Chief Forester's Guidance on Coarse Woody Debris Management

Introduction

This document provides guidance for managing coarse woody debris (CWD) on crown forest land in British Columbia. This guidance is intended to inform resource professionals and is not binding on licensees or practitioners. It does not constitute legal advice.

CWD management is particularly important to me as Chief Forester because of its impact on productivity; forest productivity in terms of soil-function and tree growth, and ecosystem productivity in terms of habitat. Studies from Europe, with many generations of intensive logging, show that species of flora and fauna dependent on dead wood are at risk when CWD levels fall below 30% of what occurs in the natural forest. CWD is one of the major inputs of organic matter to forest soils, critical for soil function, structure and productivity.

I've seen that CWD volumes are being left with a good variety and amount among recently harvested blocks, though the piece sizes are generally small.[1] This observation is consistent with monitoring results from the Forest and Range Evaluation Program (FREP).

The objective of this document is therefore to raise the level of awareness around the need for increased CWD planning and management before and during harvest operations with a focus on improving CWD quality, especially as it relates to piece size.

CWD planning can describe appropriate post-harvest CWD. It can also look to provide a staggered input of CWD throughout the life of a new forest (and into the next rotation). This recruitment CWD comes from residual trees retained at the time of harvest.

CWD Management

B.C. is producing a higher diversity of forest products than ever before, including value-added wood and bioenergy products. Coarse woody debris is often seen as source material for new products. Regardless of the end-products from a stand, I encourage licensees to actively consider and plan for CWD prior to conducting harvesting operations. This guidance outlines points to be considered for CWD management. These are basic ecological and operational principles as described in the literature and applied during CWD management trials by Weyerhaeuser on the Coast and the Morice and Lakes Innovative Forest Practices Agreement in the Interior.

Ecological Considerations

Larger pieces of CWD provide ecological functions that differ from smaller pieces. Large logs (length and diameter) last longer, hold more moisture, contribute more organic material to the soil, and provide habitat for a greater number of species.

[1] The science tells us that large pieces of CWD last longer, and serve different ecological functions than small woody debris.

A full range of CWD decay classes, diameter classes and tree species, are important for managed sites. Unmanaged forests contain CWD in all manner of sizes and decay classes and from the full suite of tree species on the site. This supports a variety of ecological processes and organisms. The higher the variability in CWD in managed stands, the higher the number of ecological functions and native species that can be maintained. Maintaining the CWD already on the site pre-harvest will likely provide the more decayed component. An influx of non-merchantable wood at harvest will provide the sound pieces.

Overlapping logs that are off the ground tend to persist longer and can provide more structural diversity. Jack-strawed logs provide vertical structural features, and contribute to ecological processes and wildlife habitat longer into the rotation than do pieces that are in direct contact with the soil.

Recruitment of CWD during the mid- to later stages of a rotation is important to maintain continuous levels of CWD. Shortfalls in CWD, especially large pieces, can occur in the mid to late stages (50-80 years) of a rotation once the initial input of CWD resulting from harvesting has decayed. CWD recruitment can be provided by retaining safe dead[2] and live standing trees (mature and immature) in the cutblock. Long-term retention (into the next rotation) of some of these dispersed standing trees, including coniferous (coniferous trees decay slower than deciduous), will help ensure a constant supply of large diameter stems as CWD. This will be of particular importance in areas where rotation lengths are decreasing.

Variability in the amount of CWD is important at both the site level and landscape level. Distribution and amount of CWD in unmanaged stands varies dramatically among stands, within ecosystems and across landscapes. To mimic this natural process in managed stands, there should be variations in the amount and distribution of CWD at the site level and across the landscape.

Lower amounts of CWD are more appropriate where fire hazard rating is high. Fuel loading resulting from logging debris is a concern where the fire hazard rating is high and areas in/next to the wildland urban interface. These areas are not likely candidates for high levels of CWD.

Silviculture requirements, such as plantable spots, are considered along with CWD management. The amount and distribution of CWD must be balanced against the post-harvest silvicultural requirements of the site.

Large piles of CWD at roadsides and landings are of limited ecological value. Any ecological functions provided by large roadside or landing piles could be greatly enhanced by dispersing the same wood in many smaller aggregations across the cutblock taking into consideration fuel loading and fire hazard rating.

[2] Suspect trees can be assessed by certified Wildlife Tree Dangerous Tree Assessors to determine if they are safe.

CWD and Merchantability

In general logs left on site for CWD will come from the un-merchantable component. The waste benchmarks as described in the *Provincial Logging Residue and Waste Measurement Procedures Manual* allows for a set volume of merchantable sawlogs to be left on a harvested cutblock without payment of a waste assessment.

Setting Block Levels of CWD

Resource professionals may choose to pre-determine a target amount or type of CWD to leave on a particular block. This, however may not always be practical and a conscious effort to manage the resource available (logging slash and pre-harvest CWD), keeping the larger pieces undamaged and on site, will also serve to improve CWD management.

There are many different ways to determine appropriate amounts of CWD to retain during harvest. For example, consider the amount of wood on the ground:

- soon after natural disturbance,
- prior to harvest, and,
- in similar mature ecosystems.

