Biomass Guidelines – Evaluation info

Topic: Recommendation for 1/3 of fine woody debris retention (general)

The biomass guidelines currently recommend that 33% of the fine woody debris (FWD, material less than 6 inches in diameter) be retained following harvesting. The retention recommendation was largely made to address biodiversity concerns, as the soils evaluation concluded low potential for impacts to soil productivity with increased biomass utilization (with some exceptions and at a broad scale of assessment). Most of the biomass guidelines that have been developed since Minnesota's have adopted a similar level of retention for similar reasons (Table 1). Although the importance of FWD and other structural legacies to biodiversity is clear, the actual amount of FWD retention necessary to maintain deadwood-dependent communities is unknown. The recommended 33% retention level was essentially a best judgment at time of guideline development, and was intended for further evaluation as additional information became available. Review of the meeting minutes from the biomass development committee suggests that the retention value was patterned after Finland's recommendation of 30%. Scoping comments recommended that the Council evaluate the appropriateness of the 33% level of retention.

There is little new information related to the amounts of FWD retention necessary for biodiversity maintenance. Effects of increased biomass removal on biodiversity are likely species-specific and dependent on post-harvest stand conditions and regional climate. The MFRC/DOE funded study being conducted by Tony D'Amato at the UMN will shed considerable light on the suitability of MN biomass guidelines at maintaining biodiversity, but the study is in its infancy and useful results will not be available for some time (at least 5 years to identify early trends). In addition, the existing study is going to be expanded to nutrient poor soils later this year if recommended funding by the LCCMR is approved by the legislature. Changing the guideline with no new information would obviously be arbitrary, but could also be counterproductive if a new recommendation ran contrary to what the D'Amato study concludes.

Topic: Recommendation for fine woody debris retention for specific situations

Situations – aspen stands in decline, winter harvest

As noted above, changing the 33% FWD retention guideline at this time is probably not warranted. However, it may be appropriate to modify the recommended approach for achieving the 33% level of retention. Currently, the underlying assumption is that 10-15% of the fine woody debris occurs as incidental breakage during harvesting, which would require that approximately 20% of FWD be backhauled to reach the 33% retention. It is unclear to me how the 10-15% incidental breakage estimate was devised, but in situations where larger or lower amounts of incidental breakage occurs, it would be appropriate to modify the amount of slash that is back hauled onto the site to achieve 33% FWD retention. Similarly, if stand conditions

were such that large amount of downed woody debris was already present (e.g., aspen stands in "decline"), then backhauled amounts could be adjusted. New language that emphasized the FWD outcome rather than the method of achievement would address this issue, but it may be neccessary to provide some guidance on estimating incidental breakage during harvesting and pre-existing downed woody material. A general recommendation to consider the pre-harvest stand condition and adjust retention where appropriate (similar to MI recommendation) could be a simple remedy although it would allow for considerable interpretation. Improved estimates of incidental breakage by covertype and harvest factors (season, equipment, etc.) are needed for more targeted application recommendations.

Topic: Exemption of certain practices or situations from the biomass guidelines
Situations: thinning, plantations, salvage harvesting

The guidelines have always focused on broad recommendations which avoid prescriptive actions at site- and management-specific situations ("a menu, not a mandate"). This approach provides owners and managers with flexibility in application across a large range of management objectives. Although this approach is practical and efficient in application, forest certification has introduced a new dynamic that may necessitate development of more specific recommendations similar to what was done for the infrastructure guideline. An important question to consider during deliberation is whether or not there is potential for certifiers to hold certificate holders to strict levels of FWD retention on all harvests, especially since it would be difficult to determine if anyone followed or ignored the guideline (similar to issues with monitoring the guideline for implementation). Scoping comments identified that forest thinning and intensive plantation management should be evaluated for exemption from the retention guidelines, and that salvage harvests should be evaluated for greater retention.

Plantations – Plantation silviculture is a form of intensive forest management characterized by greater use of cultural inputs (herbicide, fertilizer, improved planting stock, etc.) to maximize growth of a particular crop tree. In intensively managed plantations where maximized productivity is the primary objective, it is appropriate to allow greater slash utilization for easier site preparation and planting (keeping in line with the voluntary approach that emphasizes the primacy of ownership objectives). In fact, this specific practice is already provided as a example of biomass harvest for silvicultural applications. It should be noted that removal of slash can also increase herbivory of planted trees, offsetting any benefit of easier site preparation and planting. Increased herbivory is also provided as an example in the biomass harvesting guidelines. It may be useful to provide a recommendation that emphasizes the benefits and risks associated with slash removal in plantation forests.

