WATERSHED MODELING

SEDIMENT AND LAND MANAGEMENT

2013-14 Cayuga Lake Study

Public Meeting
Cayuga Lake Modeling Project
July 17, 2014
Ithaca, NY

Ultimate Goals and Objectives

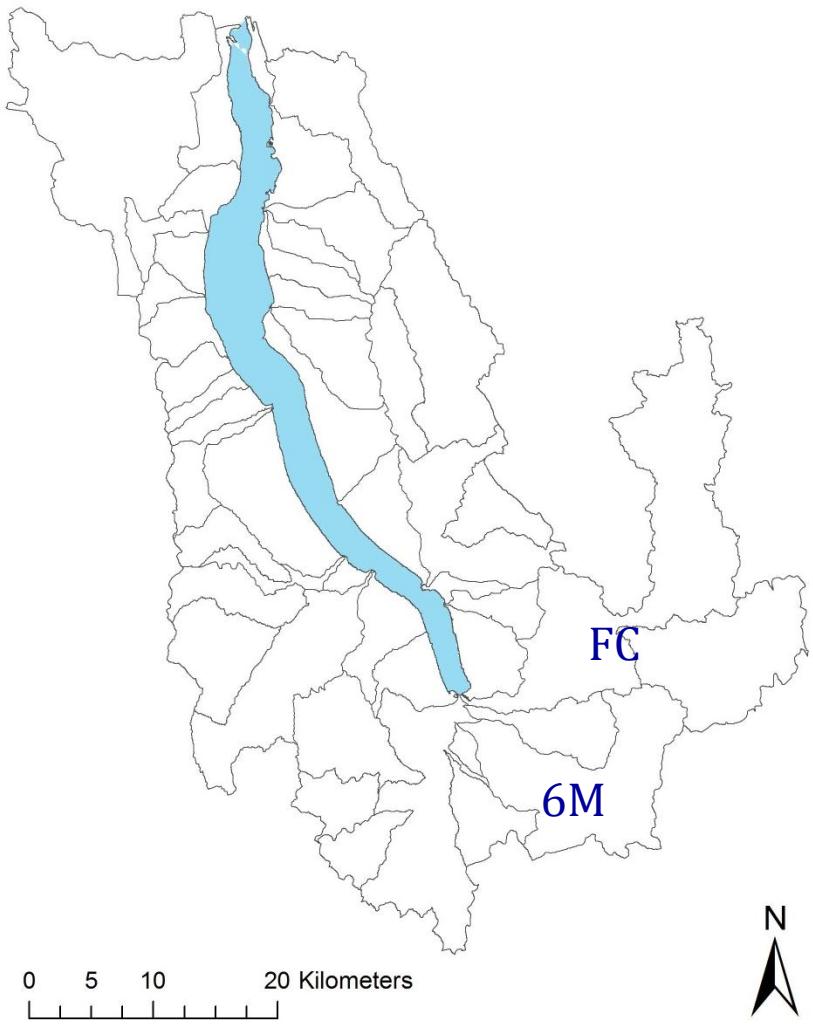
- Estimate phosphorus loads from the watershed to the lake:
  - Establish baseline
  - Input to the lake model
- Management scenario testing and forecasting

Objective to Date

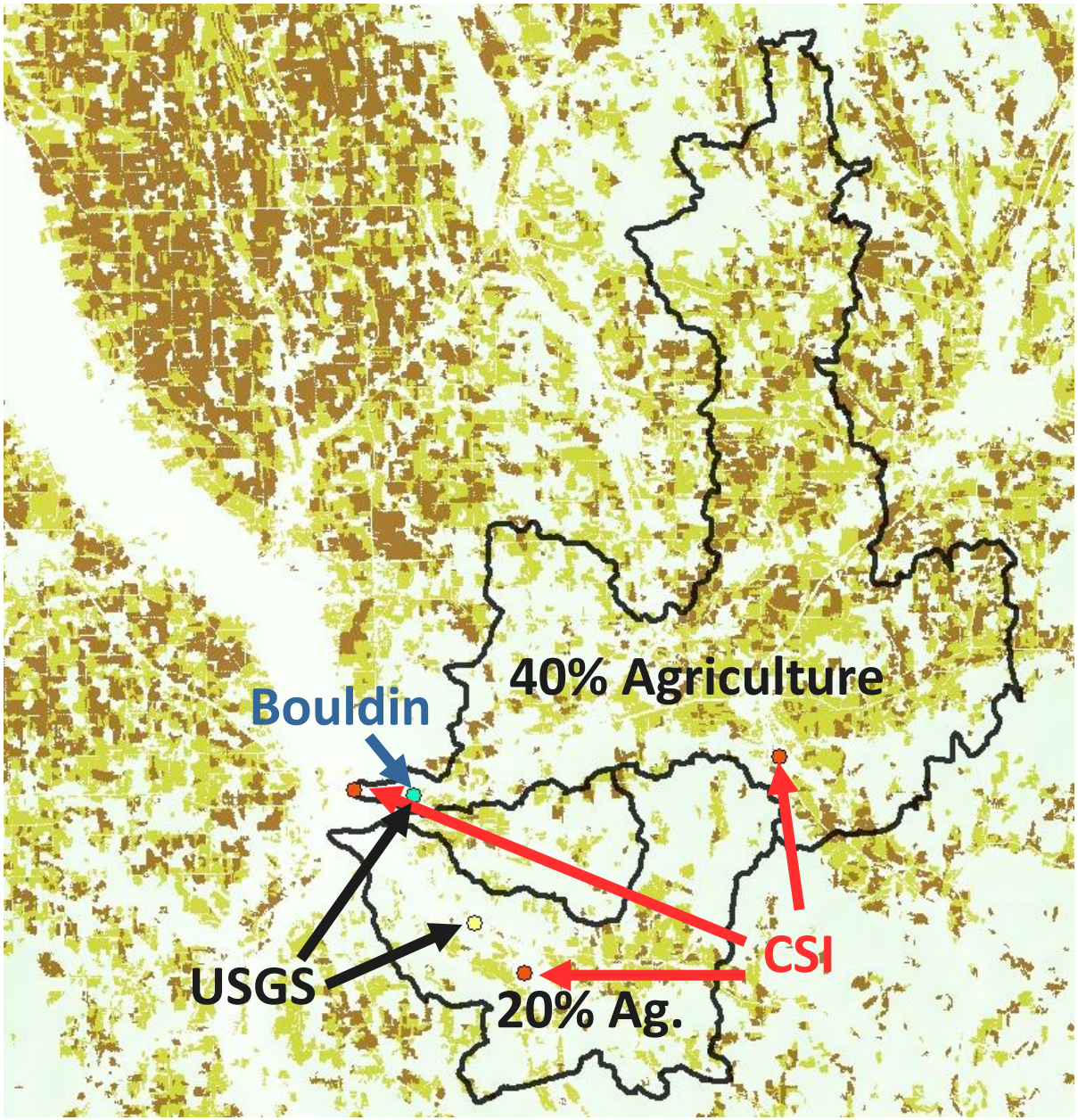
- Develop a repeatable strategy for setting-up watershed models that best represents the hydrology and **phosphorus dynamics** of the entire watershed

Fall Creek and Six Mile Creek

- USGS flow records
- CSI, Water Plant (Roxy) and Bouldin water quality data
- Represent a range of agricultural intensiveness
- Dan Karig's concerns about sediment sources