Long-term success for deadwood management means retaining the amount and type of dead wood necessary to:

- sustain deadwood-dependent organisms e.g. many fungi and invertebrates, and,
- maintain ecological function driven by input of deadwood.

CWD Monitoring

Monitoring of forest practices is an ongoing government priority. CWD management and planning starts at the cutblock level, however, success is determined at the landscape level, considering many blocks within an ecosystem. The appendix to this guidance document defines a desired level of improvement in the median density of large CWD pieces within ecosystems. Future monitoring will check against these desired levels. A backgrounder on the CWD monitoring results of Forest Practices Code Blocks is available on the FREP website (http://www.for.gov.bc.ca/hfp/frep/publications/extension_notes.htm) and is the source of data for the desired improvements.

Conclusion

In closing, the way B.C. forests are used is changing. When harvesting B.C.'s forests for saw logs, pulp, bioenergy or any other resource, it is necessary to plan for a long-term supply of CWD. It is important that we have a large diversity among cutblocks in terms of CWD volume and density of large pieces. Although this guidance does not constitute legal advice, nor is it legally binding, it is important for me, as British Columbia's Chief Forester, to share my thoughts on this important resource management issue with other forest professionals.

Appendix: Opportunity for Improvement in Density of Large CWD

Table 1 gives a summary of the FREP CWD monitoring data. FREP compares CWD attributes measured in harvested areas of a cutblock, (within the net area to be reforested) to CWD attributes measured in treed retention patches. Included in the table are some basic indicators expected to improve with increased planning and management of the CWD resource:

- Fewer cutblocks should be found with no large CWD pieces in harvested areas.
- The mean density of large CWD of harvested areas should increase.
- The median[3] density of large CWD of harvested areas should increase.

As CWD monitoring continues with FRPA blocks, a key indicator that will be looked at is the median density of large CWD on the harvested area of cutblocks. Table 2 shows what a 20% improvement[4] in the median density of large pieces of CWD on harvested areas (areas harvested after summer 2010) looks like. Such an increase in the median will indicate improvement in the full range of CWD quality among the population of blocks. For the BWBSmw, a 20% improvement will mean the harvest median increases from 6, to 11 or more pieces per hectare of large CWD. Table 1 also shows where there is the greatest need for improvement in density of large CWD pieces; in the BWBS, IDF, MS, SBPS and SBS BEC zones.

For the purposes of this guidance, large CWD is defined as pieces $\geq$ 20 cm in diameter and $\geq$ 10 m in length to encourage leaving undamaged such long pieces that are present on the ground pre-harvest (as represented by retention patches). I recognize this is only one possible definition and there is also good ecological value in large diameter but shorter logs.

Coastal ecosystem harvesting that is concentrated in thrifty second-growth stands may be at a disadvantage to obtain the suggested improvement due to a small source of potential non-merchantable large CWD. This must be taken into account during monitoring. It is not the intent of government to encourage cutting and leaving merchantable stems as CWD. The preference would be to leave a few more scattered standing trees to serve as future CWD.

[3] The median is the "middle" value in the list of numbers.

[4] Calculation to determine the target median which will represent 20% improvement is 0.2*(retention median – harvest median)+harvest median

Table 1: Summary of FREP data; density of big CWD pieces in harvest areas compared to retention patch areas. Data from Forest Practices Code blocks.

Biogeoclimatic zones & subzones	Number of blocks sampled	Differential of zero density big CWD: harvest to baseline*	Density (pieces per hectare) of big CWD.			
			Harvest area median	Retention area median	Harvest area mean	Retention area mean
BWBSmw	68	+28%	6	33	13	40
CWHds-ds-mm-ms	74	+ 9%	20	39	25	43
CWHvh-vm-wh-ws	171	+21%	17	48	26	59
CWHxm	25	+12%	8	23	13	34
ESSF	103	+22%	13	42	23	54
ICH	116	+ 4%	14	43	22	44
IDF	106	+37%	0	22	8	24
MS	67	+30%	0	21	9	29
SBPSdc-mc-mk	33	+34%	0	11	2	17
SBPSxc	34	+44%	0	12	3	12
SBSdh-dk-dw	132	+22%	1	22	14	37
SBSmc-mk-mw-vk-wk	152	+38%	0	31	13	47

*a positive number means that there is a larger percentage of harvested areas that had zero large CWD found compared to the retention areas (baseline). For example for the ESSF blocks 37% of the harvest areas had zero large pieces of CWD found compared to 15% of the retention within these same blocks giving a differential of +22%.

Table 2: Suggested improvement for density (pieces per hectare) of big CWD in harvested areas

Biogeoclimatic zones & subzones	Harvest area median (big CWD pieces per hectare) increases to at least:
BWBSmw	11
CWHds-ds-mm-ms	23
CWHvh-vm-wh-ws	23
CWHxm	11
ESSF	18
ICH	19
IDF	4
MS	4
SBPSdc-mc-mk	2
SBPSxc	2
SBSdh-dk-dw	5
SBSmc-mk-mw-vk-wk	6

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