

Public Abstract

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In 2003, the U.S. Department of Agriculture initiated research in multiple watersheds to determine effects of conservation implemented on private agricultural land in the U.S. Conservation on agricultural land consisted of best management practices (BMPs) implemented to reduce impacts of existing farms on adjacent streams/rivers as well as retirement of cropped land by establishment of perennial vegetation. This research was begun due to calls for greater accountability of BMP funding authorized by the 2002 Farm Security and Rural Investment Act (Farm Bill). The Goodwater Creek Experimental Watershed (GCEW), located in northcentral Missouri, was selected in 2005 to participate in this research effort. Water quality concerns including elevated concentrations of common herbicides (e.g., atrazine) and nutrients (e.g., nitrate) in streams were the focus of this research. Specific objectives of this research were to assess impacts of existing BMPs implemented in the GCEW on atrazine and nitrate losses to streams, predict future time required show reductions in atrazine and nitrate, and formulate strategies to target future BMPs in the GCEW based on a hydrologic model, analysis of watershed terrain, and assessment of soil properties. This study relied on examination of water quality samples collected from 1993-2006, hydrologic models that predicted pollutant loss from fields in the GCEW, and soil properties measured from two cropped fields.

Analysis of water quality samples from 1993 to 2006 showed no decreasing trends in atrazine and nitrate losses from the GCEW after 14% of this watershed had been affected by BMP implementation. Future tracking of BMP effects on atrazine transport in GCEW streams will be difficult and take long time periods (e.g., 20 years) based on results from this study. Past studies indicate establishment of grass filter strips at field edges are efficient at trapping pollutants transported across fields. However, local conservationists indicate the extent of grass filter strip implementation required to reduce atrazine and nitrate stream losses to detectable levels is not likely due to unwillingness of land owners to replace farmable acreage with grass at field edges. This implementation effort, predicted by hydrologic models, shows fields adjacent to streams contribute greater amounts of pollutants to GCEW. Other attempts to identify sensitive fields based on surface terrain did not agree with hydrologic models. This disagreement indicated relatively simple methods to target BMPs at a watershed scale may be misguided when soil properties and farm operations are not considered. At a field scale, simple methods to target BMPs based on surface terrain may be useful in selected watershed areas. Further use of soil properties to validate these BMP placement methods may be required in the absence of intensive data collection on individual fields.

This study highlighted the difficulty with tracking and documenting effects of BMPs. Strategies to optimally place BMPs may be adopted locally and outside the GCEW to increase cost effectiveness of agricultural conservation programs. However, this will need to be verified by future on-the-ground monitoring.