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A Simple Alphanumeric Classification of Wood Debris Size and Shape

by David R. Montgomery

A simple alphanumeric classification of wood debris size and shape is proposed for use in river and stream channel surveys and restoration projects. Dividing wood debris length and diameter into seven categories, respectively distinguished by an alphanumeric code, results in a total of forty-nine distinct size and shape categories. Intended to be analogous to the phi class intervals used to characterize channel bed substrate, this classification allows for rapid visual characterization of the size and potential function of wood debris in wood budgets and channel assessments.

Recognition of the role of wood debris in the ecology and geomorphology of forest rivers and streams over the past several decades established the importance of understanding the wood regime for stream channel assessments. Characterizing the size of wood debris is important because large pieces of wood can deflect flow to form pools and catalyze formation of logjams that trap otherwise mobile sediment and smaller pieces of wood (e.g., Montgomery and others 1995; Abbe and Montgomery 1996; Collins and Montgomery 2002). Although the size of in-channel wood debris large enough to prove stable is a function of channel width and depth, as well as wood size and shape (Abbe and Montgomery 2003), definitions of large woody debris typically rely on a minimum piece length and/or diameter. Surveys of in-channel wood and semi-quantitative wood budgets (e.g., Benda and others 2003) generally involve accounting for wood larger than a certain size, but the size of wood debris large enough to prove functional depends on channel size. It would be useful therefore to have a standardized nomenclature for classifying wood size and shape. Moreover, adoption of a standard framework for classifying wood debris size and shape could help streamline wood debris inventories in channel assessments to establish (and track changes in) the distribution of wood debris size classes and potential functions of in-channel wood debris.

Classification

The proposed wood debris classification relies on a simple

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alphanumeric coding like that proposed by Rosgen (1994, 1996) for classifying stream channels. Whereas many geomorphologists criticize Rosgen's approach as overly simplistic for classifying channel morphology and predicting channel response (e.g., Kondolf and others 2003), the application of a similar coding scheme to characterize the size and diameter of wood debris provides a simple two-dimensional framework that accounts for variations in both dimensions (table 1). A simple alphanumeric code is particularly well suited for characterizing variations in the two primary dimensions of wood debris size and shape—length and diameter.

The proposed classification simply divides both wood debris length and diameter into seven discrete categories, the smallest of which corresponds to a typical minimum size definition for large woody debris in many stream survey protocols (wood less than 1 m in length and less than 0.1 m in diameter). Size classes for both wood debris length and diameter increase in progressively doubled size bins yielding categories of <1 m, 1-2 m, 2-4 m, 4-8 m, 8-16 m, 16-32 m, and >32 m for wood debris length and 0-0.1 m, 0.1-0.2 m, 0.2-0.4 m, 0.4-0.8 m, 0.8-1.6 m, 1.6-3.2 m, and >3.2 m for wood debris diameter. Pieces at the high end of each range would be included in the larger category, as in methods used to characterize sediment size. Hence, a wood debris piece with a length of 3 m and diameter of 1 m would be classified as C5, whereas a piece of wood debris with a length of 6 m and diameter of 0.5 m would be classified as D4. The simple pairing of a letter code for piece length with a numeric code for piece diameter conveys directly the respective differences (i.e., a log classified as D3 is longer and thinner than a C4 log). The proposed size categories result in a total of 49 discrete, visually estimable classes of wood debris.

Table 1. Proposed size classes and codes for the length and diameter of wood debris.

Wood length letter code and classes (m)	Wood diameter numeric code and classes (m)
(A) 0 to 1	(1) 0 to 0.1
(B) 1 to 2	(2) 0.1 to 0.2
(C) 2 to 4	(3) 0.2 to 0.4
(D) 4 to 8	(4) 0.4 to 0.8
(E) 8 to 16	(5) 0.8 to 1.6
(F) 16 to 32	(6) 1.6 to 3.2
(G) > 32	(7) > 3.2

Wood debris with an attached rootwad functions differently than the same size piece without a rootwad, and consequently the presence and size of a rootwad is an important aspect of wood debris characterization. The simple alphanumeric coding can be readily modified to include both the diameter of the bole and rootwad, with the appropriate numbers separated by a slash. For example, a 6 m-long, 1 m-diameter log with a 4 m-diameter rootwad would classify as D5/7, with the first number indicating the log diameter and the number after the slash indicating the rootwad diameter.

Discussion

Standardization of wood debris bin sizes would be useful and allow comparisons between surveys and regions, but this proposed classification is not intended to provide a comprehensive classification of organic matter for use in stream ecology. Neither is it intended to convey directly geomorphological implications regarding wood function. For example, different classes of fine organic matter, such as branches, twigs, and leaves, may share an A1 designation. Similarly, a C4 log may be a stable obstruction to flow in a small headwater stream and mobile flotsam in a large river. Nonetheless, this simple system provides a general framework for classifying wood debris in a manner useful—when coupled with information on channel size—for understanding the potential to influence channel morphology or provide structural components of log jams. With practice, the simple alphanumeric shorthand should prove relatively easy to learn and allow rapid visual classification of wood debris into the appropriate category.

Wood in different bins of the classification would be expected to function differently in different channels. Small mobile debris would have low alphanumeric combinations (e.g., the smallest material classified as A1), whereas larger stable pieces would tend toward higher combinations (e.g., an old-growth log classified as G7). In addition, the classification would relate to potential functions. For example, stumps classified as A5 would float upright. Additional criteria could be coupled to the classification to determine which categories of wood debris would be expected to provide structural elements to particular stream channels. For example, the simple approximation of functional wood debris as being longer than half the channel width and with a diameter greater than half the channel depth (Montgomery and others 2003) could be used in conjunction with the channel size to predict which wood debris categories could provide "key pieces" large enough to influence channel morphology. Classifying wood debris by this system would also provide a simple framework for tracking changes in the size distribution and/or shape of wood debris in monitoring projects. Additional information such as the relation of the wood debris to its location in the channel, and whether the wood is associated with other wood debris could be combined with the proposed classification for projects in which such information is desired.

Much like how the phi scale for characterizing particle size (Wentworth 1922; Krumbein 1934) allows rapid characterization of channel bed substrate using pebble counts (Wolman 1954) to determine grain size distributions, the use of the proposed alphanumeric framework for classifying wood debris size and shape may provide a parallel tool for use by fluvial geomorphologists and stream ecologists. In particular, the system provides a convenient standardized shorthand to facilitate communication and comparison of results among studies conducted by different investigators for different purposes in different settings.

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