Application of the Soil and Water Assessment Tool (SWAT) and Geographic Information Systems (GIS) to Integrated Water Management of the San Joaquin River Basin, California.

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Abstract

This poster presents methods and initial results of investigations into the application of the Soil and Water Assessment Tool (SWAT) and Geographic Information Systems (GIS) to integrated water management of the San Joaquin River Basin, California. This 85,000 sq. km basin is one of the richest agricultural regions of the U.S., yet has been plagued with issues relating to surface water (selenium toxicity, nutrient and pesticide loadings, salinity) and groundwater (water logging, overdraft, subsidence). Most research to date has focused on small-scale issues, perhaps leading to solutions that are not appropriate on the basin-scale, and has not addressed the integrated nature of the problems, especially with regard to salinity. In combination, SWAT and GIS can be used to gain insights into the effects of land management/use on water, salt, sediment, nutrient and pesticide yields throughout the basin. Model software components include: ESRI's ArcInfo and ArcView with the Spatial Analyst and 3D Analyst extensions, along with the SWAT ArcView extension (developed by the Grassland, Soil and Water Research Laboratory, USDA). MS Access databases are used to store and format input data. Model components include: weather, surface runoff, return flow, percolation, ET, transmission losses, pond and reservoir storage, crop growth and irrigation, groundwater flow, reach routing, nutrient and pesticide loading, and water transfer. Model input data include: digital elevation, river reach, land cover/land use, soil classification, climate, reservoir activity, and groundwater. Management scenarios can be planned based on existing land cover/land use types, or on theoretical scenarios, e.g. land retirement, urbanization. This model can be used to address several important questions on the Basin's future. First, it will permit quantitative characterization of the magnitude and geographic extent of problems in the basin and identify the contribution of local components to regional problems. Second, it will help understand how changing (or not changing) patterns of management and land use can affect the Basin as a whole. Specifically, it will help estimate on the sub-basin level, the accretion of salts, groundwater pumpage, nutrient and pesticide loadings, and the effect of potential land management strategies. Finally, this work points toward the need for better basin-scale modeling and the importance of readily available public information in the field of water resources management.