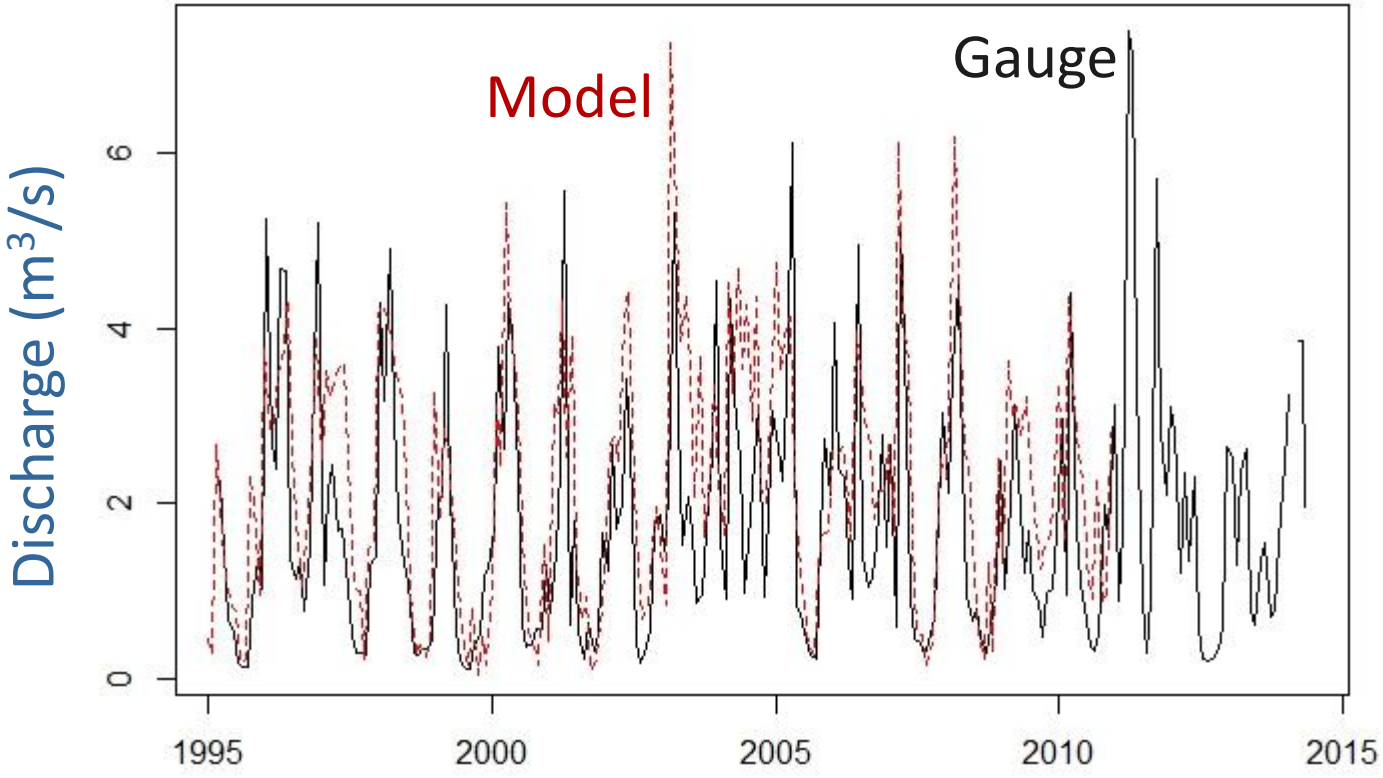


Fall and Six Mile Creeks

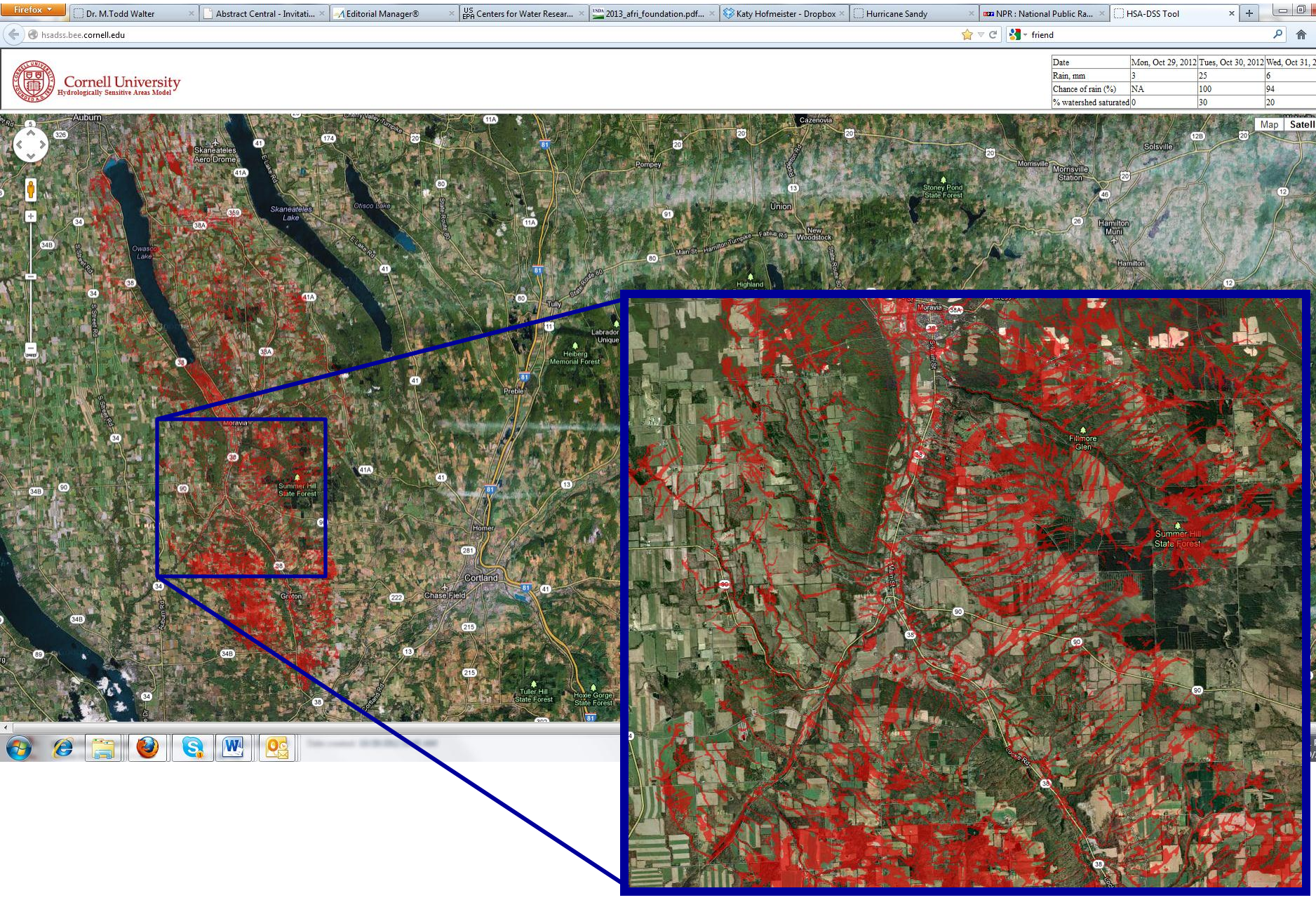


Hydrology is the easy part

Six Mile Cr. discharge



Storm Runoff


Firefox
Dr. M.Todd Walter
Abstract Central - Invitati...
Editorial Manager®
Centers for Water Resear...
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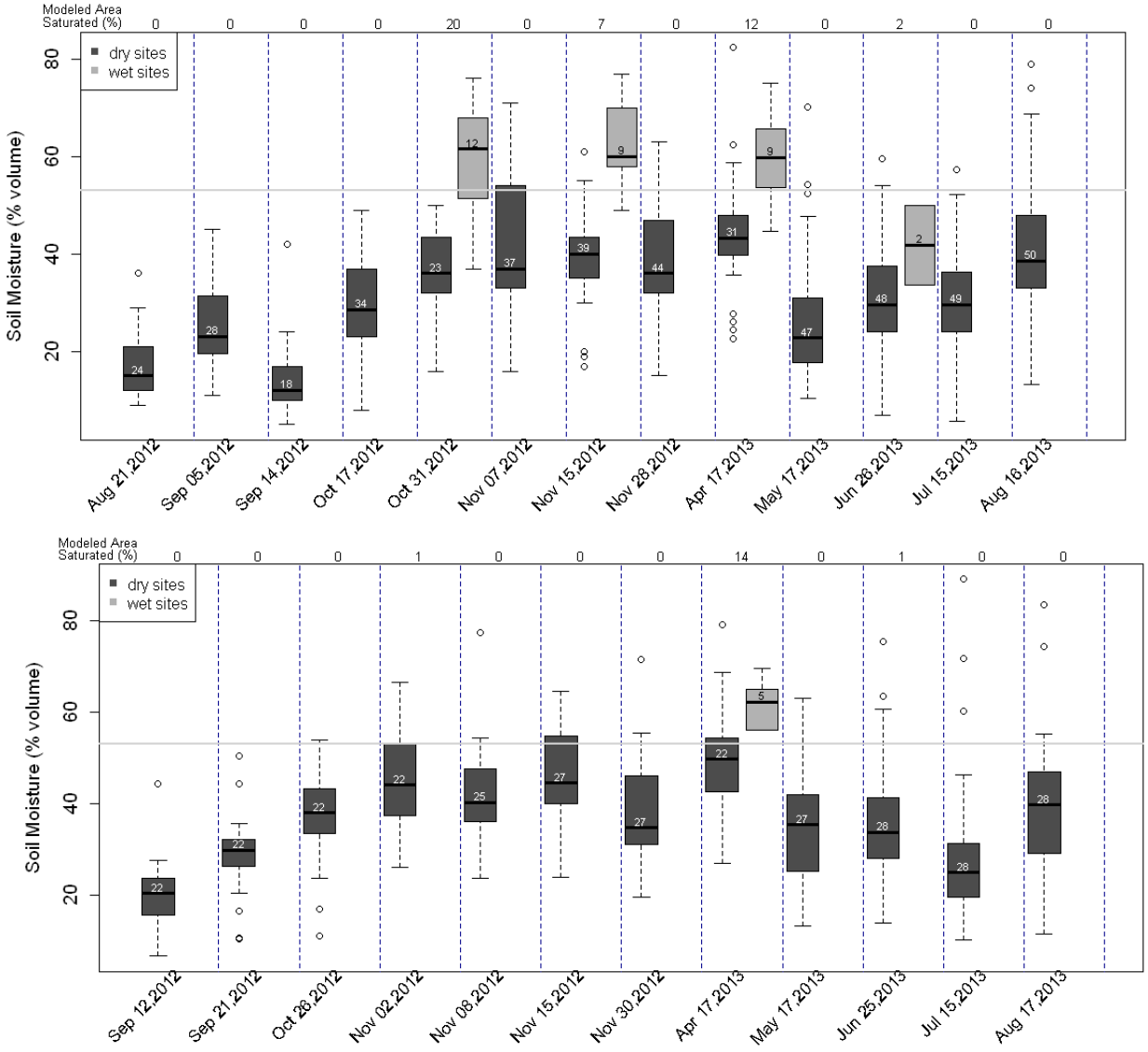
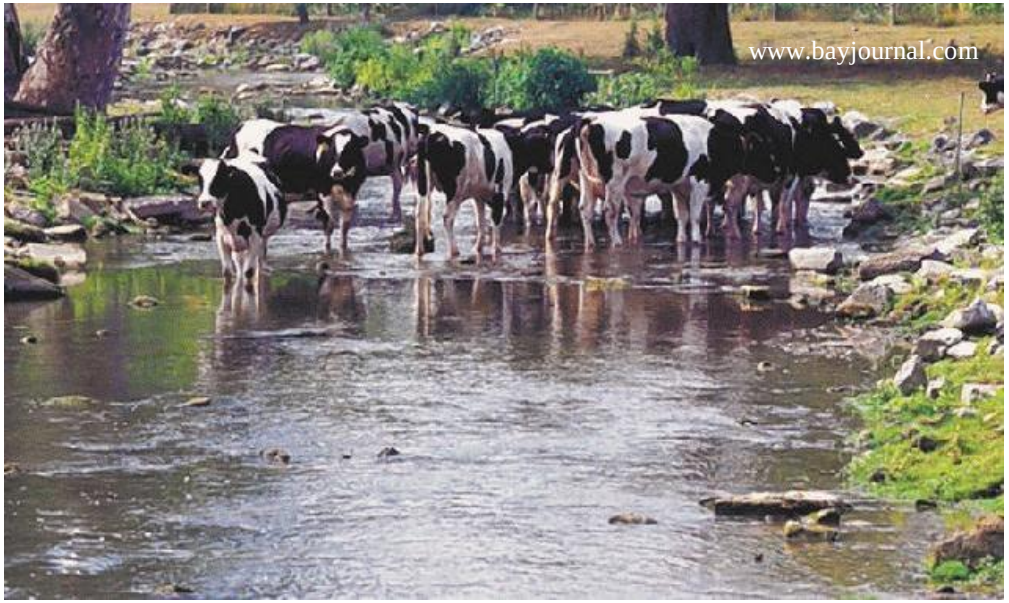
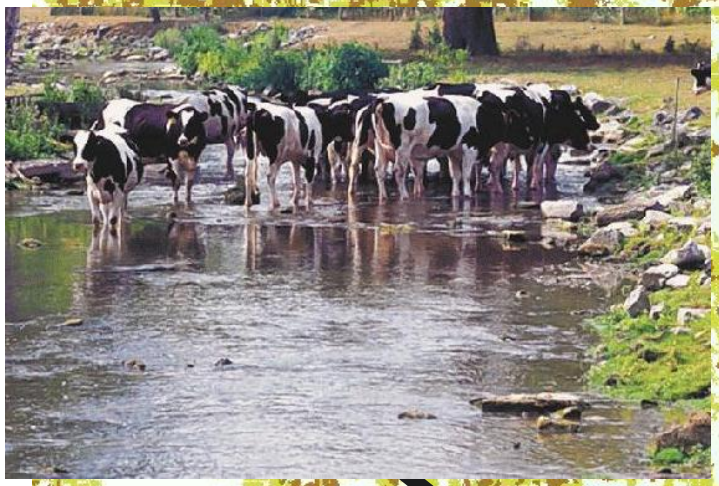
Katy Hofmeister - Dropbox
Hurricane Sandy
NPR : National Public Ra...
HSA-DSS Tool
hsadss.bee.cornell.edu
friend
Cornell University
Hydrologically Sensitive Areas Model
Date | Mon, Oct 29, 2012 | Tues, Oct 30, 2012 | Wed, Oct 31, 2012
Rain, mm | 3 | 25 | 6
Chance of rain (%) | NA | 100 | 94
% watershed saturated | 0 | 30 | 20
Map
Satellite
Auburn
Skaneateles Aero Drome
Skaneateles Lake
Owasco Lake
Pompey
Cazenovia
Union
Morrisville
Morrisville Station
Solsville
Stoney Pond State Forest
Hamilton Muni
Hamilton
New Woodstock
Highland
Truxy
Labrador Unique
Heiberg Memorial Forest
Preble
Moravia
Summer Hill State Forest
Homer
Cortland
Chase Field
Groton
Tuller Hill State Forest
Hoxie Gorge State Forest
Fillmore Glen
Summer Hill State Forest



Archibald et al. 2014. A simple, regionally parameterized model for predicting nonpoint source areas in the Northeastern US. *Journal of Hydrology: Regional Studies* (in press)

Where are the Phosphorus Sources?





