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QUANTITY, CONTROLS AND FUNCTIONS OF LARGE WOODY DEBRIS IN MIDWESTERN USA STREAMS

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ABSTRACT

Large woody debris (LWD) can increase stream habitat heterogeneity by providing structure, altering flow patterns, enhancing sediment deposition, forming pools and retaining organic matter. In North America, the role of LWD has been studied extensively in streams of mature forests (e.g. Pacific Northwest), but few studies have assessed LWD in streams of younger forests (e.g. Midwestern USA). Our objectives were to: (1) quantify the volume and abundance of LWD in a set of Midwestern streams; (2) evaluate possible factors influencing LWD quantity; (3) identify the functional roles of LWD; and (4) compare LWD levels in the upper Midwest to those elsewhere in North America. In 2002 and 2003, we measured LWD and geomorphological variables in 15 low-gradient streams draining previously logged watersheds in the Upper Peninsula of Michigan. Mean (\pm SE) LWD volume ($0.77 \pm 0.12 \text{ m}^3 \text{ 100 m}^{-2}$) and abundance ($33 \pm 3 \text{ pieces } 100 \text{ m}^{-1}$) were 71% and 10% lesser, respectively, than in streams of similar gradient elsewhere in North America. Channel shape (width:depth ratio) explained 30% of the variation in LWD volume (multiple stepwise regression, $P = 0.015$) while LWD length and length:channel width combined, explained 72% of the variation in LWD density (multiple stepwise regression, $P < 0.0001$). About 50% of the LWD either stored sediment or stabilized banks and 14% of the LWD formed pools, although pool density was not significantly related to LWD volume or density. LWD levels, overall, were low in upper Midwestern streams, but the relative importance of that LWD to ecosystem function may be magnified in these wood-poor systems. Copyright © 2006 John Wiley & Sons, Ltd.

KEY WORDS: large wood; forested streams; channel shape; geomorphic function; stream habitat

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