

# Experimental Manipulation of Entire Watersheds through BMPs: Nutrient Fluxes, Fate and Transport and Biotic Responses

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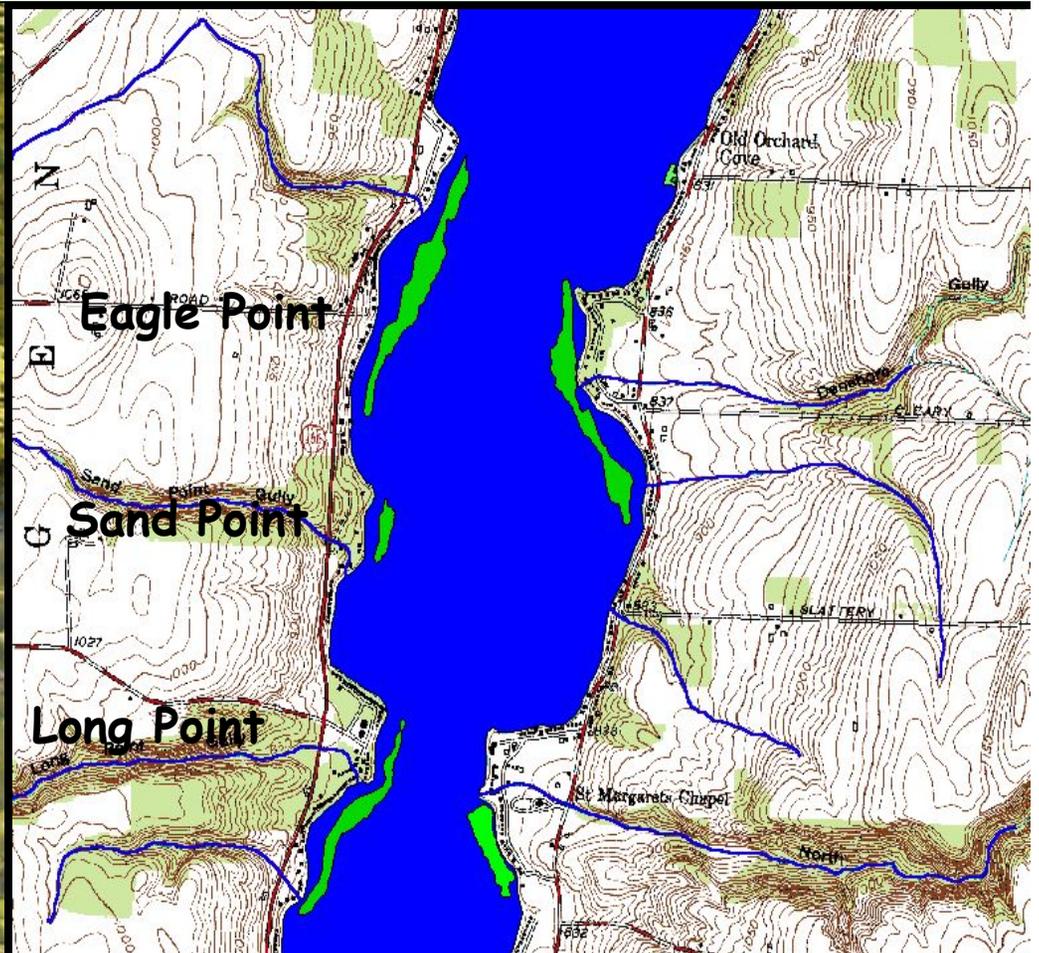


