Abstracts

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Modeling Dynamics of Wood in Streams and Rivers

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Over the last thirty years, many studies have explored the geomorphic and ecological roles of wood in streams and rivers. Most studies have focused on either the amounts and distributions of wood or the functional relationships with channel structure or biological communities. Long-term dynamics or landscape-level distributions of wood in river networks are difficult to address through empirical observations in the field. In addition, correlational relationships based on field observations can be distorted by historical legacies, time lags in processes, and human behavior. Such complex interactions and errors can lead to weak projections over long time periods and large spatial extents and processes and their interactions can be misinterpreted.

Models provide a tool to explore the consequences of the interactions of critical processes of wood dynamics across scales of time and space. We will review the characteristics of ten existing models of wood dynamics. Many existing models address a limited set of processes and specific age classes and management applications. Current models are primarily deterministic or probabilistic. Some models incorporate stochastic processes but none directly account of interactions of stochastic events and consequences of interactions of wood processes. Heuristic or fuzzy models offer the potential to represent human actions effectively, as illustrated in one current model.

Models generally integrate the processes of riparian forest growth and mortality, input processes (lateral blowdown, landslides, channel avulsion), breakage during input, decomposition, breakdown, transport, and storage. Empirical data for model development generally is stronger for storage. Stand dynamics, blowdown, and decomposition are not known as well. Processes of breakage during input, transport, and episodic inputs (landslides and channel avulsion) are based on limited empirical data. Most existing models do not incorporate human actions that influence distribution and abundance of wood in rivers, but policies and practices related to wood in rivers can be incorporated in deterministic, probabilistic, or heuristic models.

Models offer a critical tool for exploring interactions of processes and the potential importance of processes for which empirical data are weak. Sensitivity analysis can identify those aspects of wood dynamics that strongly influence the abundance and distribution of wood. All empirical observations and models are subject to error and uncertainty, and models provide a tool for assessing the consequences of different degrees and sources of error and uncertainty. Models are one of our most promising tools for identifying hypotheses for future research and for directing the development of management systems to maintain or restore functions of wood in world rivers.