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Tons of Slash?

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Slash & Coarse Woody Debris. With all the recent fires, many people are focused on removing all dead forest organic debris (also known as "fuel"). Reducing fuels is critical within 30-100 feet around homes and structures to reduce fire risk. Beyond that, removing woody debris can be taken too far. A large body of research supports leaving organic debris in forests to aid nutrient cycling and improve soil structure and function.

There are two types of forest organic debris: 1) *slash* – materials smaller than 3" in diameter; and 2) *coarse woody debris* - material larger than 3" in diameter. Roughly half of a conifer's above-ground nutrients (e.g., nitrogen and potassium) are stored in the needles and branches. But larger diameter materials are also important (especially as they decay) for moisture reservoirs, improved soil structure, beneficial fungi habitat (e.g., mychorrizal fungi), and wildlife habitat.

Fire wardens and foresters commonly talk about the amount of slash or coarse woody debris in terms of "tons" or "tons per acre". Many forest owners are not sure what a ton of slash or woody debris looks like. There are two common ways of measuring organic debris: photo series estimation and transect sampling.

Photo Series. Fire wardens and others who inspect woody debris and slash loading commonly use photo series (a series of photographs of sites where organic debris has been measured) to guide their estimates. With this method, you simply find the photo that most closely matches what you see on the site and estimate accordingly. An excellent series of these photos is available through the Idaho Department of Lands in a publication titled *Photographic Series: Appraising Slash Hazard in Idaho*. The publication has over 50 color photographs of varying amounts of different kinds of slash after logging on hemlock, grand fir, cedar, and ponderosa pine forest cover types. In addition to estimates of tons per acre of slash and coarse woody debris, the description for each photo also rates the fire potential of the material shown on the site (e.g., rate of spread, intensity, torching, crowning, resistance to control, etc.).

Transect Sampling. If you would prefer to measure coarse woody debris or slash directly, you can use the planar intersect technique. For coarse woody debris, that involves counting sound and rotten pieces of wood (above ground) that intersect 50 or 100 foot transects (see Figure 1 and Table 1). In counting those pieces:

- Logs are rotten if they can be kicked apart.
- The transect must intersect the central axis of the log to count that log (the transect can't just catch the log's corner).
- Splintered logs are mentally molded together to estimate diameter.
- If the same piece crosses more than once it is counted each time.
- Look above your head for suspended slash. Snags (standing dead trees) are not counted.

You then assign a weight to each piece of wood according to its diameter (see Table 2). Adding those weights together estimates the tons of coarse woody debris per acre for that transect. Anywhere from 1-3 randomly placed transects per acre are then averaged together to estimate tons of debris per acre for the site. To be precise, these numbers must also include a slope correction, but as long as the slope isn't more than 50%, it won't increase the estimate by more than 12%. A high degree of precision isn't usually neces-

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Figure 1. Sample: Three 100-foot transects

