WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002OK6B

Title: Evaluating Cost Effective Technologies to Reduce Phosphorus Loading to Surface Waters in the Ozark Region

Project Type: Research

Focus Categories: Non Point Pollution, Economics, Water Quality

Keywords: Point and nonpoint source pollution, economic analysis, phosphorus, Ozark, water quality, poultry litter, surface water

Start Date: 03/01/2002

End Date: 02/28/2003

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Non-Federal Matching Funds: $60,000

Congressional District: Oklahoma 3rd

Principal Investigators:
Daniel E. Storm
Oklahoma State University

Arthur L. Stoecker
Oklahoma State University

Abstract

The landscape of the Ozark Highlands is a complex arrangement of geologic features, soil types, vegetation, and land use. In recent years, changing agricultural practices and significant population growth in the region have coincided with deterioration in surface water quality. Accelerated eutrophication in regional water bodies has been attributed to increased nutrient inputs at the watershed level. Potential sources of excess nutrients include runoff from agricultural lands, recreation, urban runoff, on-site septic systems, and municipal wastewater treatment plants, channel erosion, and others. The proposed research will develop methods that will aid watershed managers in the Ozark and similar regions to set and implement TMDL's in a cost effective manner. As a case study, these methods will be applied to the Lake Eucha-Spavinaw basin to find cost effective methods of reducing phosphorous loads to the lake. Point and nonpoint sources of phosphorous will be identified and quantified. The Soil Water Assessment Tool (SWAT) model will be calibrated and used to predict the impact of land management practices on water and phosphorous yields. The basin will be subdivided into approximately 2000 homogenous hydraulic response units according to soil type, topography, and land use. A baseline scenario will establish surface water loading, and costs and returns associated with current production and point source treatment practices. Appropriate technologies and cultural practices for reducing phosphorous loads to the surface waters of the Ozark region will be identified and quantified. These will include the use of alum in the poultry house, application of alum residual materials on fields, changes in the time and amount of litter application, the use of buffer strips, riparian protection and restoration, alternative uses of poultry litter, and the hauling of excess litter from the region. Economic engineering approaches will be used to estimate the costs and returns associated with these technologies. These technologies will be incorporated into the SWAT model both singly and in combination to test their effect on phosphorous loadings from the basin.

Enterprise budgets and engineering costs will be used to estimate the change in income associated with each technology. The cost effectiveness of each technology will be measured by comparing it to the baseline scenario. The technologies will be sorted or ranked in terms of increasing unit cost of phosphorous reduction. The simulation results will be searched for technologies where the per unit cost of phosphorous reduction in each hydraulic response unit is less than some specified amount. This will allow watershed planners to evaluate technologies in each hydraulic unit. As the allowable cost per unit of phosphorus is increased the total loading will be reduced. At the same time the benefits of phosphorous reduction to users of public water systems due to reduced treatment costs and to recreational users of affected lakes and streams will be determined. Economic engineering methods will determine the change in costs for treating algae affected water for each level of phosphorous loading. Existing studies will be used with travel cost approaches to estimate the value of increased recreational use.