Soil and Water Conservation Districts

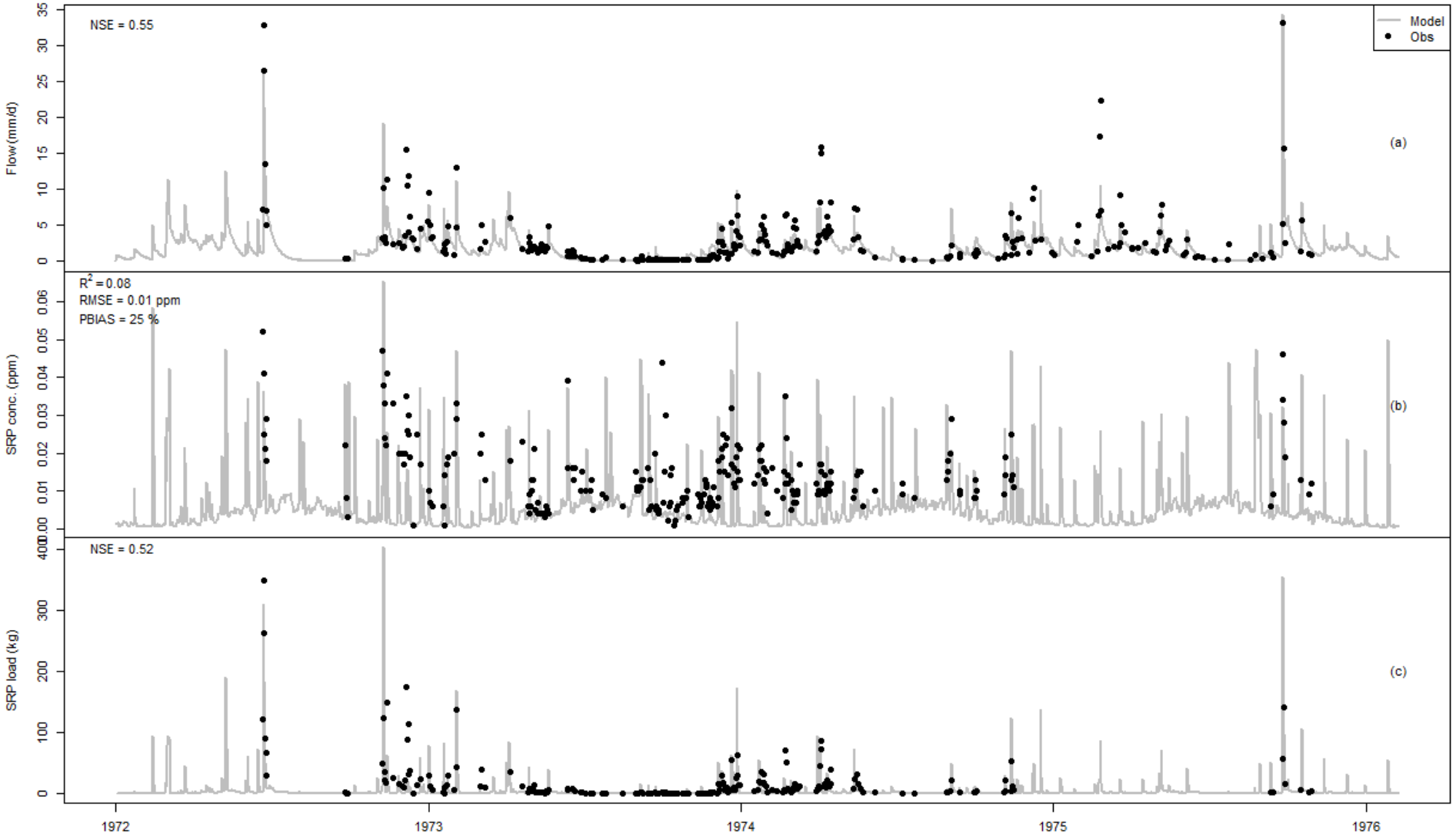
Tompkins, Cortland, Cayuga Co.

