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Developing a framework for reducing turbidity violations in southern Minnesota

High concentrations of organic (nutrient-driven algae) and inorganic sediment have adversely impacted water quality in southern Minnesota and across agricultural regions of the United States. Studies done in the Minnesota River basin over the last decade suggest that the corn/soybean crop production system, coupled with intensive drainage may be driving turbid water quality impairment. Excessive turbidity measured in Minnesota surface waters will place a waterbody on the Clean Water Act Section 303(d) list; requiring a TMDL study. This study, in the Elm Creek basin of south-central Minnesota, examines runoff from upland corn/soybean watersheds, flood peak attenuation provided by restored wetlands, and in-stream fluvial processes influencing turbid water quality. Preliminary results suggest that movement of sediment from upland corn/soybean fields strongly contributes to exceedance of Minnesota's numeric criteria of 25 NTUs for turbidity, with turbidity measurements reaching 385 NTU. The turbidity standard was exceeded in 75% of samples taken near the Elm Creek mouth in 2005. While the restored wetlands are currently storing sediment and nutrients, turbidity measured over varying flow conditions at 10 locations from the Elm Creek headwaters to the mouth often exceed the turbidity standard. Though the turbidity exceedance is variable, suspended material may be related to unit stream power, channel morphology and sediment-nutrient supply stored within the channel cross-section. The lack of an active floodplain caused by entrenchment results in increased streambank erosion and poor connectivity with attenuating riparian vegetation. We propose strategically placed perennials in marginal landscape positions (drained wetlands and riparian oxbows) to attenuate excessive sediment and nutrient delivery to the Minnesota River and ultimately the Gulf of Mexico. Reconnection of previously disconnected oxbows also provides increased flood storage, reduced main channel velocity and improved active channel stability.

Author: Chris Lenhart