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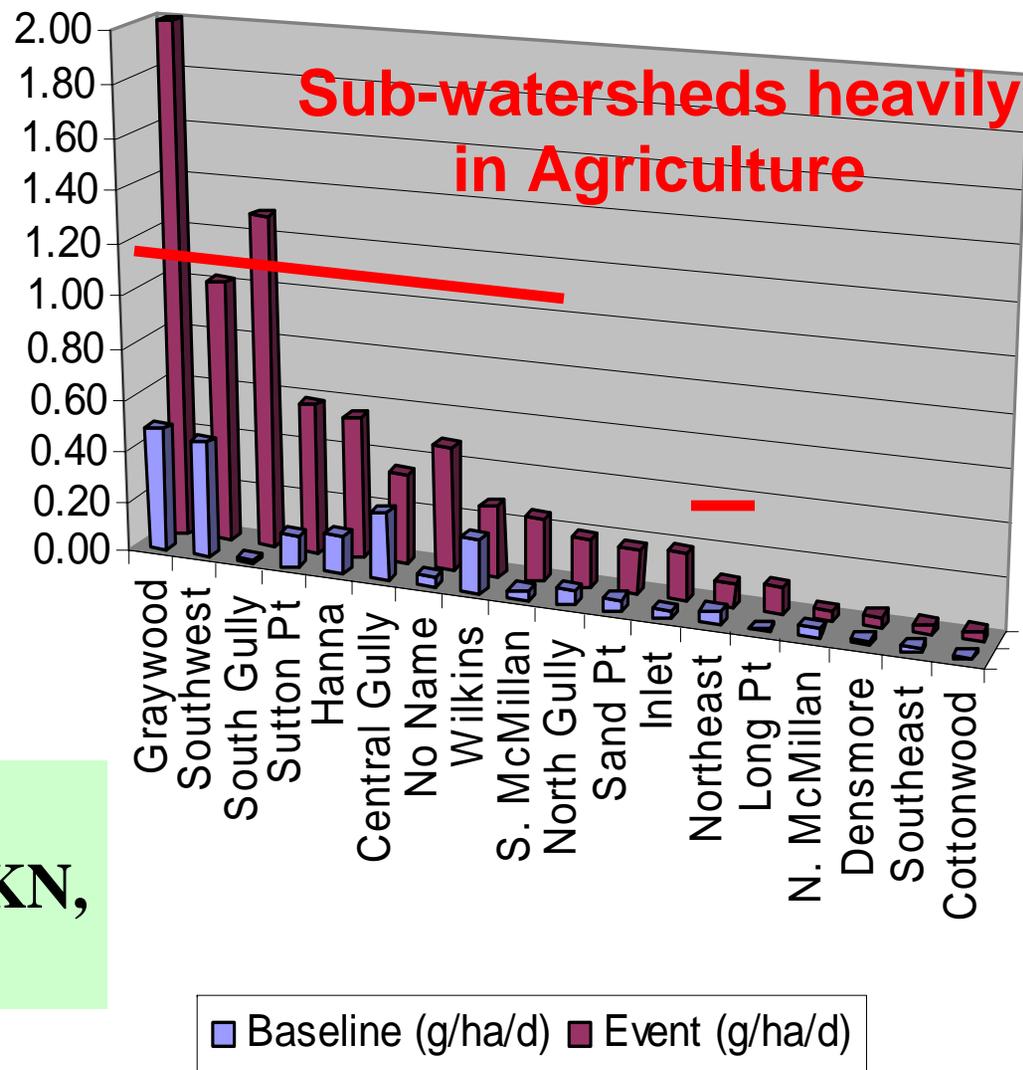
Cooperative State Research, Education and Extension Service:  
Nutrient Science for Improved Watershed Management

**Excessive growth of filamentous algae on or around milfoil beds is related to near loss of nutrients from watersheds heavily used for agriculture**

Area near stream mouths dominated by algae species *Zygnema* and *Spirogyra* which grow on Eurasian milfoil

