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Restoring Hydrologic Stability and Meeting TMDLs in the Minnesota River:

Meeting Total Maximum Daily Loads (TMDLs) in the Minnesota River Basin will require major changes in land use that go beyond Best Management Practices. This research was initiated to investigate the extent to which conversion from annual corn-soybean crops to woody and other perennial crops, in conjunction with wetland and riparian restoration, can reduce agricultural nonpoint source pollution. Implementing such changes in selected portions of the basin would require that farming practices be changed in those areas. Economic incentives will be needed for farmers, including income from perennial crops and, most likely, payment for environmental services resulting from such changes. Farmers and other stakeholders have been engaged from the beginning of this project through learning groups to ascertain local interest and to identify barriers to implementation that must be overcome to meet TMDLs and restore hydrologic stability of the Minnesota River. This paper describes an integrated field and computer modeling approach to identify potential hydrologic improvements and economic benefits that can result from replacing annual crops with agroforestry and other perennial cropping systems in selected watersheds. The Hydrologic Simulation Program FORTRAN (HSPF) model was applied to simulate different scenarios of perennial cropping and wetland - riparian restoration within watersheds. Field studies provided information for model parameter calibration based on soil water use, runoff, drainage and water quality relationships for six perennial crops and corn-soybean crops. These results were then entered into economic models to assess economic impacts on flood damages and recreational values. Lastly, given their financial viability, proposed changes in watershed land use may provide significant cost-saving opportunities for point-source polluters through the process of nutrient trading. The results of this work suggest that changes in farm policy will be needed to achieve TMDL goals through improved watershed management.

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