Woody Debris

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Woody debris can be defined as any dead, woody plant material, including logs, branches, standing dead trees, and root wads. Woody debris is an important part of forest and stream ecosystems because it has a role in carbon budgets and nutrient cycling, is a source of energy for aquatic ecosystems, provides habitat for terrestrial and aquatic organisms, and contributes to structure and roughness, thereby influencing water flows and sediment transport (Harmon and others 1986). Few studies of woody debris in forested wetlands have been done in the Southeastern United States. To characterize this important ecosystem component, the influence of flooding and plant community type on woody debris must be understood.

The woody debris study has two primary objectives: (1) to quantify and characterize the distribution of woody debris in the bottomland hardwood forest, and (2) to determine the flux of woody debris through the forest. A fundamental first step was to develop and apply a woody debris classification system that can be used in forested wetlands in the Southern United States. All published woody debris classification systems (Brown 1974, Harmon and others 1986, Triska and Cromack 1980, Van Wagner 1968, Warren and Olsen 1964) consist of divisions by size class, decay class, and sometimes position class. Because no critical review of woody debris classification systems for the South existed, two initial objectives were to (1) examine existing classification systems and assess their appropriateness for use in a bottomland hardwood forest and (2) develop a data matrix that provided values of specific gravity of woody debris classified by decay and size classes for each tree genera present on the Coosawhatchie site. The classification system provided a way to more accurately inventory the amount of woody debris in the Coosawhatchie Bottomland Ecosystem Study site by producing values in volume, which could then be converted to values in mass using the specific gravity data matrix.

The classification system divided woody debris into three size classes: 1 to < 2.5 cm, 2.5 to 10 cm, and > 10 cm in diameter. According to the recommendations of Harmon and Sexton (1996), the breakpoint between fine woody debris and coarse woody debris is 10 cm. Woody debris < 1 cm, snags, and root wads were not addressed in this study. Fine woody debris was divided into the two smaller size classes using a go-no-go gauge (Brown 1974) and coarse woody debris was measured to the nearest centimeter diameter with calipers. Coarse woody debris was classified into shapes (fig. 3.11) to increase volume accuracy by accounting for missing parts of logs. Fine woody debris was divided into two decay classes: sound and decayed. Coarse woody debris was divided into three decay classes: sound, intermediate, and advanced decay.

The method used to divide coarse woody debris into decay classes was based on the penetration of a bluntly pointed steel rod pushed firmly into each piece of woody debris: penetration < 0.5 cm was sound, penetration 0.5 cm to the radius of the woody debris was intermediate, and penetration greater than the radius of the woody debris indicated advanced decay (Lambert and others 1980, Lang and Forman 1978). The penetration method was selected over visual criteria because achieving accuracy in southern bottomland hardwood forests using the latter method is difficult; these forests contain a vast number of genera that exhibit different decay patterns.

A pilot inventory was conducted in October 1997 on the lower floodplain portion of the site using the planar intersect method (Brown 1974). For each piece of woody debris inventoried, the following data were recorded: (1) size class, (2) penetrability, and (3) position on the ground (in contact

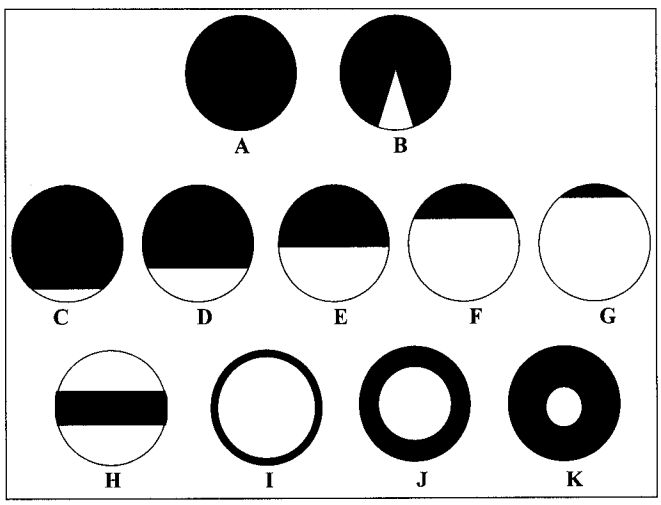

Figure 3.11—Idealized cross-sectional shapes of coarse woody debris. The shape that best matches the piece of woody debris was recorded to improve volume estimates. Shapes are not to scale.

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with ground, elevated, or in a debris dam). The diameter of coarse woody debris was measured, and the cross-sectional shape of each piece was recorded. The results from the pilot inventory are shown in table 3.2. Fine woody debris in the 2.5- to 10-cm diameter size class contributed almost as much to total volume, as did coarse woody debris.

Specific gravity values for woody debris were needed to transform estimates of volume to estimates of corresponding mass. Samples for specific gravity analysis were collected in July and August 1997, and the results of the specific gravity analyses will be incorporated with data from the complete inventory.

Input and flux of woody debris are being measured in a series of plots distributed among three elevation zones on the site. The plots consist of nested traps that permit the calculation of net woody debris input, net woody debris output, and direct deposition of woody debris. Transport distance is being assessed by tagging pieces of woody debris and tracing their movement through the bottomland.

A complete inventory of the bottomland portion of the site was conducted during September and November 1998. Results were similar to those of the pilot study (table 3.2) except that fine woody debris in the 2.5- to 10-cm diameter size class contributed only half as much to total volume, as did coarse woody debris. In any event, it appeared that fine woody debris constituted an important part of the total woody debris on the Coosawhatchie Bottomland Ecosystem Study site. Future investigations will include decomposition studies wherein the decay rate of different tree species and the influence of site conditions on decay processes will be compared.

Table 3.2—Results from a pilot inventory on the Coosawhatchie Ecosystem Study Site showing average woody debris volume, percent of total volume, and percent of total number of woody debris pieces per 100 linear meters by size class

Size class	Volume		Pieces per 100 linear m
Diameter	*m^3/ha*	*%*	*% of total*
Fine woody debris			
1 to 2.5 cm	1	5	56
2.5 to 10 cm	12	46	38
Coarse woody debris			
> 10 cm	13	49	6
Total	26	100	100

Installation of drift fences for woody debris studies.