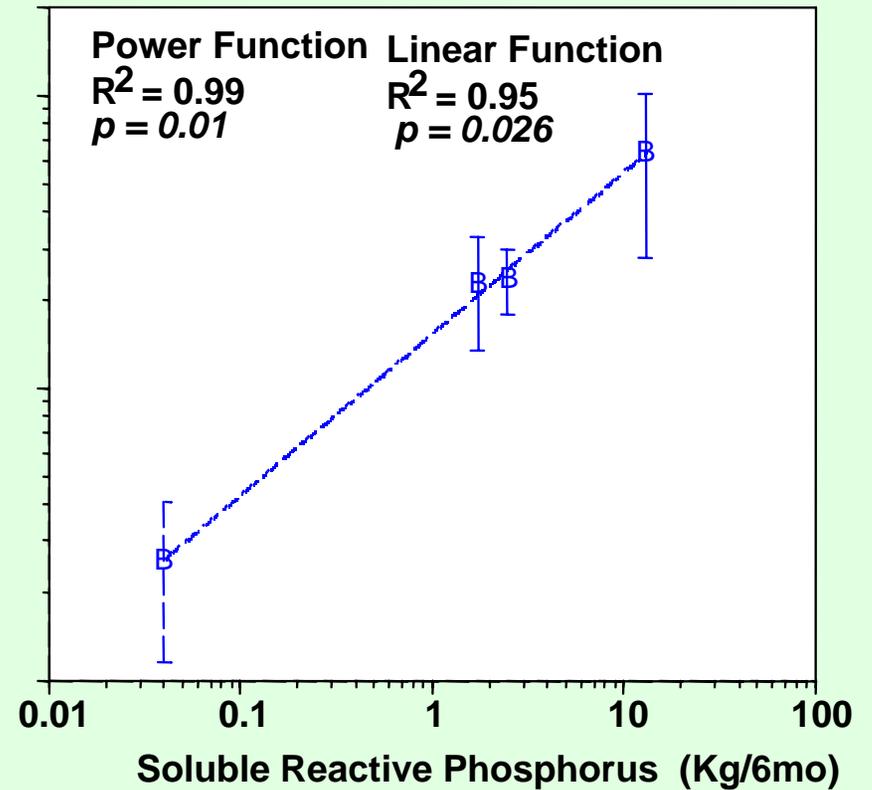
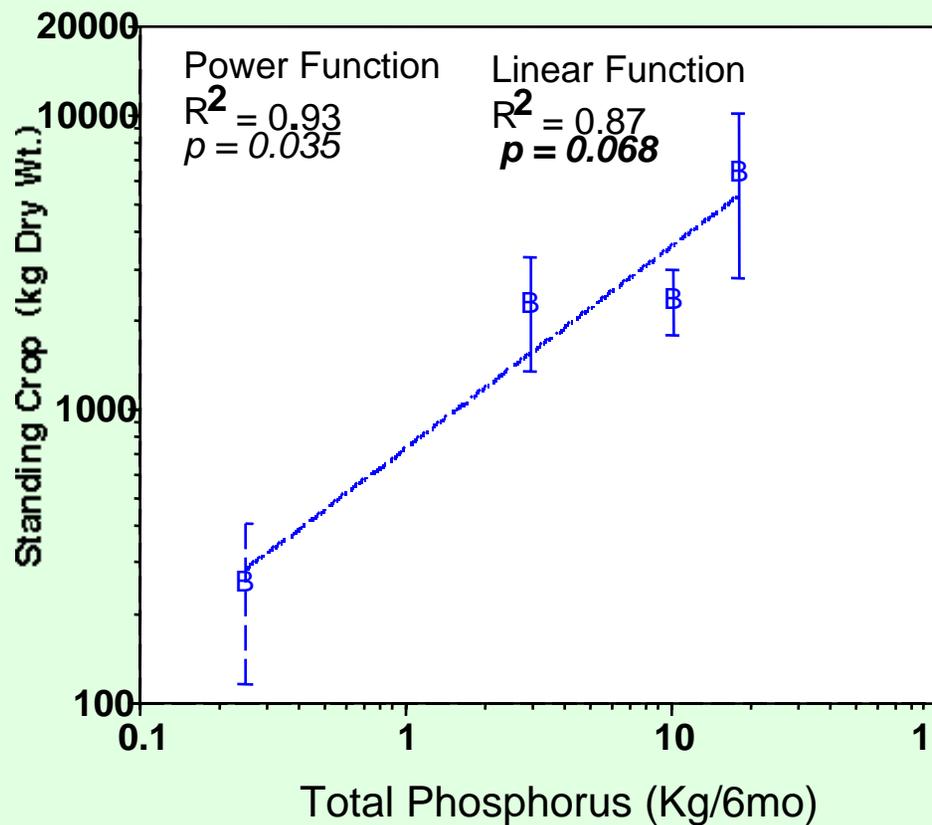


## Total Phosphorus (g/ha/d)



**High Losses  
NO<sub>3</sub>, SRP, TKN,  
TP, Soil**

# The loading of total and soluble reactive phosphorus were good predictor of the standing crop of milfoil beds in areas near the mouths of streams



