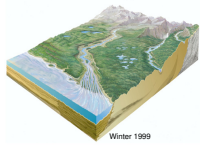


# Development of an Ensemble Model Set to Identify Sediment Sources and Evaluate BMPs in Spring Creek, PA

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## Identifying the most effective management practices for improving water quality remains one of our biggest challenges.



- The relative importance of hillslope, gully, and stream bank erosion remains uncertain, thereby limiting our ability to evaluate BMPs at a regional scale (Stream Information Exchange 2008).
- Models provide some of our best tools for exploring human interactions with the landscape and for predicting management effects on stream discharge (Miller et al. 2004).
- A multi-model approach provides a framework for explicitly testing different conceptual models and accounting for the structural uncertainty of individual models (Kadane and Lazar 2004).

## Project Goal: Develop an ensemble model set to evaluate BMPs across the Spring Creek watershed.



- For the Spring Creek drainage basin, we identified three watershed models that focus on hillslope erosion as the predominant sediment source and two stream models that focus on streams as the predominant sediment source.

### Watershed Models:

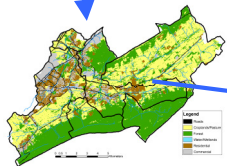
- SWAT
- PSU AVGWLF
- USGS GSFLOW

### Stream Models:

- CSIRO SedNET
- USDA CONCEPTS

- Here, we compare preliminary results from the SWAT and SedNET applications, both implemented at SERC.

- Ultimately, we will compare the abilities of all the models to predict observed flow and sediment discharge at four stream gauges and then apply the models to evaluate hillslope and riparian BMPs.

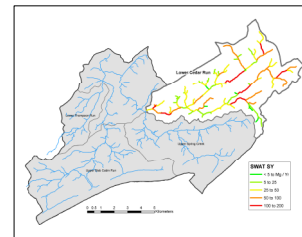
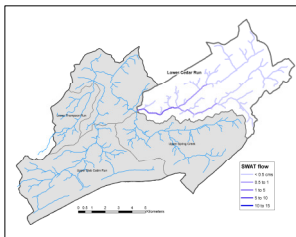
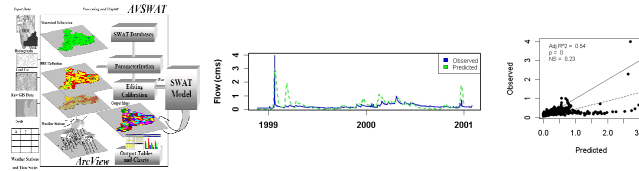


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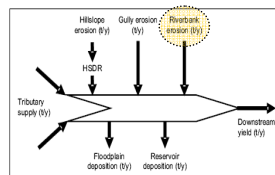
## Soil & Water Assessment Tool (SWAT)

(Arnold and Allen 1992)



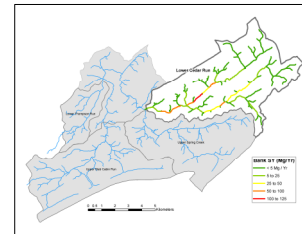
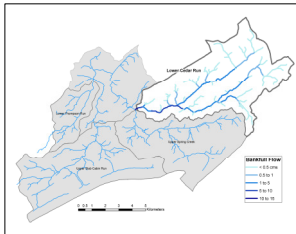
## CSIRO SedNET River Network Model

(Wilkinson et al. 2009)

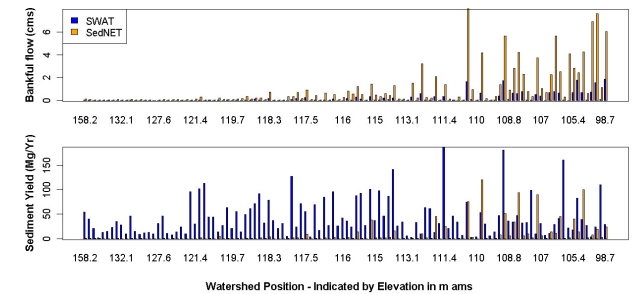


SedNET is a spatially distributed sediment budget to assess hillslope soil erosion, gully and riverbank erosion, and floodplain or reservoir deposition. The different sources are described separately and so can be evaluated independently. Here, we used SedNET to estimate bank erosion. **Key inputs include:**

- Bankfull cross-section
- Reach slope and length
- Riparian condition

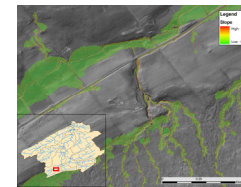


## Preliminary Results



Compared to SedNET bank erosion estimates, the SWAT model predicts much higher sediment yields, generated primarily from hillslope erosion, despite lower predicted flow rates.

## Future Work and Additional Models

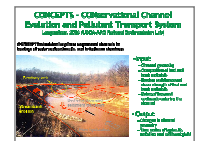
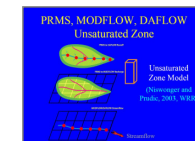
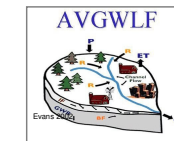


- Analyze LIDAR data throughout the Spring Creek watershed to identify streams, riparian zones, and floodplain zones and to estimate channel dimensions.

- Incorporate results of LIDAR topographic analysis into regional SedNET and CONCEPTS models.

- Compile and compare results from SWAT, SedNET, PSU AV-GWLF, GS-Flow (PRMS, MODFLOW, DAFLOW integration), and CONCEPTS models.

- Evaluate riparian and hillslope BMPs.



## Funding:

