



*2009 CSREES National Water Conference; St. Louis, MO*

### **Predicting Irrigation-Induced Furrow Erosion with WinSRFR**

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#### Abstract:

In many locales in the world, the transport of sediments via surface irrigation, especially from the upper reaches of sloping agricultural fields, is a significant agronomic, economic, and environmental problem. Loss of topsoil reduces the productivity of the land. Soil loss in runoff poses a threat to aquatic life in the receiving waters. Agricultural chemicals and naturally occurring minerals such as phosphorus, as well as the increased turbidity itself, impact negatively on the aquatic environment, harming not only wildlife but contributing to eutrophication in downstream water bodies.

WinSRFR, a comprehensive surface irrigation software package from the U.S. Arid Land Agricultural Research Center, is now in its third release. It focuses on the quantities of water used, with the aim of uniform and efficient application. The current release expands the purview to water quality, specifically to the erosion of furrow soil and its transport by the irrigation stream. The capability of predicting soil movement theoretically can be helpful in evaluating potential designs and operation of surface-irrigation systems from the standpoint of sediment movement..

The theoretical predictions are based on a mass balance in the unsteady flow of the surface stream, leading to a solution by a method of characteristics, curves in the distance-time plane with local inverse slope given by the water velocities calculated by the clean-water component of WinSRFR. The characteristics represent the trajectories of cross sections swept along the flow at the extant velocity, gaining sediment in response to sediment-size distribution, the local transport capacity of the stream for each particle size, the shear of the stream on the furrow walls and the erodibility of the soil, site-specific input data. When the transport capacity is exceeded, the cross sections lose soil, deposited on the furrow bed. The output consists of sediment hydrographs and total soil loss.

#### Impact Statement:

The new software provides a tool for field-office personnel, consultants, and educators concerned with surface irrigation to investigate the efficacy of one or another design or operation strategy from the standpoint of erosion and deposition of the furrow soil. This will allow these water quality considerations to play a role in surface irrigation recommendations and positively affect land and water quality.

Category: Conservation and Resource Management

Type of Presentation: Oral Presentation