Coarse Woody Debris on the Bartlett Experimental Forest

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Foresters and wildlife biologists recognize coarse woody debris (CWD) as an important wildlife habitat component within forested stands across North America. Coarse woody debris provides a structural cover and foraging component on the forest floor for a variety of wildlife species like redback salamander (*Plethodon cinereus),* red-backed vole (*Clethrionomys gapperi*), woodland jumping mouse (*Napaeozapus insignis*), pine marten (*Martes americana),* and black bear (*Ursus americanus)* (DeGraaf and Yamasaki 2001).

We have few reference characterizations of CWD for the variety of forest types found in New England. Various silvicultural systems used in New England – single-tree and group selection, shelterwood, and clearcutting – influence the recruitment of larger-diameter woody debris to the forest floor in contrast with the recruitment of CWD in unmanaged or natural forest conditions over time. The occurrence, distribution, and condition of CWD pieces > 6 inches at the midpoint were sampled relative to the dominant overstory and management history, across the Bartlett Experimental Forest (BEF) in New Hampshire on the existing 0.25-acre cruise plot grid system (Leak 1987; Leak and Smith 1996).

Two hundred and twenty randomly selected cruise plots were inventoried across three levels of stand history (stands under some form of vegetation management (n = 129); stands cut 100 years ago and since left to grow (n = 47); and stands that have remained uncut (n = 44)). Measurements included: 1) an ocular estimate of overstory dominance (hardwood, mixedwood, or softwood) on each cruise plot; and 2) for each CWD piece – species, length to a 4-inch diameter top, diameter at the midpoint, log condition, and signs of wildlife usage.

Mean CWD percent coverage ranges from 1.2 on managed plots to 2.5 on uncut plots (Table 1). CWD coverage was slightly higher under mixedwood and softwood overstory conditions than under hardwoods. Mean number of CWD pieces per acre ranges from 43.6 on managed plots to 83.6 on uncut plots (Table 2).

Mean number of large standing snags (> 16 in dbh) per acre ranges from 0.6 on managed plots to 3.3 on uncut plots (Table 3). The occurrence of large standing snags appears to be greater under mixedwood overstory conditions than under either hardwood or softwood overstory conditions.

Mean number of large CWD pieces (> 16 in midpoint diameter) per acre ranges 0.67 to 2.46 (Table 4). If the two larger diameter categories are combined (> 12 in midpoint diameter), the mean number of CWD pieces per acre ranges from 4.8 to 8.44. CWD pieces per acre appear to be greater under mixedwood overstory condition than either hardwood or softwood overstory conditions.

Inspection of CWD pieces for evidence of past woodpecker use revealed foraging evidence on roughly 15 to 31 percent of the pieces (Table 5). Evidence of excavated cavities ranges from 0 to 3. 7 percent and was considerably less than the visible foraging evidence.

Results suggest that active management over time can influence the distribution and abundance of CWD (Tritton 1980; Roskoski 1977). Stands cut and then left unmanaged for an extended time period appear to be intermediate within the observed range of CWD characteristics to either managed or uncut stands. Large diameter CWD, especially large hollow logs, probably is the component least abundant in managed and unmanaged stands. Foresters and wildlife biologists can insure a minimal availability of large diameter CWD by leaving cull logs in the woods and using other practices and recommendations as suggested in Tubbs et al. (1987).

Table 1. Average coarse woody debris (CWD) percent coverage on 0.25-acre plots across the Bartlett Experimental Forest, NH (number of plots in parentheses).

	------	Overstory (number of plots)	------
Stand History	Hardwood	Mixedwood	Softwood
Managed	1.20 (109)	1.29 (13)	1.42 (7)
Unmanaged	1.66 (18)	1.85 (19)	1.61 (10)
Uncut	1.94 (16)	1.60 (18)	2.50 (10)

Table 2. Average CWD pieces (> 6 inches midpoint diameter) per acre across the BEF.

	------	Overstory	------
Stand History	Hardwood	Mixedwood	Softwood
Managed	43.60	43.69	53.14
Unmanaged	66.00	55.37	45.60
Uncut	70.50	58.67	83.60

Table 3. Average large standing snags > 16 in dbh per acre across the BEF.

	------	Overstory	------
Stand History	Hardwood	Mixedwood	Softwood
Managed	1.10	0.61	1.71
Unmanaged	0.89	2.10	1.20
Uncut	2.25	3.33	2.40

Table 4. Average large CWD pieces per acre across the BEF.