Thinning – Biomass harvesting has often been touted as a practice that can be used during pre-commercial thinning to offset costs, with greater removals increasing economic benefit. The following is an excerpt from the existing guidelines:

(Pg. 33, BHG Section) Thinning stands: Many plantations may benefit from pre-commercial thinning, before individual stems are large enough to provide traditional roundwood products. Consider biomass harvest as a means of marketing early thinnings in these plantations.

The potential impacts of biomass harvest during thinning to long-term soil productivity, stand structure (including downed woody debris, DWD), and biodiversity are not well known. Conceptually, thinning followed by clearcutting at the end of the rotation will result in more nutrient removal from a site if merchantable volumes at final harvest are similar between thinned and unthinned sites. Impacts of greater nutrient removal on soil productivity are unclear, as there is a lack of experimental studies that have examined the combined effects of biomass harvest during thinning and final harvest on growth. Potential impacts are likely greatest on sites with low initial nutrient pools (peatlands, deep sands, shallow soils)(Page-Dumroese et al. 2010). Vanderwel et al. 2010 recently demonstrated that slash inputs during thinning can approximate the DWD structure observed in unmanaged forests, highlighting the importance of slash to maintaining DWD pools in managed forests. Presumably, utilization of slash during thinning would reduce DWD pools which are important for wildlife populations and biodiversity in general. However, Verschuyl et al. (2010) conducted a meta-analysis of thinning studies in N. America and concluded that thinning generally had positive to neutral effects on measures of biodiversity. Applicability of their results to biomass removal is unclear, as the studies they used in the meta-analysis were not focused on biomass harvesting (i.e., slash was not removed). Given the above, there is a good deal of uncertainty related to effects of biomass harvesting during thinning.

Other factors to consider include type of thinning (Pre-commercial, commercial), thinning intensity (volume removed), operational considerations such as the use of slash on forwarder trails to minimize soil compaction, and the overall management plan for the thinned stand. All of these should be considered if an exemption for thinning operations is developed, in particular the overall management plan. For example, thinning is most common in conifer plantations which are likely to be planted following final harvest. Greater biomass removal (i.e., no slash retention) during thinning and final harvest (for planting preparation) would have large impact on DWD pools and biodiversity, and increase the risk of impacts to soil productivity. Any recommendation should emphasize consideration of existing stand conditions and future management plans when evaluating specific sites for slash removal during harvesting.

Salvage harvest – Forest disturbance such as fire and blowdown provide unique forest structure that can have large benefits for some wildlife populations and biodiversity in general (e.g., greater snag density across large areas). In recognition of this, some of the States with biomass guidelines make specific recommendations for salvage harvests to leave more slash or unharvested salvage area when appropriate (WI recommends 5% of salvage area left unsalvaged; MI recommends considering risk and benefits of more or less salvage on a site by site basis). The MFRC biomass guideline development committee also recognized the importance of burned and blowdown areas for wildlife, but could not agree on how much area should be retained as habitat. The committee provided the Council with several options related

to biomass harvesting on salvage sites during deliberations at the May 2007 council meeting. These options were:

Option 1

- Retain reserve patch(es) that total at least 25% of the harvest unit
- When present, retain at least 10 snags >12-inch dbh per acre outside reserve patches (if fewer large snags are present, retain 10 snags per acre of the largest dbh). These do not have to be evenly distributed.
- Follow existing timber harvesting guidelines for CWD retention (GG page 79&80).
- Down logs and snags do not need to be evenly distributed across the sale; rather they could be concentrated in specific areas to ease labor and create safe conditions

Option 2

- Remove section addressing blowdown and fire salvage guidelines all together, and reference existing General Guidelines and Timber Harvesting guidelines for leave tree, snag and CWD retention (GG-75-80 and TH 33-39).

Option 3

- Retain reserve patch(es) that total at least 20% of the harvest unit.
- When present, retain at least 20 snags >12-inch dbh per acre outside reserve patches (if fewer large snags are present, retain 20 snags per acre of the largest dbh). These do not have to be evenly distributed.

The Council eventually voted to adopt option 2 which essentially makes no distinction between salvage and traditional harvests. The committee could examine creation of a new guideline related to salvage harvesting similar to the above options, or consider including additional information for consideration as there is no mention of anything related to salvage harvests for biomass within the existing guidelines.