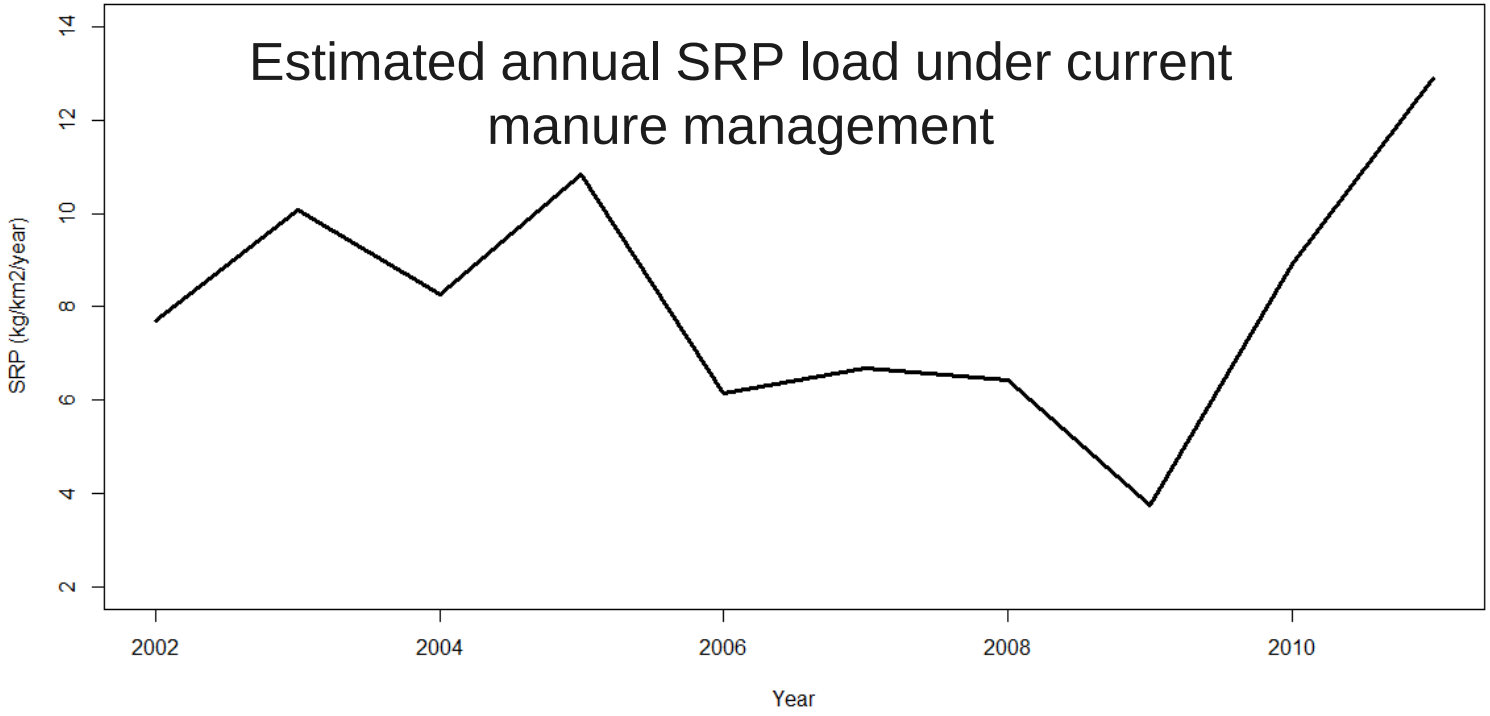
Pro-Dairy

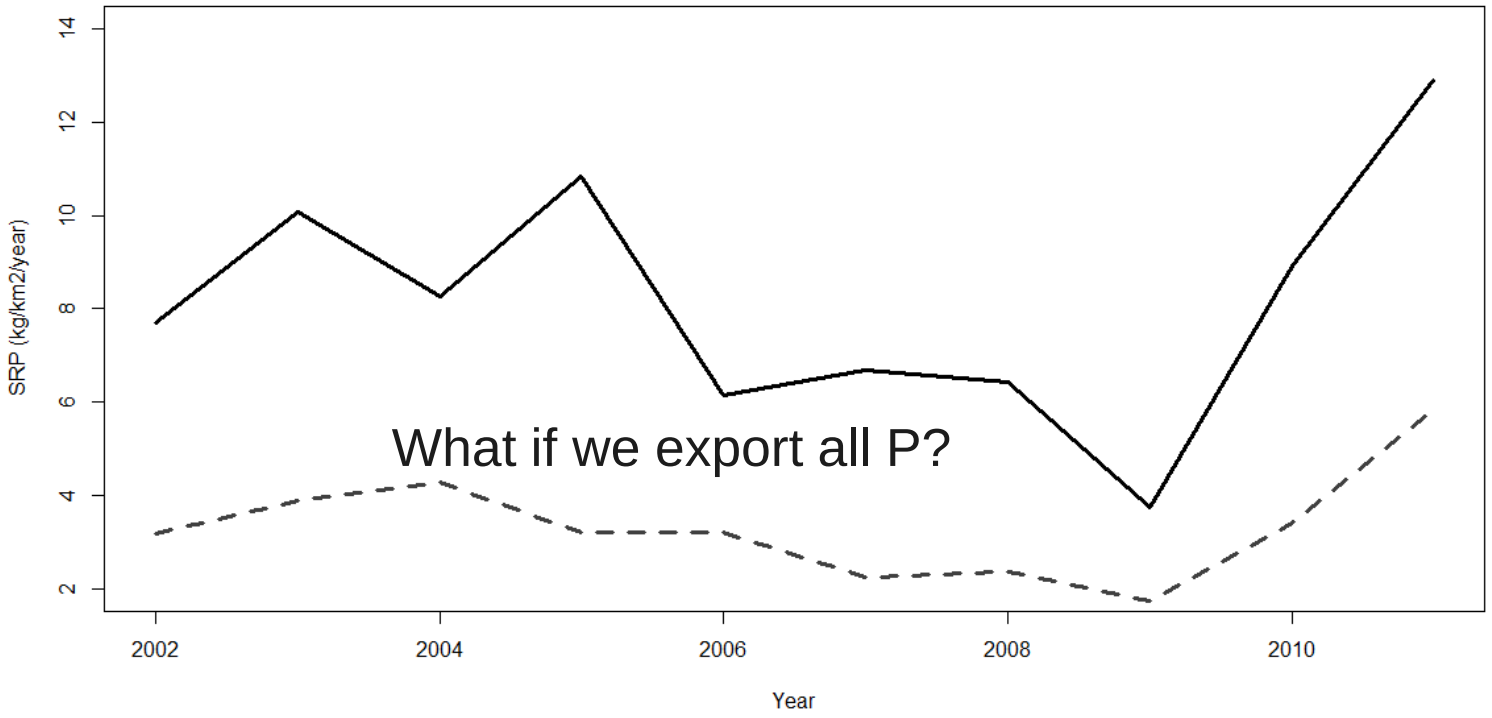
Agricultural Environmental Management

(AEM)

Bouldin data




Estimated annual SRP load under current manure management
SRP (kg/km2/year)
2
4
6
8
10
12
14
2002
2004
2006
2008
2010
Year


SRP (kg/km2/year)
2
4
6
8
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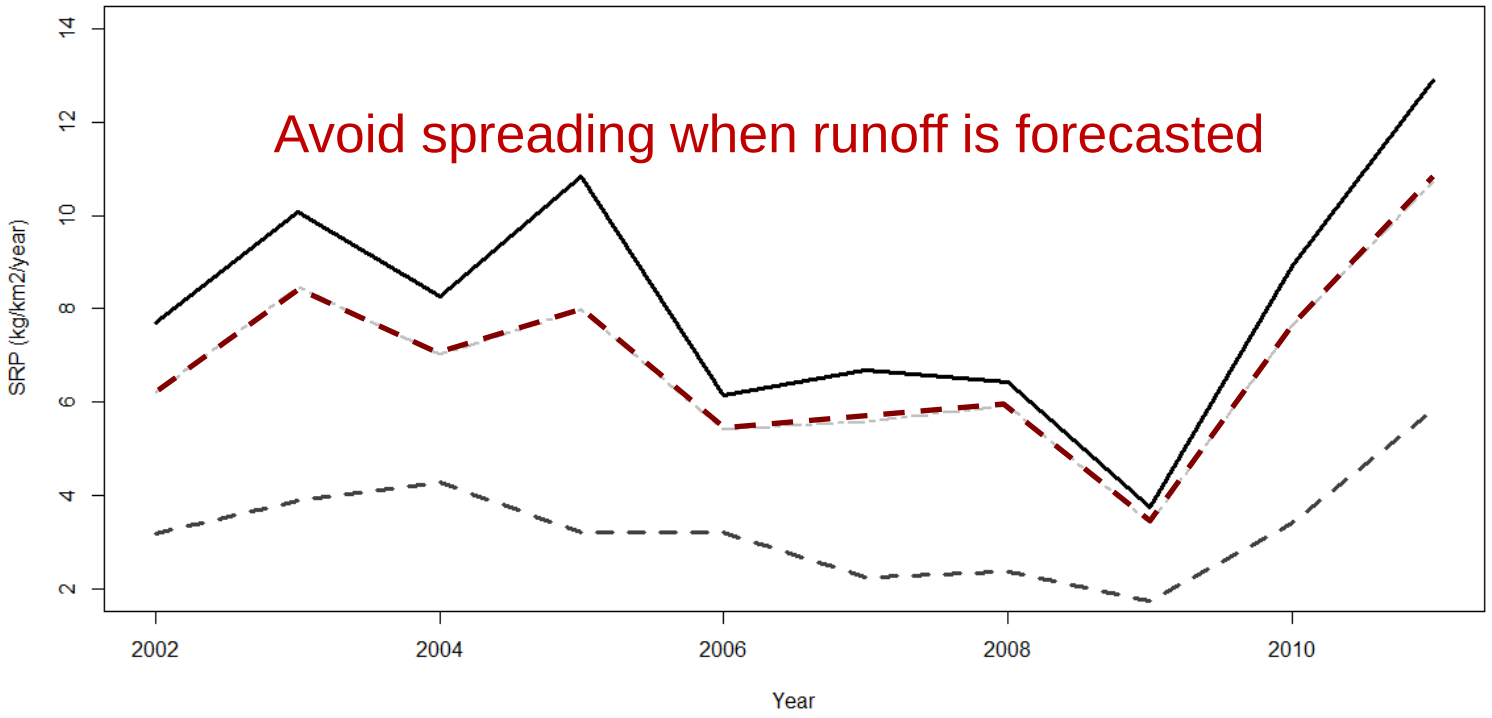
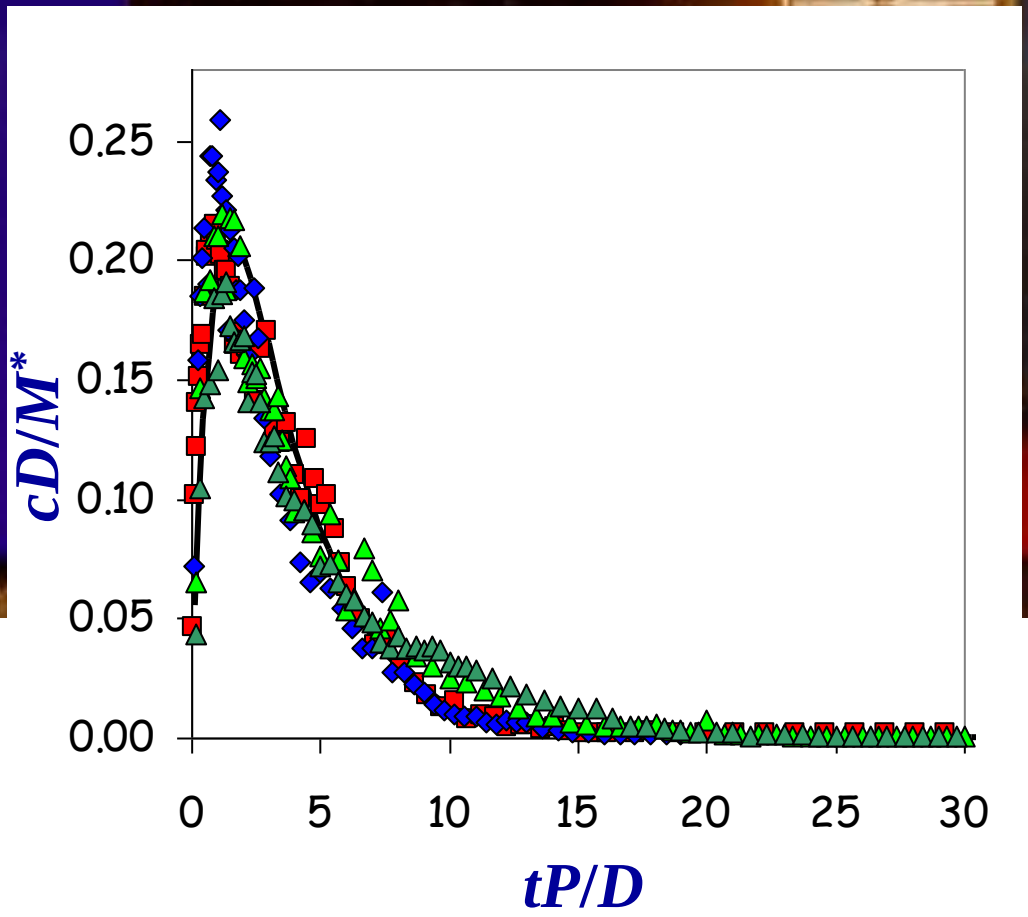
12
14
2002
2004
2006
2008
2010
Year
What if we export all P?