		------	Overstory	------
Midpoint diameter (in)	Stand History	Hardwood	Mixedwood	Softwood
12 – 15.9	Managed	5.50	5.23	5.71
> 16		1.76	2.46	1.71
12 – 15.9	Unmanaged	5.33	6.53	4.80
> 16		0.89	1.47	2.00
12 – 15.9	Uncut	6.75	7.78	3.20
> 16		1.00	0.67	1.60

Table 5. Evidence of woodpecker use in CWD by percent across the BEF.

		------	Overstory	------
Type of use	Stand History	Hardwood	Mixedwood	Softwood
Cavities	Managed	0.94	0.00	0.84
	Unmanaged	3.25	0.00	0.00
	Uncut	0.00	0.79	0.45
Foraging	Managed	20.68	21.33	14.86
	Unmanaged	29.67	19.50	25.31
	Uncut	23.22	30.78	21.11
Both	Managed	1.21	0.00	0.00
	Unmanaged	0.44	2.12	2.50
	Uncut	1.11	0.56	0.91

Literature Cited

DeGraaf, R.M. and M. Yamasaki. 2001. New England Wildlife: Habitat, Natural History, and Distribution. Hanover, NH: University Press of New England. 482 p.

Leak, W.B. 1987. Fifty years of compositional change in deciduous and coniferous forest types in New Hampshire. Canadian Journal of Forest Research. 17: 388-393.

Leak, W.B. and M.-L. Smith. 1996. Sixty years of management and natural disturbance in a New England forested landscape. Forest Ecology and Management. 81: 63-73.

Roskoski, J.P. 1977. Nitrogen fixation in northern hardwood forests. New Haven, CT: Yale University. PhD dissertation.

Tritton, L.M. 1980. Dead wood in the northern hardwood forest ecosystem. New Haven, CT: Yale University. PhD dissertation.

Tubbs, C.H., R.M. DeGraaf, M. Yamasaki, and W.M. Healy. 1987. Guide to wildlife tree management in New England northern hardwoods. USDA For. Serv. Gen. Tech. Report NE-118. 30 p.

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2001 Workshop Proceedings
Forest Measurements for Natural Resource Professionals

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Sampling & Management of Coarse Woody Debris- October 12
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A Workshop Series on Forest Measurements for Natural Resource Professionals was held in the fall of 2001. These proceedings were prepared as a supplement to the workshop. Papers submitted were not peer-reviewed or edited. They were compiled by Karen P. Bennett, Extension Specialist in Forest Resources and Ken Desmarais, Forester with the NH Division of Forests and Lands. Readers who did not attend the workshop are encouraged to contact authors directly for clarifications. Workshop attendees received additional supplemental materials.

Sampling and Management for Down Coarse Woody Debris in New England: A Workshop- October 12, 2001

The What and Why of CWD– *Mark Ducey,* Assistant Professor, UNH Department of Natural Resources

New Hampshire's Logging Efficiency– *Ken Desmarais,* Forester/ Researcher, Fox State Forest

The Regional Level: Characteristics of DDW in Maine, NH and VT– *Linda Heath,* Research Forester, USDA Forest Service, Northeastern Research Station, Durham, NH

The Effects of Management on CWD for Wildlife Habitat– *Mariko Yamasaki,* Research Wildlife Biologist, USDA Forest Service, Northeastern Research Station, Durham, NH

How Do Silvicultural Methods Affect Amounts of CWD?– *Bill Leak,* Research Forester, USDA Forest Service, Northeastern Research Station, Durham, NH

Methods for Sampling CWD: LIS– *Mark Ducey,* Assistant Professor, UNH

Methods for Sampling CWD: The Relascope Connection– *Jeff Gove,* Research Forester, USDA Forest Service, Northeastern Research Station, Durham, NH

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Multicruise- *Tom Hahn,* FORECO

Flex-Fiber- *Tom Brann,* University of Maine University of Maine

Informal Use of Field Data Loggers- *Jeff Underhill,* Foresters Inc., Blacksburg, VA

Two-Dogs- *Jeff Underhill,* Foresters Inc., Blacksburg, VA

NED- *Mark Twery,* USDA-Forest Service, Northeastern Research Station, Burlington, VT

The Biotimber Inventory- *Andrea Alderman,* Society for the Protection of NH Forests

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