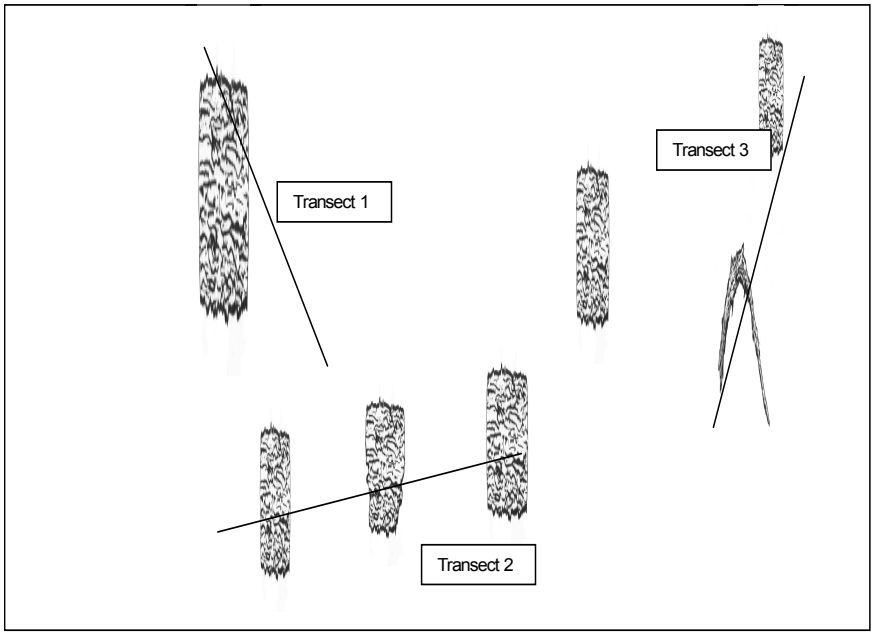

Table 1. Down Woody Material Computation

Date/Location: 06/23/02, Hendrix unit

Transect Length	100'									
Transect	Size*	# Logs	Tons	Size*	# Logs	Tons	Size*	# Logs	Tons	Total Tons/Acre
1	10s	1	4.7							4.7
2	6s	1	1.7	8r	1	2.2	8s	1	3.0	6.9
3	7s	1	2.3	4s	1	.7	3s	1	.4	3.4
* "s" = sound log, "r" = rotten log. Number is diameter in inches.								Average:		5.0 tons/ac

Table 2. Down woody material estimation

sary except for research efforts, because we are typically looking at a fairly broad range of acceptable tons per acre of coarse woody debris (e.g., 7-14 tons/acre on Douglas-fir habitat types). This method does not count snags. If your tons per acre seem low, but you have a lot of snags on the site, you may be fine, as snags will eventually fall and add coarse woody debris to the site.

Slash can also be measured along these transects, but the method is tedious. Slash pieces are counted in three diameter classes (<.25", .25-1", & 1-3") in the first 6 feet of the transect, and added in a similar manner to the large pieces, to estimate tons of slash per acre. The planar transect method for slash is used primarily in research. In day-to-day forest practice, photos are most often used to estimate slash.

How much organic debris should be left?

Slash. Fresh slash is high in nutrients. Allowing nutrients to leach from fresh needles, leaves, and branches into the soil benefits forest growth and health in both the long and short term. However, there is a fire hazard associated with slash, so Idaho has rules to keep that risk within acceptable limits. These rules are administered by the Idaho Department of Lands (IDL) and are structured differently for logging and pre-commercial thinning slash. Slash must be reduced to an acceptable level to release the landowner or operator from liability for any forest fires that start on or move through the property:

- *Logging slash* is administered under the "Idaho Forestry Act – Fire Hazard Reduction Law". Newly created slash is evaluated on the basis of: fuel quantity, slope, aspect, distance to structures and pre-existing slash. Three tons of slash per acre can go untreated.
- *Pre-commercial thinning slash* is administered under the "Idaho Forest Practices Act". Slash hazard is based on: the number of thinned stems per acre, diameter of the trees and species, size of the unit thinned, slope, aspect, condition of the unit prior to thinning, and time of the year. For sites with too much newly created fuel, slash must be reduced.

The most common approach to reduce logging slash hazard on private lands is to pile it and burn it. Unfortunately, this concentrates nutrients in a few piles. Burning those piles typically removes those nutrients from the site in the form of smoke. There are other ways to reduce slash hazard, including: lopping and scattering (the goal is to get more of the slash laying flatter to the ground); making water available; limiting access (e.g., gating roads); and creating fuel breaks, fire trails, or fire lines to isolate the slash into smaller subunits and break up the continuity.

As long as your paperwork with the IDL is current, you also may have up to two years to reduce the slash hazard after logging or one year after a pre-commercial thinning, before you are liable for any fire that starts in the material (unless you are responsible for igniting the fire). Be sure to check the expiration date on your paperwork and ask the IDL if you can get it extended if necessary. If you can leave slash over a winter, most of the nutrients leach to the soil; you can treat the slash later and still conserve nutrients. If circumstances permit, a spring broadcast burn (a "cool burn", when soils are moist) through the site will reduce the fire hazard, while minimizing the nutrient losses.

