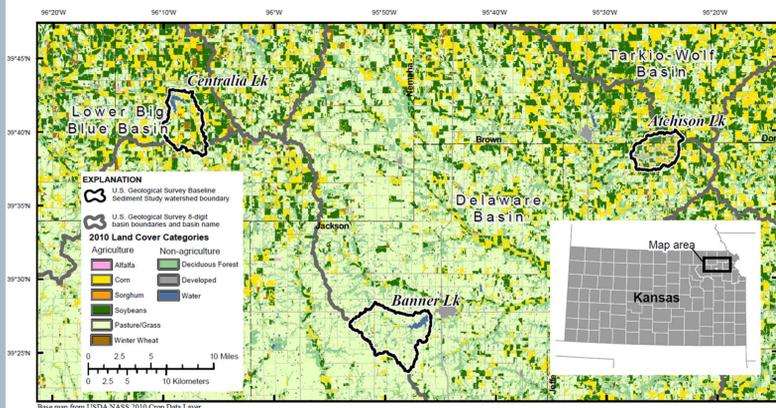


Guy Foster, [gfoster@usgs.gov](mailto:gfoster@usgs.gov)  
Casey Lee, [cjlee@usgs.gov](mailto:cjlee@usgs.gov)

U.S. Geological Survey, Kansas Water Science Center

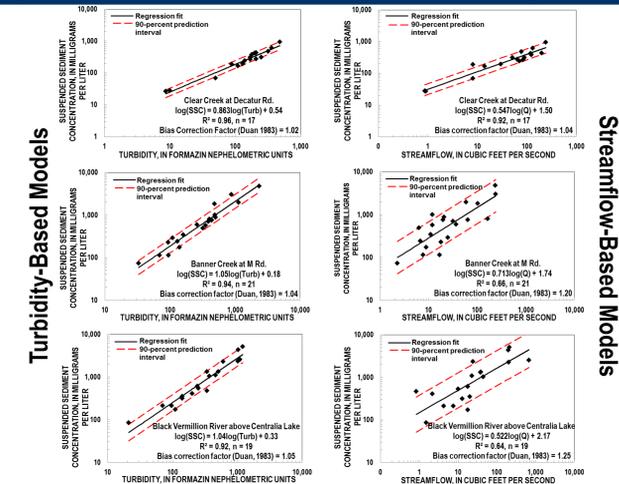
## Watershed Locations



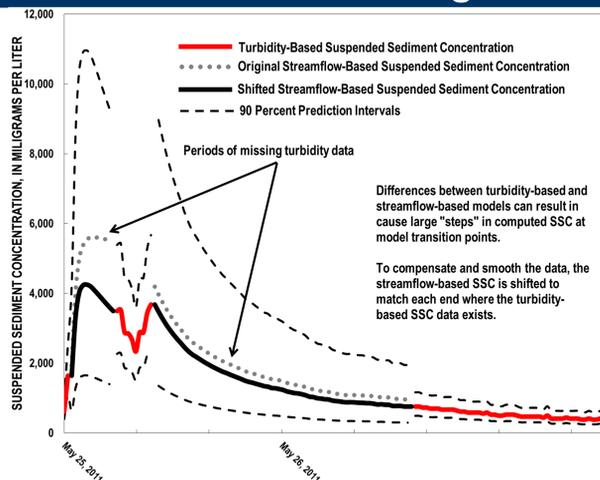
## Monitoring Sediment in Small Watersheds Presents Unique Challenges

- Sediment transport is affected by both natural and human factors, and plays an important role in stream quality and downstream reservoir function.
- Relatively little information exists nationally on sediment transport from small watersheds.
- Rapidly changing streamflow and suspended-sediment concentration can prevent accurate estimation of loads because of difficulty in obtaining storm samples and underestimating streamflow because of short duration stormflows.
- Three headwater watersheds (4 to 9 mi<sup>2</sup>) monitored for turbidity and streamflow in order to estimate sediment transport. Yields varied widely among the three watersheds despite similarities in land-use and streamflow conditions.

## Regression Models: Turbidity is Better



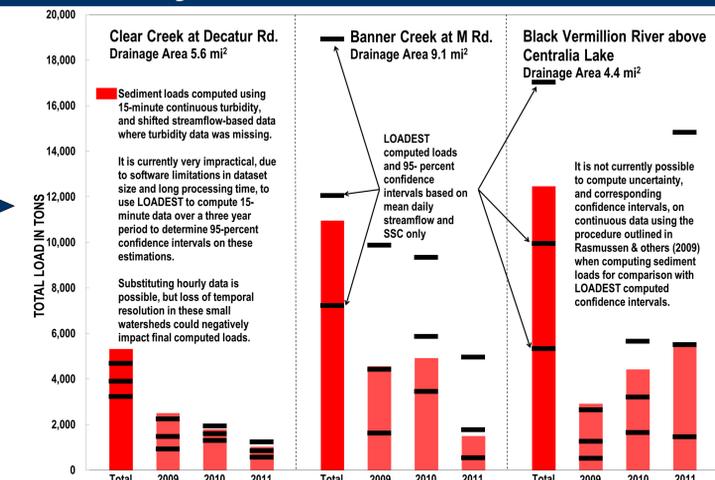
## Estimation of Missing Data



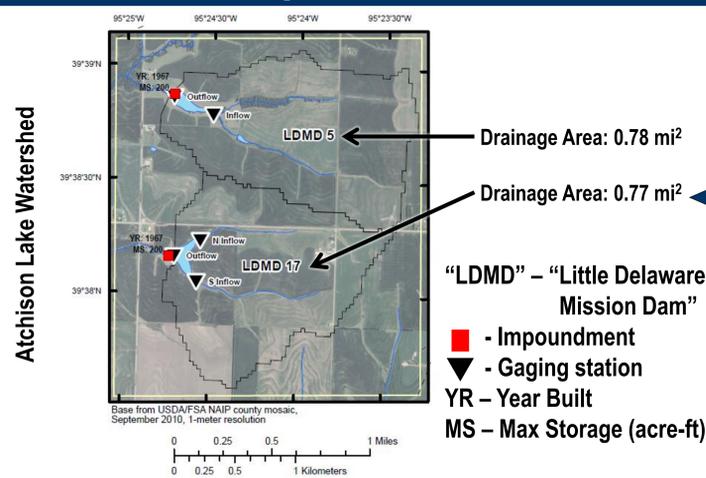
## Continuous Turbidity and Streamflow Data to Compute Transport

- Continuous, real-time data collected at least every 15-minutes to effectively capture short duration storm hydrographs inherent to small watersheds.
- These data were coupled with periodic suspended-sediment sampling to develop regression models for computing continuous suspended-sediment concentrations and loads (Rasmussen and others, 2009).
- During periods of missing turbidity data, streamflow-based regression models were used. Resulting computed suspended-sediment concentrations were "shifted" to match points of turbidity-based suspended sediment concentration using a method from Porterfield (1972).

## Loads by "Old" and "New" Methods



## Small Impoundments



## Use of Turbidity to Assess Small Impoundment Trapping Efficiency

- Initial analysis indicated that small impoundments likely played some role in regulating sediment transport.
- To assess the effect of small impoundments (original storage volumes of 200 acre-ft) on sediment loading within the study watersheds, two were monitored for turbidity and elevation to estimate trapping efficiency.
- Data up- and downstream from small impoundments were collected at continuous, 5-minute increments. Reservoir routing equations were used to estimate inflow and outflow. Turbidity-based regression models developed at downstream sampling sites were applied to compute suspended sediment concentrations, transport, and trapping efficiency.

## Example Small Impoundment Results

