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## **The Boone River Watershed Modeling Framework: A Common Land Unit (CLU) Approach for Constructing Model Simulation Scenarios**

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### Abstract Text:

Iowa leads the U.S. in biofuels production, due to intensive corn production and a high concentration of ethanol plants that comprise 28% of total U.S. ethanol production. Shifts towards higher levels of corn production in Iowa and Midwest cropping systems have resulted in rising concern regarding the potential for increasing negative environmental externalities, including greater export of pesticides and nutrients to stream systems. The Boone River Watershed (BRW) covers over 237,000 ha in north central Iowa and exemplifies a typical intensively cropped Iowa watershed dominated by corn and soybean production. Shifts towards an increased incidence of corn in BRW crop rotations have also recently occurred due to ethanol production demands. Fertilizer and livestock manure applications to cropland are key sources of nutrient loads to the watershed stream system. Nitrate losses are of particular concern, much of which escapes the cropland via subsurface tiles that drain the predominantly flat landscapes that characterize the watershed. A modeling framework has been constructed for the BRW using the Soil and Water Assessment Tool (SWAT) model (version 2005) and land parcels defined at the Common Land Unit (CLU) level. An overview of the modeling system will be presented, including the intensive field-level cropping and conservation practice data set defined at the CLU level that is used for building the baseline simulation. The interface between SWAT and an economic model developed for the modeling system is also described; the economic model generates estimates of cropping systems and management practices at the CLU level in response to economic incentives. The system can be applied for a broad suite of scenarios including several that are related to current and possible future bioenergy demands. The results of several corn expansion scenarios on sediment and nutrient losses will be reported, which reflect bioenergy-influenced cropping patterns in the watershed.

### Impact Statement:

The modeling system developed for the Boone River watershed will provide the basis for evaluating a wide range of scenarios by local stakeholders, and various agencies and environmental NGOs such as the Prairie Rivers RC&D and The Nature Conservancy. These scenario applications will provide key insights as to which cropping systems and/or management practices will likely result in the most beneficial environmental impacts, and what the associated costs would be to obtain those benefits. The system will accommodate perennial-based and mixed perennial-row crop cropping systems, which may prove essential to both future water quality and bioenergy solutions.