In deciding on a slash strategy, it is often best to check your specific site and circumstances with the fire warden (for logging slash) or forest practice advisor (for pre-commercial thinning slash) at your local IDL Office.

Coarse woody debris. Idaho fire wardens only assess fire risk associated with slash – materials less than 3" – created in a timber harvest. *Coarse woody debris (both new and old material) is not even measured by fire wardens*; you can legally leave as much of it as you like. However, research from the USFS Rocky Mountain Research and Experiment station indicates a point of diminishing returns for coarse woody debris, whereby additional tons don't provide as much biological benefit. Heavy coarse woody debris loads (more than 40 tons/acre) impede fire suppression and are more of a hazard than a benefit, because if this much material does burn, the soil may be damaged. Generally, more material is recommended to maintain growth after harvest on

Table 3. Course Woody Debris Recommendations for Maintaining Forest Growth After Harvest in Idaho.*

	Habitat Type Series	Target tons per acre of coarse woody debris
Dry Forests	Ponderosa pine types	5-13 tons/acre
⇕	Douglas-fir types	7-14 tons/acre
	Grand fir types	7-14 tons/acre
Moist forests	Western hemlock types	16-33 tons/acre

These are approximate guidelines. For specific recommendations for individual habitat types, see Graham et al (1994), in reference section. For a summary explanation of habitat types see http://www.its.uidaho.edu/extforest/FM34.pdf

moist forests than dry forests (see Table 3). Ideally, coarse woody debris from Douglas-fir, larch, & pines provides the longest lasting benefit (hundreds of years) because of the type of fungi that decay them ("brown cubical rots"). Debris from grand fir, hemlock, and hardwood species is more short-lived because they are decayed by "white rots".

Reducing fire hazard in western forests is vital. But healthy trees and forests are also more resistant and resilient to fire, insects, & disease. Try to balance between reducing fire risk, enabling nutrient cycling within your forest, and maintaining adequate coarse woody debris to maintain a healthy forest soil.

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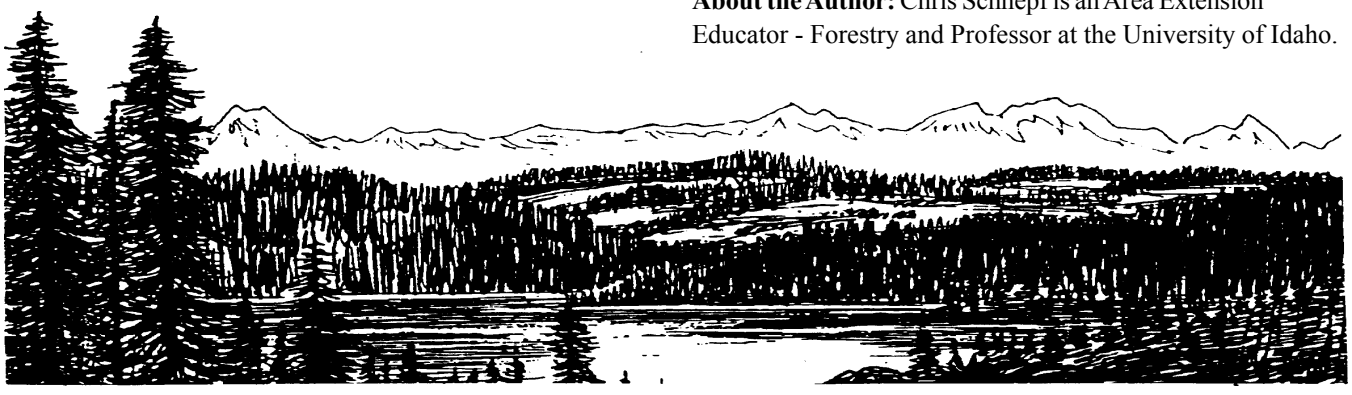

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