USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Watershed Based Optimization Approach for Identification and Management of Non-Point Source Pollution

Duration: 3/1/99-2/29/00

FY 1999 Federal Funds: $28,178

FY 1999 Non-Federal Funds: $56,412

Focus Categories: WQL, M & P, LIP

Descriptors: hydrologic models, nonpoint source, watershed management, water quality, policy analysis, stakeholders, acceptance, adoption, BMP maintenance

Investigator(s): Scott G. Witter, Department of Resources Development; Ouyang Da,, Department of Crop and Soil Science, Michigan State University

Congressional District: eighth

Critical Regional or State Water Problems

Agricultural NPS pollution was identified as the major threat to the Nation's water quality in the 1992 Clean Water Act Amendment. Many efforts have been initialized to reduce the agricultural NPS pollution; however, EPA still reported NPS as the primary source for impaired streams and lakes. The Michigan Department of Environmental Quality (MDEQ) identified hundreds of watersheds that had NPS pollution problems in early 1998. These watersheds will need a "watershed performance based plan" not only to address NPS pollution problems but also to implement solutions that will optimally reduce the NPS pollution. The research will address both environmental and economic issues in NPS pollution management.

Results or benefits

With EPA's emphasis on watershed and total maximum daily loading (TMDL), watershed planners critically need a systematic economic/environmental watershed NPS pollution optimization approach. The selected study area is the Stony Creek watershed, which is one of the NPS problem (303d) watersheds identified by the MDEQ. The watershed covers 115,000 acres of land and approximately 85% of the watershed is agriculture. The final research result is a user friendly performance based NPS watershed management system for the Stony Creek watershed. This NPS watershed management planning tool can serve as the guidance or strategy for the watershed communities to meet both environmental and economic goals in the NPS pollution management. However, several intermittent outcomes can also be expected. First, the methodology

itself will demonstrate a solid scientific-based approach for NPS pollution management. Secondly, the investigation of the cost-effectiveness of alternative BMP's can generate knowledge to help facilitate scenario analysis for NPS pollution management assessment. Finally, the watershed experience can be applied to other watersheds that have NPS pollution problems.

Nature, scope, and objectives of the research

Nature/Scope: This proposed project investigates Non-Point Source (NPS) pollution management from a watershed perspectives. The research will address both environmental and economic issues in NPS pollution management. The goal is to provide scientific, informed decision-making for NPS pollution management. The results will be applicable to other watersheds that have NPS pollution problems. With EPA's emphasis on watershed and total maximum daily loading (TMDL), watershed planners critically need a systematic economic/environmental watershed NPS optimization approach for selection from a set of farm level locations and options.

The selected study area is the Stony Creek watershed, which is one of the NPS problem (303d) watersheds identified by the MDEQ. The watershed covers 115,000 acres of land and approximately 85% of the watershed is agriculture. It has been estimated that the point sources contributed approximately one-third of the phosphorus loading and the rest are mainly from NPS's including agriculture. The watershed stakeholders are currently working together to meet the environmental goal set by the MDEQ while maintaining the economic viability of all stakeholders.

Objectives: The overall objective is to use the Stony Creek River Watershed as a case study for the evaluation of performance-based management approach to restore and protect water quality. Specifically, the sub-objectives are to:

1. Use mechanistic watershed hydrologic models and farm-level models to:

a. characterize reaches (and their sub-watersheds) throughout the Stony Creek River watershed (urban, sub-urban, and rural) with the highest risk of water quality impairment from phosphorus;
b. determine specific land areas with high potential for contributing NPS pollution to reaches in the high-risk sub-watersheds;

2. Evaluate the general validity and effectiveness of watershed models for predicting reaches at high risk from phosphorus loadings through physical and biological monitoring of reaches;

3. Assess a farmer's set of proposed BMPs and evaluate their relative cost-effectiveness in reducing potential phosphorus loading to the reach;

4. Develop and coordinate coalitions of stakeholders into appropriate focus groups needed to evaluate their willingness to accept, adopt, and maintain recommendations and procedures stemming from this study.