Avoid spreading when runoff is forecasted
SRP (kg/km2/year)
2
4
6
8
10
12
14
2002
2004
2006
2008
2010
Year

What to do about sediment?



What to do about sediment?

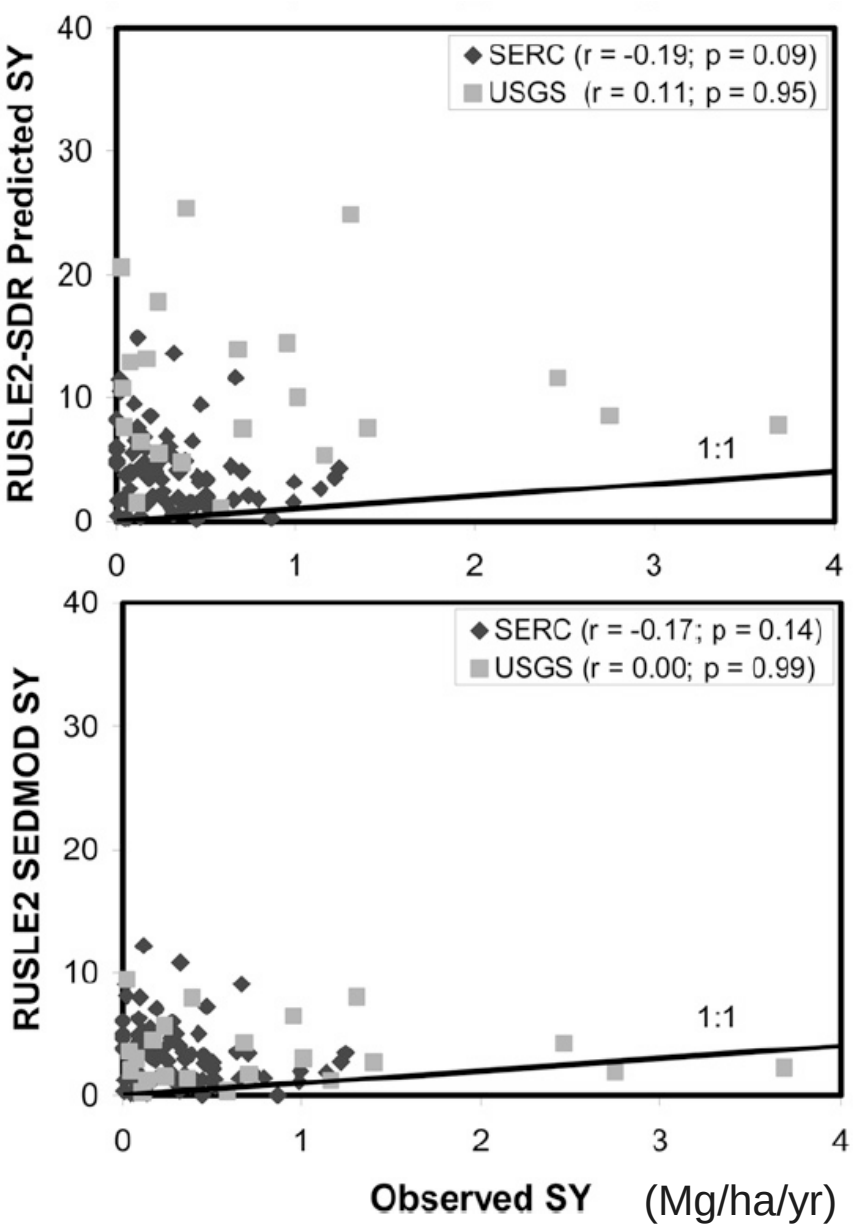
How are sediment loads currently modeled?

Universal **S**oil **L**oss **E**quation

RUSEL, MUSLE, etc.

$$A = R \times K \times L \times S \times C \times P$$

Boomer, K. et al. 2008. *Journal of Environmental Quality* 37: 79-89.



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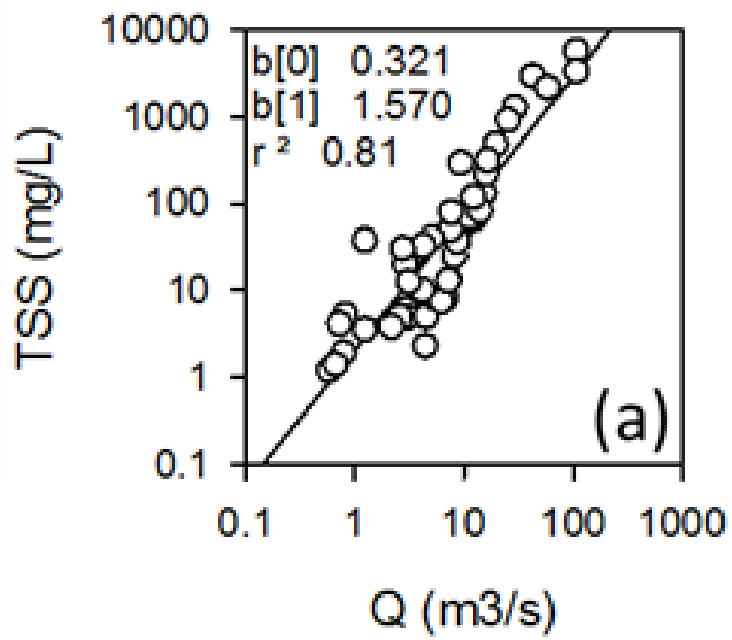