Topic: Incorporate into the larger set of guidelines to rectify conflicting recommendations

When the biomass guidelines were developed, they were not incorporated into the existing guidelines because of time and resource constraints. Because of this, there are several biomass guidelines that conflict with pre-existing guidelines. Most of the conflicts are associated with the pre-existing slash retention guidelines, which identify a broader range of soils where slash retention is appropriate than identified in the biomass guidelines (e.g., well drained sandy soils). There are two approaches that could be taken to rectify the situation:

1) Make piecemeal changes within the existing guidelines where appropriate so that conflicts are rectified between the biomass section and other sections.
2) Incorporate the standalone biomass guidelines into the existing sections of the guidebook

Option 1 would be easiest to complete, and would retain clear identification of the suite of recommendations associated with biomass harvesting. Option 2 would be more difficult to accomplish, but would simplify delivery of the forest management guidelines because many of the themes addressed within the biomass guideline section are common to other sections of the guidebook. Upcoming development of the guideline field manual should be considered when choosing the option.

Literature

Page-Dumroese, D., et al. 2010. Maintaining soil productivity during forest or biomass-to-energy thinning harvests in the western United States. Western Journal Applied Forestry 25(1):5-11.

Vanderwel, M.C., et al. 2010. Contributions of harvest slash to maintaining downed woody debris in selection-managed forests. Canadian Journal Forest Research 40:1680-1685.

Verschuyl, J., et al., Biodiversity response to intensive biomass production from forest thinning in North American forests – A meta-analysis. Forest Ecol. Manage. (2010), doi:10.1016/j.foreco.2010.10.010

Table 1. Summary of biomass harvesting guidelines

State	Key Components	Recommended Retention	Special considerations / exemptions
Minnesota	Detailed description of supporting information, underlying concepts, and considerations including mechanisms for achievement. Emphasis on existing guidelines related to wildlife, water quality, and soil productivity.	-Retain all incidental breakage -Retain and scatter 20% of tops and limbs	**No biomass harvest on:** -Appendix J NPC's -ETS present -Riparian management zones -Ombrotrophic peatlands -soils <8 inches in depth
Maine	General description of concerns related to biomass harvesting with emphasis on existing guidelines related to soil productivity and water quality	"As much as possible" on sites with potential for impacts. -fine woody debris -snags -wildlife trees	**Site conditions with potential impacts:** -Low fertility soils -shallow to bedrock soils -Coarse sandy soils -poorly drained soils -erosion prone sites
Michigan	Moderately detailed description of concerns and specific guidelines to address them. Emphasis placed on existing guidelines with specific mention of rutting, skidding, infrastructure, leave tree, and RMZ guidelines.	1/6 to 1/3 of residues <4 inches -retain more if pre-existing low -retain less if pre-existing is high Retain all existing CWD Retain some cull or mast trees	- Avoid biomass harvest on sensitive sites (ETS present, shallow soils, riparian, etc.) -Retention amount dependent on residual stand conditions following thinning
Missouri	General guidelines followed by sections related to specific topics of high value forests, wildlife, soils, water quality, and aesthetics.	Chainsaw – 1/3 residue Mechanized – 1/3 residue + 1/3 of "small trees"	**When thinning in:** sapling stands – leave >200 trees / acre pole stands – leave >150 trees / acre sawtimber stand - >80 trees/ acre
Pennsylvania	Detailed discussion related to biomass policy and biomass guidelines including Identification of situations where biomass harvesting is beneficial or unacceptable. Emphasis on existing guidelines.	15-30% of biomass as CWD (for wildlife considerations)	**Biomass acceptable:** -fire risk high -high ground -salvage **Biomass unacceptable:** -riparian areas -peat bogs -conversion of native forest -ETS present, native shrubbery
Wisconsin	Detailed description of	-Retain all incidental	**No biomass harvest on:**

	supporting information and underlying concepts for general and site-specific guidelines.	breakage -Retain and scatter 10% of tops and limbs -Salvage – retain 5% of area as un-salvaged for cuts >10ac.	-Sensitive sites / ETS -Soils < 20 inches depth -Nutrient-poor sandy soils -Dysic histosols **Retention may be modified for:** -site prep. -fuel reduction -invasive spp. -prescribed fire
Finland		-retain 30% of residues	unknown