Sample Research Prospectus

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TITLE:

Agricultural BMP placement for cost-effective pollution control at the watershed level

MOTIVATION:

Best Management Practices (BMPs) have been shown to be effective in reducing nonpoint source (NPS) pollution. For example, conservation tillage and cover cropping are useful in reducing erosion from areas having erosion potential, such as slopes. However, a watershed benefits more from BMPs placed in critical diffuse pollution areas than in others. Cover cropping on a flat field has limited benefits for the field or the watershed. Cover cropping on a relatively steep slope might benefit the entire lower portion of the watershed.

Additionally, some BMPs cost more to implement and maintain than do others. Currently, many BMPs are implemented in order to meet pollution reduction requirements. However, BMPs may provide pollution compliance for a single farmer, but at an exorbitant cost, or be economically feasible without reducing pollution sufficiently.

Maximizing pollution reduction for the entire watershed considers the combined effects of pollution from individual farms. BMPs should be located in such a way that they jointly provide the highest reasonable NPS reduction for the lowest possible cost. This optimal placement will provide for sufficient pollution reduction in the critical areas and, potentially, reduction in lesser amounts throughout the remainder of the watershed. Optimal placement of BMPs will result in more efficient use of the money spent on their creation and implementation. As a result, the group of BMPs will be more cost-effective in reducing pollution from the watershed.

OBJECTIVE:

To increase the cost-effectiveness of pollution reduction measures within a watershed.

PROCEDURES:

Tasks involved in this research include identification of the best measures of cost-effectiveness, selection of appropriate BMP constraints, and determination of appropriate techniques for model verification and validation. Cost-effectiveness will be defined in terms of environmental quality and economic feasibility. Pollution reduction measures will depend on identified BMP constraints.

This project will involve creation of a mathematical programming model which utilizes new and existing optimization techniques. The model will interface with an NPS prediction model that enables calculation of pollution quantities based on a selection of BMPs. Also, the optimization model will be compatible with a GIS program so that users can graphically view BMP locations and related parameters.