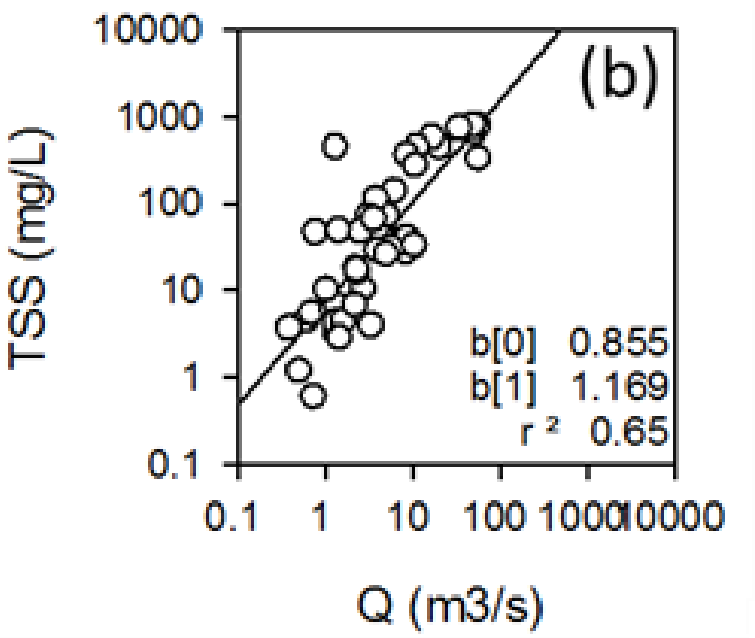

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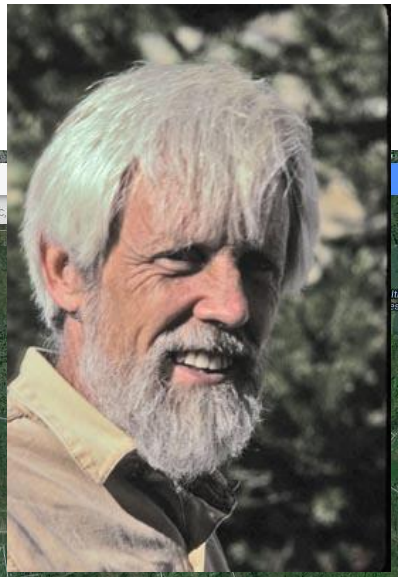
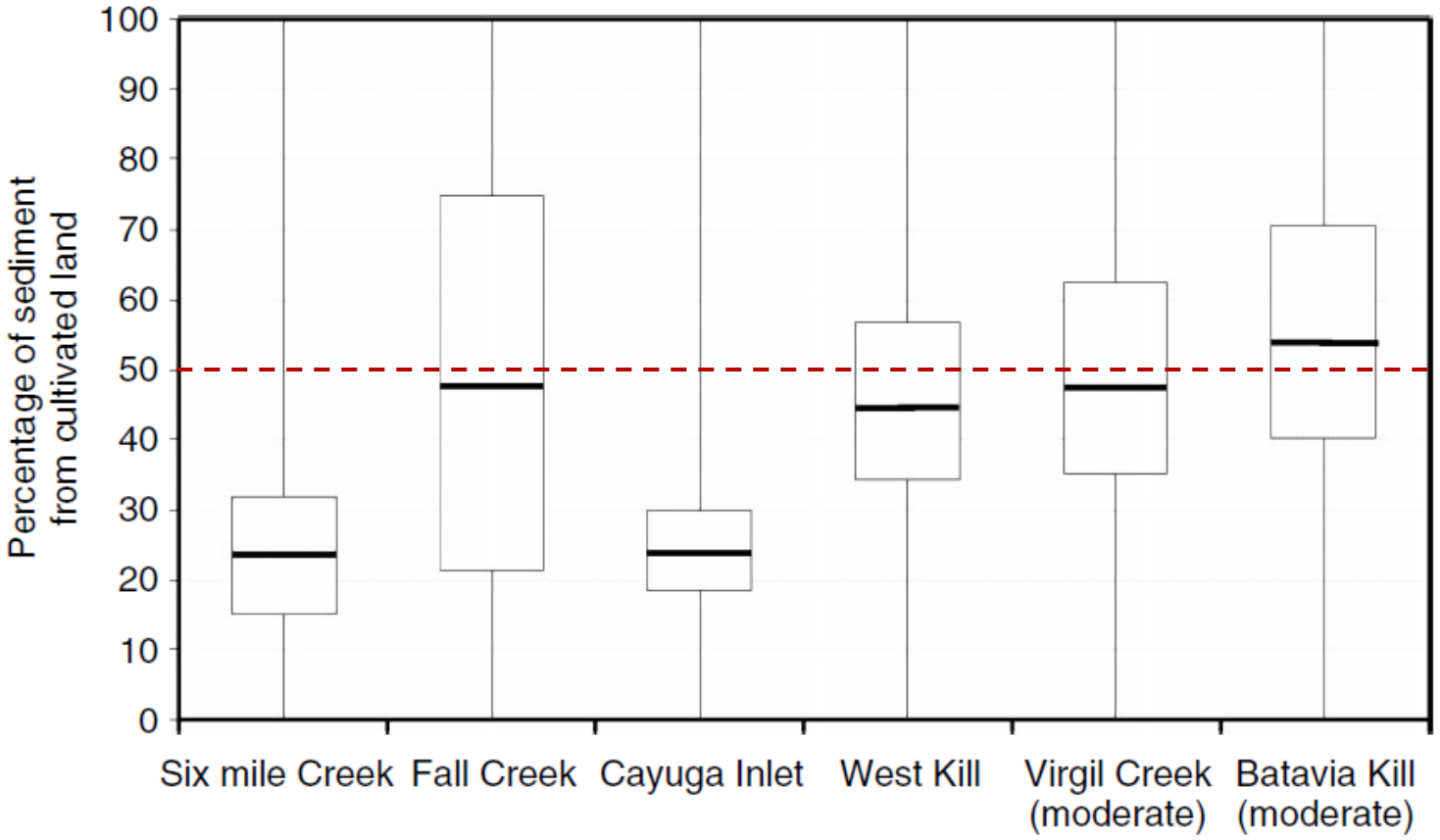


Using local expertise to help locate sediment sources

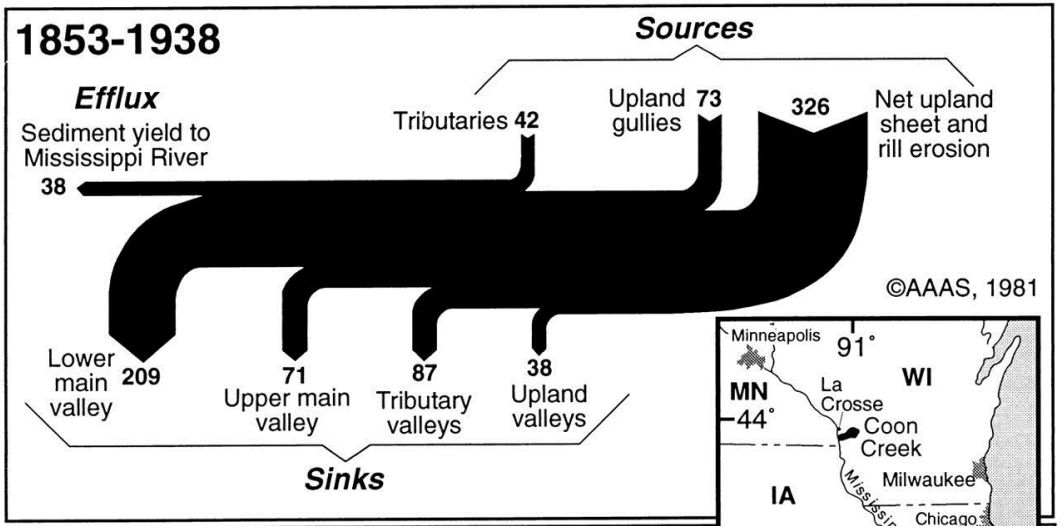
Around Cayuga Lake, 50-75% of stream sediment originates from the stream bank



Nagle, G. et al. 2007. *Hydrological Processes* 21: 821-838

Trimble, *Science* 20 August 1999: 285(5431): 1244-1246.

