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Use of Channel Evolution Models for Assessing Restoration Priorities and Meeting TMDLs for Agricultural Watersheds

Abstract:
Land use in the Blue Earth River (BER) watershed, located in south-central Minnesota, consists of 77% intensive corn-soybean agriculture. Extensive wetland drainage and reduced perennial plant cover have altered hydrologic pathways, resulting in excessive delivery of sediment and nutrients to the BER which flows into the heavily polluted Minnesota River. This paper presents a new approach in addressing total maximum daily loads (TMDLs) that accounts for stream channel instability contributions to sediment loads and turbidity levels in the BER. Objectives include, 1) determining patterns of suspended sediment and turbidity within watersheds under different land use conditions, 2) determining the relative contribution of stream bed and bank instability to sediment, turbidity, and nutrient loads and their relationship to channel evolution stage, and 3) assessing the applicability of channel evolution models (CEMs) and stream classification systems in watershed restoration and meeting total maximum daily loads (TMDL) goals. Study sites have been identified in the BER basin to investigate the cause-and-effect relationships between impaired water quality and both upland and channel sources of sediment and nutrients. Along with collecting surface runoff samples from selected upland sites, (CEMs) will be used to provide an approach for linking channel morphology to suspended sediment and the implementation of upland and perennial riparian corridors. Stream channel morphology will be measured at representative reaches across the watershed applying the Simon CEM and Rosgen stream classification systems. Stream discharge, suspended sediment, turbidity, total phosphorous, and nitrate-nitrogen data will be collected over three years. Stage of channel adjustment and Rosgen channel type will be analyzed with respect to suspended sediment and turbidity. This is a collaborative project involving private land owners, the University of Minnesota, Minnesota Pollution Control Agency, Martin County Soil and Water Conservation District, Three Rivers RC & D, and the Blue Earth River Basin Initiative (BERBI).

Author: Christian Lenhart