## **Pre- BMPs Results**

**Greater loss of nutrients and soils from agricultural watersheds – especially during hydrometeorologic events**

**Elevated levels of NO<sub>3</sub>, SRP, TP, TKN and soil in streams**

**Macrophyte beds in lake associated with watersheds in agriculture – stream mouths**

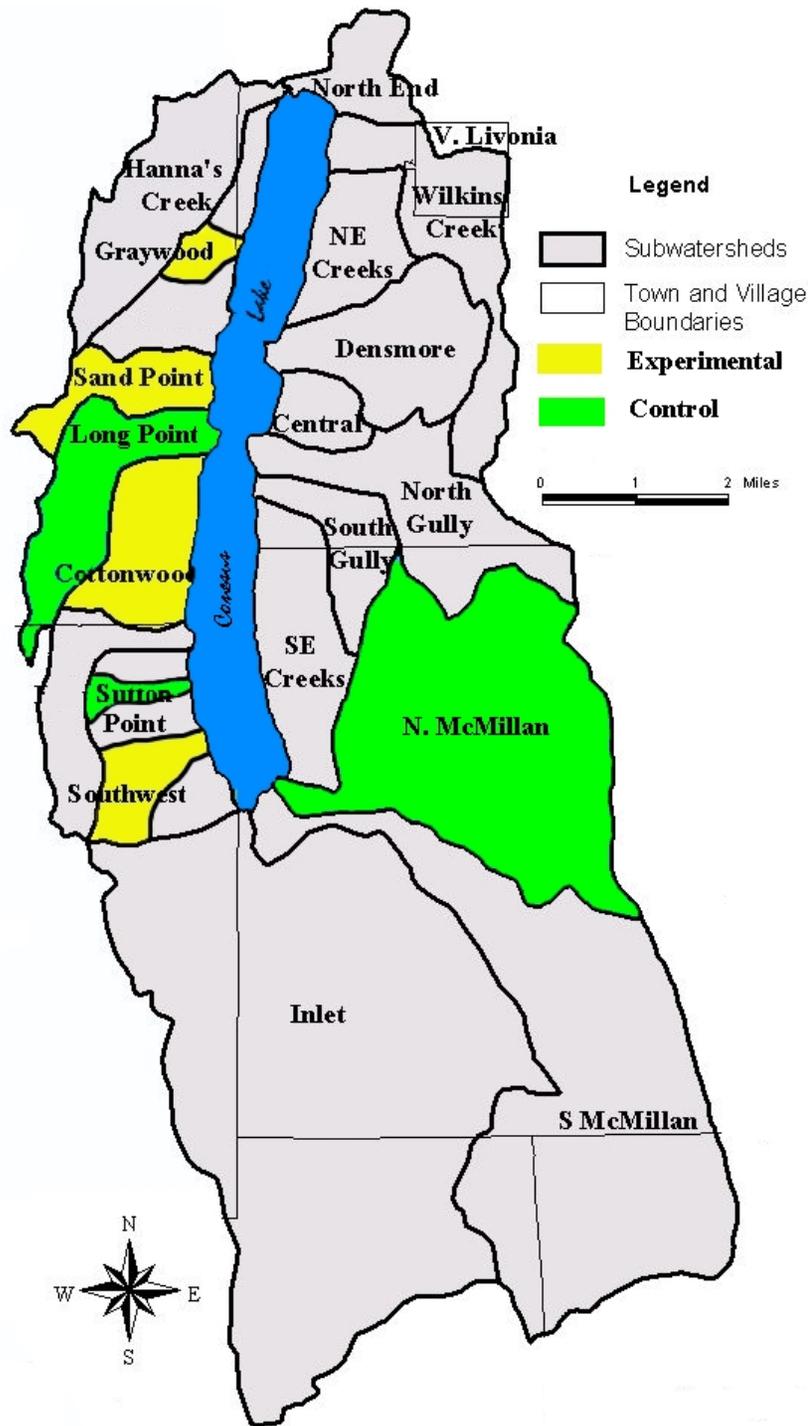
**Macrophyte biomass highly correlated with phosphorus loading**

**Algae biomass at stream mouths stimulated by water from watershed**

# **Experimental Manipulation of Entire Watersheds through BMPs: Nutrient Fluxes, Fate and Transport and Biotic Responses**

## **Goals**

- 1. To demonstrate, through the experimental watershed approach, that implementation of BMPs in agricultural dominated watersheds will preserve soil and reduce nutrient loss from a series of sub-watersheds.**
- 2. To evaluate the impact of instituted BMPs by considering the impacts on the down stream lake community on the watershed scale.**
- 3. To evaluate the fate and transport of nutrients over space and time.**



