distance to Highway 16

To generate a rough platform for feasibility consideration of logging waste, we calculated the shipping cost per cubic metre for transport on forest service roads in the interior of British Columbia. These calculations were based on a haul truck with a payload of almost 50 cubic metres and a road maintenance cost of $1.92/$m^3$ (based on current Interior Appraisal Manual rate for log trucks). Note, this cost represents transport from a hypothetical logging block to Highway 16 only. The graph demonstrates the cost of shipping to Highway 16, thus the processing costs of alternatives must fit this general model to be economically viable.

The good news is that in the case of logging slash, most of the participants in this survey reported to having greater than 50 percent of their logging slash less then 100 kilometers from Highway 16. Similarly, when asked what this model might look like in ten years they also reported that more than 50 percent would (likely) be within 100 kilometers. This distance, then, is a good price point for feasibility.

This figure presents that cost of shipping wood waste - logging slash piles - on forest roads in the central interior. This cost represents standard road maintenance and transport costs from the cutblock to Highway 16 only. This graph demonstrates that under this model transport costs of wood waste would be approximately $15/m^3 with a 100 km round trip or $25/m^3 with a 200 km round trip.



6. Recommendations for Improving Recovery Rates of Waste Wood

Key recommendations resulting from local consultations are summarized in this section. Additional recommendations for forestry sector and provincial government reform are contained within the cited reports and should also be considered.

1. AMS and stakeholders to itemize infrastructure improvements needed for moving woody debris from the cutblock to an end market and submit to provincial government as a partnership opportunity.
2. AMS and stakeholders to facilitate discussions between MOE and MoFR Revenues Branch to assess liability responsibility of Prime Contractor when a residue recovery contractor comes on to the site.
3. AMS and stakeholders, such as MoFR, BC Hydro, Forest Licensees and alternative energy companies, should participate in the development of a regional economic development strategy that favours efficient and wise use of woody debris such that a reasonably reliable feedstock is available with minimal long-haul transportation. Incentives for participation should be developed as this is essential to attract and retain markets. Working with well-resourced economic development and resource management focused agencies such as OBAC, Community Futures, and the Provincial Government will be essential as these agencies should be taking the lead to consult with industry in the development of appropriate fees and regulations in support of the move to alternative economic uses of wood residue. This includes reducing barriers to the alternative use of wood residue by ensuring that all policies in all government ministries are reinforcing use of residue. For example, new and renewed woodlot licenses to secure new fibre could require checking a central database that is geographically based for available residue. Similar to the powers available to Regional Districts for licensing waste management facilities, powers could be assigned to an appropriate agency to ensure that fees and regulations support the clean and efficient movement of primary and secondary wood fibre based on social, environmental, and economic sustainability.
4. The Regional Districts of Bulkley-Nechako and Kitimat-Stikine should evaluate the benefits of harmonizing material handling fees at transfer stations and landfills that encourage separation of materials for recovery. Harmonized fees will reduce materials crossing borders and send a consistent message to generators that all local governments in the BVLD Airshed are committed to improving recovery rates and supporting new markets.
5. The use of Landfill Diversion Credits as a stimulus for recycling-based based business should be further evaluated to assess the level of funding needed and criteria for assessing priority projects. As it stands, RDKS is prioritizing the diversion of organic material and the next round of diversion credits will reflect this need.
6. Urban woody debris should be segregated to meet quality control guidelines for multiple end markets such as firewood, mulch (consider separating into colours as well), compost, fibreboard, and biomass energy. At least three sorting grades should be considered: green wood, painted or treated wood, clean wood. Additionally, woody debris should be stockpiled as brush, chips and logs. For safety: Stockpile wood in piles 12 feet high or less. Keep woody debris loose - do not compress the piles. Water down the ground up wood before putting it in piles.
7. AMS or alliances should pursue a Phase 2 of the Hwy 16 Woody Debris Inventory to keep up momentum, explore market feasibility for local uses, focus on urban woody debris, and produce a organic wood products brochure for public distribution similar to 2008 Bulkley Valley Local Food Directory.

8. A special air quality monitoring project should be considered for forestry open burning operations to evaluate the impact of Custom Venting Forecasting, best practices, and removal of barriers for alternatives to burning.

7. Project Marketing Plan

Objective: Increase awareness of the Woody Debris Inventory Project and gather support for implementation of recommendations

Target Audience: Survey participants, Burn Operator Forum invitees, AMS members, Resource Management organizations (i.e. BV Research Centre, OBAC), Economic Development agencies (i.e. Project funders), Government Agencies (i.e. BCTS, MOE, MOF, Regional Districts)

Budget: $500 remaining in grant plus volunteer time of AMS Board (4 hours)

Timelines: August 24, 2009 - August 24, 2010 (to span 2009 burning season and lead up to 2010 season)

Strategies:

word of mouth, media coverage, direct mail, presentations to key target audiences

Provide one hard copy to CFDC 16/37 (based in Terrace) and one hard copy to AMS/MOE (based in Smithers);

Provide free electronic copy of report on AMS website

Prepare cover letter/press release highlighting key findings and recommendations for circulation to audience

E-mail cover letter/press release with link to report on AMS website and request to post report or link on other suitable websites

Provide a 20 minutes presentation of report at the 2009 Burn Operators Forum and one other presentation based on requests from target audience.

Ask AMS Directors and other key stakeholders to circulate report and champion appropriate recommendations in their circles of influence

Ask Omineca Beetle Action Coalition to promote report on their website and newsletter

Invite generators of woody debris to submit listing to Recycling Council of BC's Industrial Materials Exchange Program and work with Regional Districts and MOE to promote this website http://rcbc.bc.ca/services/materials-exchange

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Maps

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Appendix A: Woody Debris -Survey Questions

Appendix B: Woody Debris -Survey Responses

Appendix C: Database of Woody Debris Generators