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Geomorphological controls on the mobility of large wood in rivers: Implications for river restoration

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The geomorphological and ecological effects of large wood and logjams have been widely described, however the mobility of wood in streams has received far less attention. Understanding which pieces of large wood move and under what conditions is critical for flood risk management, ecology and geomorphology. Wood in rivers remains a crucial but poorly quantified element in forested rivers. In this presentation we describe a field study in which individual pieces of large wood were tagged and surveyed over a 32 month period within a third and fourth order lowland forest river. Individual pieces of wood were found to be highly mobile, with 75% of pieces moving during the survey period, and a maximum recorded transport distance of 5.6 km. We combine data from our study and two other published studies in order to perform a multivariate analysis of the factors influencing mobility and identify dimensionless wood length (relative to channel width) as the important factor describing likelihood of movement in all settings. From our data we identify a length threshold of 2.5 channel widths for near functional immobility, with few pieces above this size moving.

Based on analysis of data from reaches with differing geomorphological characteristics we propose a conceptual model explaining how the relatively importance of different characteristics of wood in controlling mobility vary with channel complexity and riparian forest density. The findings of this study have implications for river management and restoration. The high mobility observed in this study demonstrates that only very large pieces of wood of length greater than 2.5 channel widths should be considered functionally immobile. Thus projects using engineered logjams where stability is important should consider using very large anchoring pieces of wood. River managers or river restoration projects should anticipate pieces of wood of length less than the channel width have the possibility of high rates of mobility and long transport distances.