Bankfull Geometry Determinations in the Hocking River Basin

by

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Natural stream-channels are constructed and maintained by forces of the water and sediments of the watershed balanced against the resistance of bed and bank materials (Moody and Odem, 1999). Though the process of channel formation is complex, there are consistent quantifiable patterns for natural streams (Leopold et al., 1964). These patterns form the basis of bankfull stage and discharge defined as the channel maintenance stage and discharge for a stream. Channel maintenance is most effective at the bankfull stage, while the associated discharge carrying sediment loads, forming and removing bars, and forming and changing bends results in average morphological characteristics of stream channels (Dunne and Leopold, 1978).

Bankfull stage and its corresponding discharge are a useful measure in determining natural stream morphological characteristics for channel classification. This measure provides a valuable tool for assessing stable channel characteristics of natural streams. Bankfull channel dimensions for classifying and characterizing natural streams have been used in both regulatory programs and environmental impact analysis. To develop possible measures of relationship between the bankfull stage and the physical, geological, and meteorological conditions in the major regions of Ohio will greatly enhance the understanding of bankfull stage characteristics for classifying streams quantitatively. This will provide information to assess impacts of projects for modifying channels and a useful tool to design channels for minimizing these impacts.

Natural stream channels are constructed and maintained by complex processes of their watersheds including waters and sediments. Though the formation process of a natural channel is complex, there are quantifiable and consistent patterns for the process, especially at the bankfull stage (Leopold et al., 1964). The stability of a stream channel is generally defined as the ability to carry the water and sediment of its watershed while maintaining dimension, pattern, and profile without degrading or aggrading channel dimensions over time (Leopold, 1994). However, any changes of geomorphic parameters will trigger adjustments in a channel to reach a new equilibrium. A geomorphic approach quantifies the physical characteristics of stream channels and identifies patterns common to a watershed or region (Moody and Odem, 1999).

Bankfull stage is described as the point of incipient flooding, at which flow overtops the natural channel and spreads across the floodplain. It is believed that the flow at the bankfull is most efficient to carry sediments. Wolman and Miller (1960) defined the effective discharge as the flow that

transports the greatest volume of sediment over time. Dunne and Leopold, (1978) stated that a bankfull flow carries an effective discharge with a typical return interval of 1 to 2 years. Many studies in the United States have conclusively identified relationships between bankfull channel geometries and drainage area (Leopold et al., 1964; Emmett, 1975; Jackson, 1984; Castro, 1997, Moody and Odem, 1999; Kuck, 2000;). These form the basis of the proposed study to develop possible measures of relationship between the bankfull stage and the physical, meteorological, and geological conditions to enhance the understanding of bankfull stage characteristics for classifying streams quantitatively in the major regions of Ohio.

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