Units = 10^3 Mg y^{-1}



Trimble, *Science* 20 August 1999: 285(5431): 1244-1246

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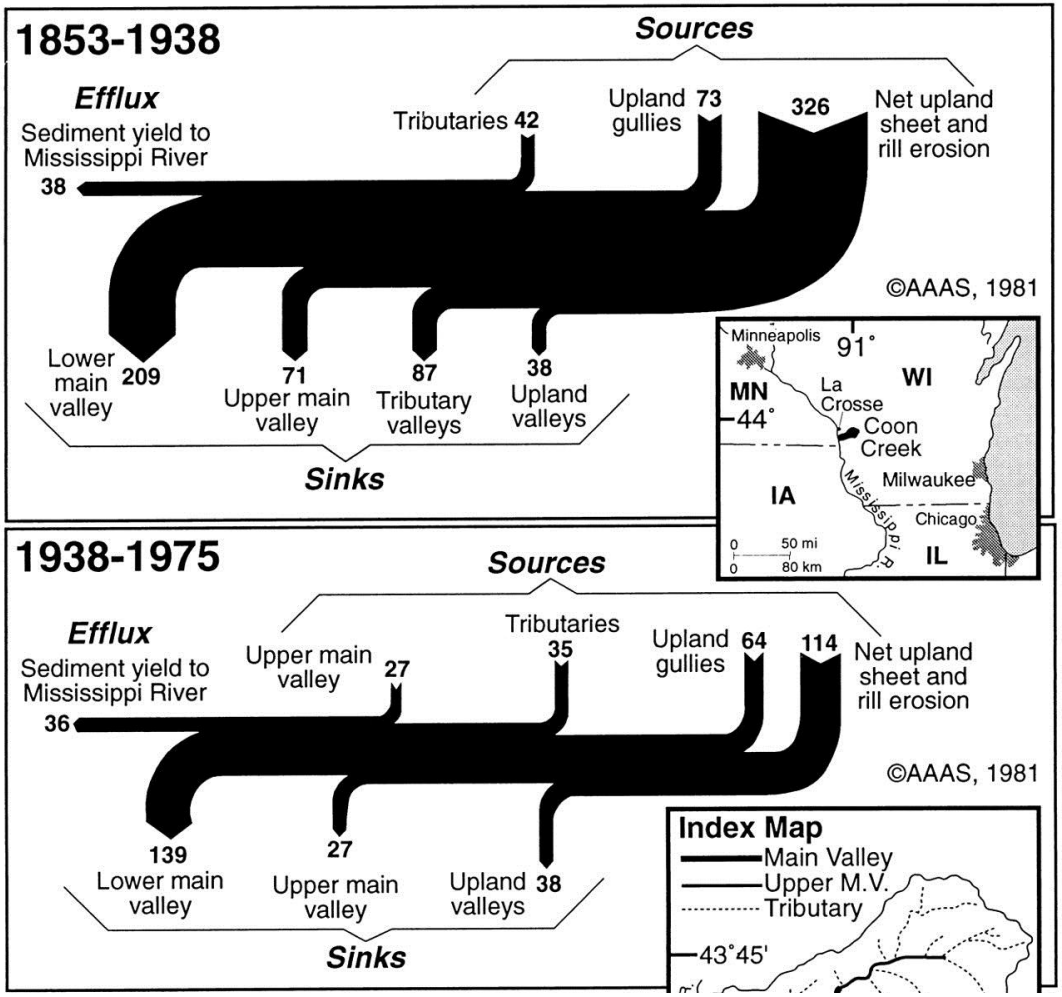

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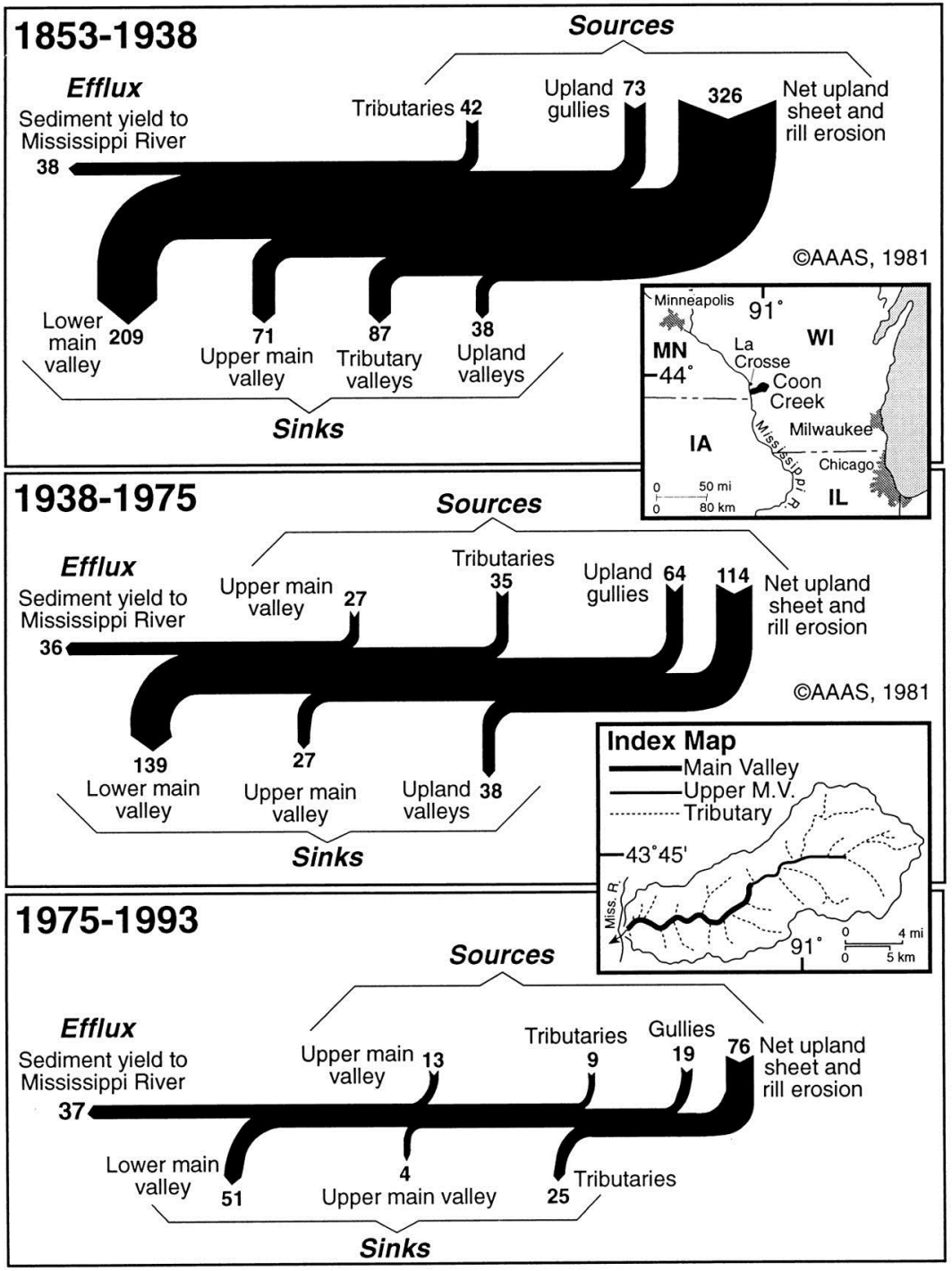

Acknowledgements

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Christine Georgakakos
Becky Marjerison

Thanks also:

UFI
Roxy Johnson, Dan Karig
Karl Czymmek, Greg Albrect, Jon Negley, Aaron Ristow, and everybody I forgot

Hydrology is the easy part

Fall Cr. discharge