



Air, Water and Aquatic Environments Science Program

Rocky Mountain Research Station



Large In-Stream Wood Studies A Call for Common Metrics

Research

Technology Transfer

Science Application

Key Issues

- Over the past several decades, research on in-stream large wood has expanded considerably, while increased research and interest in the physical and ecological effects of in-stream wood has also resulted in several syntheses and review articles.
- Interpretations of spatial and temporal patterns of in-stream large wood have been hampered by high levels of variation, measurement error, and inconsistencies in the type of variables and methods of measurement.
- Core variables based on the importance in previous studies and collective experience have been identified.
- The agreement on primary variables and methods of measurements could resolve uncertainties associated with the understanding of in-stream wood patterns.

Challenge

Investigation into the role of downed wood in terrestrial and aquatic ecosystems has persisted for decades, as research on the physical and ecological effects of in-stream wood has increased substantially over the past decade. Recent syntheses of in-stream wood characteristics and dynamics have been useful in identifying regional patterns and gaps in knowledge, but stronger inferences have been hampered by the inherently high spatial and temporal variation in large wood data and by measurement error. Our review of in-stream wood studies has also revealed inconsistencies in the types of variables measured as well as methods of measurement.

Context

The past decade of research on large in-stream wood has experienced an expansion to diverse environments beyond North America's Pacific Northwest and has shifted toward increasingly holistic perspectives that incorporate processes of wood recruitment, retention, and loss at scales from channel segments to entire watersheds. Syntheses of this rapidly expanding literature can be facilitated by agreement on primary variables and methods of measurement.

Actions

We identified core variables based on their importance in previous studies and our collective experience, and subdivided them into three categories: wood, geomorphic, and riparian (Table I). Variables described as Level II are suggested for studies with more specific objectives. Wood variables include the size, orientation, and characteristics of wood in the bankfull channel, as well as functional parameters directly associated with wood. Geomorphic variables include the physical characteristics of the stream channel, valley, and drainage basin for a reach, defined as the length of channel within which wood is measured. If channel morphology varies substantially within a reach, then the reach should be subdivided into geomorphic channel units and geomorphic variables measured for each unit. Riparian variables include the ecological characteristics of the valley reach beyond the channel. Many of these variables rely on quick visual assessments or measurements derived from maps. Inclusion of these data in studies of in-stream wood would substantially facilitate the insights and models that can result from inter-study compilations.



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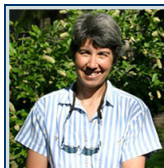
Table I. SUGGESTED METRICS FOR RESEARCH-ORIENTED IN-STREAM WOOD STUDIES

Levels	Notes
<i>Wood – measured for each piece</i>	
<i>Level I</i>	
1. Length	Whole piece and length in bankfull channel
2. Diameter	≥1 measurement
3. Orientation	Angle with respect to downstream bank
4. Root wad	Note if present, including orientation with respect to flow
5. Jams	Spatial distribution and size (no. pieces per jam, or total dimensions of jam)
6. Accumulation ^a	11 categories
7. Status ^{b,c}	Decay class (six categories), burn status (three categories)
8. Stability ^d	Six categories
<i>Level II</i>	
9. Species	Note species or general category (e.g., deciduous/coniferous)
10. Submergence	Measure in relation to stage
11. Age	Tree-ring counting or radiocarbon dates
12. Biomass/density	Based on volume and wood density
13. Function	Characteristics of wood function include sediment storage (note if present; ideally, measure dimensions and grain size), pool scour (note if present; ideally, measure dimensions), backwater pools (note if present; ideally, measure dimensions), flow deflection, energy dissipation, and bank stabilization
<i>Geomorphic (channel and valley) – measured for each reach</i>	
<i>Level I</i>	
1. Channel gradient	Average streambed or water-surface gradient at study reach
2. Channel width	Average bankfull channel width at study reach
3. Flow depth	Either bankfull or at time of measurement
4. Grain size	Bed-material size distribution; D_{50} and sorting at minimum
5. Discharge	Bankfull, mean annual, peak annual, or at time of measurement
6. Reach length	Length of channel along which wood is measured
7. Channel morphology	Cascade, step-pool, plane-bed, pool-riffle, dune-ripple, braided
8. Drainage area	Area drained by study reach
9. Elevation	At study reach, and range for catchment
10. Valley side slope	Average or maximum side slope values
11. Confinement	Ratio of channel width/valley-bottom width
12. Connectedness	Ratio of channel width/distance to valley wall
13. Disturbance history	Wildfire, blowdown, insect infestation, hillslope mass movements, avalanches
14. Management history	Timber harvest, percent roaded, tie-driven, dams, diversions, etc.
<i>Level II</i>	
15. Bank scour	Visual estimate of percentage of total stream bank length
<i>Riparian – measured for each reach</i>	
<i>Level I</i>	
1. Forested	Yes/no, deciduous/conifer, note cover type if not forested (e.g., willow or herbaceous dominated meadow, bedrock)
<i>Level II</i>	
2. Dominant species	Where forested, note forest type(s)/species of trees
3. Source ^e	Six categories
4. Seral stage	Young, mid-successional, or mature
5. Floodplain survey	Dimensions and spatial density of wood on forest floor
6. Basal area	Measure of the cross-sectional area of standing trees at breast height (may be measured by species)
7. Site potential	Rate of tree growth, time to reach maturity, longevity of trees

Publication

Wohl Ellen, Cenderelli, Daniel A., Dwire, Kathleen A., Ryan-Burkett, Sandra E., Young, Michael K., Fausch, Kurt D. 2010. Large in-stream wood studies: a call for common metrics. *Earth Surface Processes and Landforms* 35: 618–625.

Project Science Team



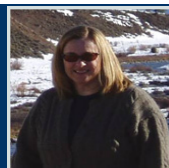
Ellen Wohl
Fluvial Geomorphologist
Dpt. of Geosciences,
Colorado State University
(970) 491-5298
ellenw@cnr.colostate.edu



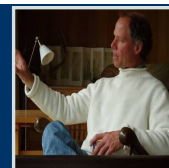
Dan Cenderelli
Geomorphologist
Stream Technology
Center
(970) 295-5984
dcenderelli@fs.fed.us



Kathleen A. Dwire
Research Riparian
Ecologist
USDA Forest Service
(970)498-1016
kadwire@fs.fed.us



Sandra Ryan-Burkett
Research Hydrologist/
Geomorphologist
USDA Forest Service
(970)498-1015
sryanburkett@fs.fed.us



Michael K. Young
Fisheries Biologist
USDA Forest Ser-
vice
(406) 542-3254
mkyoung@fs.fed.us



Kurt D. Fausch
Dept. of Fish, Wild-
life Conservation
Biology, CSU
(970) 491-6457
kurtf@warnercnr.
colostate.edu