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Building a comprehensive watershed-scale project for assessing conservation effects at the St Joseph River Watershed

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In 2002, we began a Source Water Protection Initiative project in the St Joseph River Watershed at northeast Indiana, USA. The initial focus was to evaluate existing and innovative agricultural practices in reducing pesticides, specifically atrazine, loadings to the source water for the City of Ft Wayne, which uses the St Joseph River water as its domestic water supply. The effort later became a part of the US Department of Agriculture (USDA) nationwide Conservation Effects Assessment Project (CEAP) with focus expanded to include nutrients and sediment as water quality concerns.

In the past 6-years, we have engaged a large team of professionals and developed a fairly comprehensive research, data collection and modeling program. Efforts include conducting flume and field rainfall simulations at meter scale plots, automatic water quality sample collection from fields, topographic depressions, drainage tiles, ditches and a natural stream with drainage areas ranging from 2 to 19,000 hectares and weather and soil hydrology monitoring through a net work of automated weather stations and soil moisture sensors. Our intent was to quantify individual sediment and pollutant transport mechanisms and effects of specific management practices through controlled experiments, i.e., flume and plot scale rainfall simulation and to quantify the spatially and temporally aggregated effects through the monitored data from the nested fields and sub-watersheds. Parallel to field data collection, we are also conducting model calibration for the Soil & Water Assessment Tool (SWAT) and Agricultural Non-Point Source Pollution Model (AGNPS) models.

This presentation will summarize what we have learned in the past years from this multitude of studies and discuss challenges that we still have yet to overcome to assess conservation effects at the watershed scale. The scaling issue is probably the biggest challenge as physical, chemical and biological processes affecting soil and water quality are operating at different spatial and temporal scales, resulting in different response times and critical zones. How to upscale or aggregate individual transport mechanisms quantified at the controlled plot scale to observed responses at the field and watershed scale? Also, the input data required to calibrate and validate SWAT and AGNPS are not compatible with what we can collect reliably. Additionally, the implementation of current conservation program is based on political boundaries without consideration of geographically-based environmental goals. We will use our data and experiences learned at the St Joseph River Watershed to discuss which soil and water quality attributes can be realistically assessed for their effects in the watershed scale.