## Design of Study

### Experimental Watersheds

Graywood Creek – 33.8 ha

Sand Point Gully – 325.0 ha

Cottonwood Ck – 76 ha

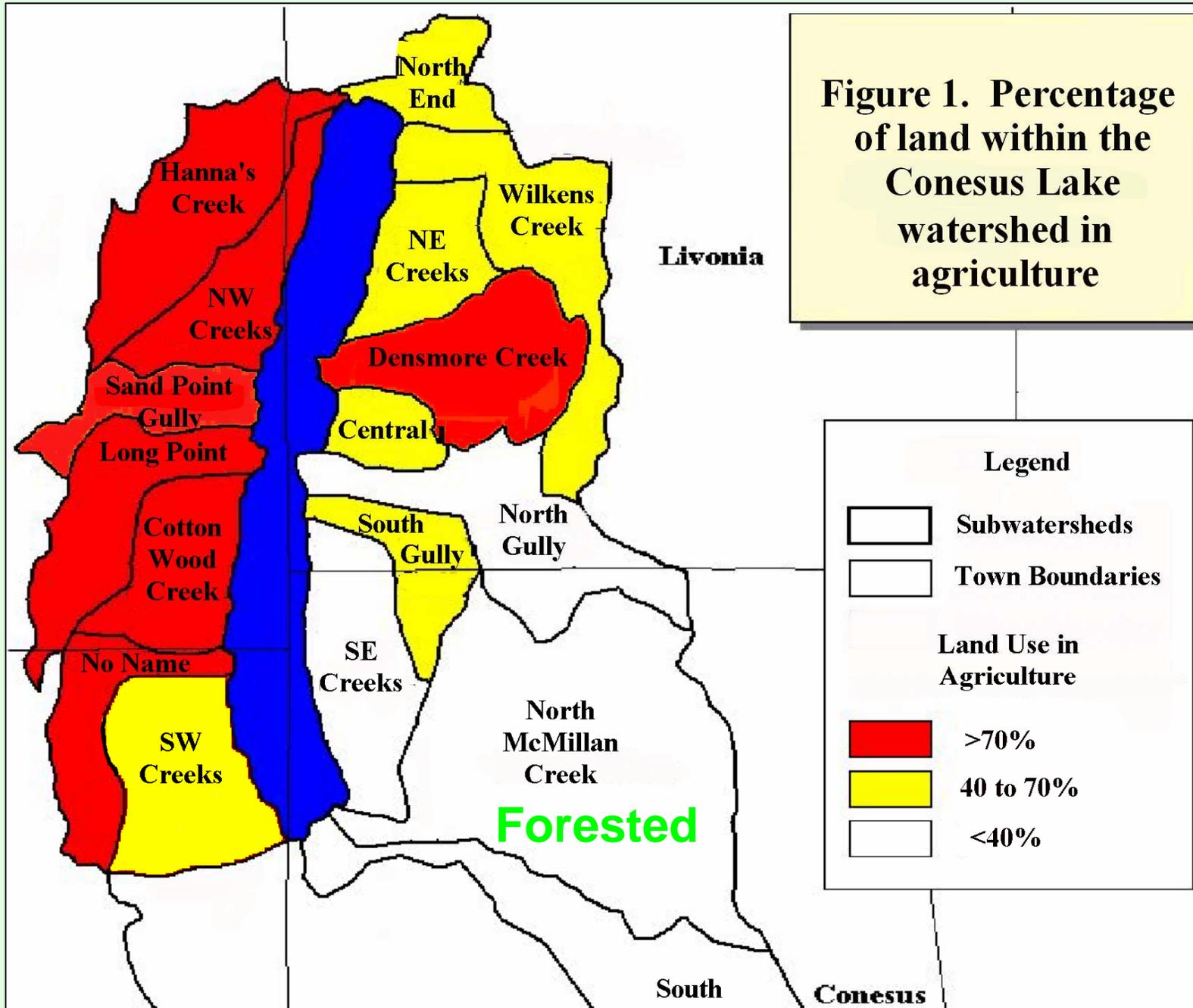
Southwest Gully – 636 ha

### Control Watersheds

Sutton Point Gully – 62.2 ha

Long Point Gully – 622.5 ha

North McMillan Ck. – 2045 ha



Hanna's Creek  
 NW Creeks  
 Sand Point Gully  
 Long Point  
 Cotton Wood Creek  
 No Name  
 SW Creeks

North End  
 NE Creeks  
 Wilkens Creek  
 Densmore Creek  
 Central Gully  
 South Gully  
 SE Creeks

North Gully  
 North McMillan Creek

**Forested**

Livonia

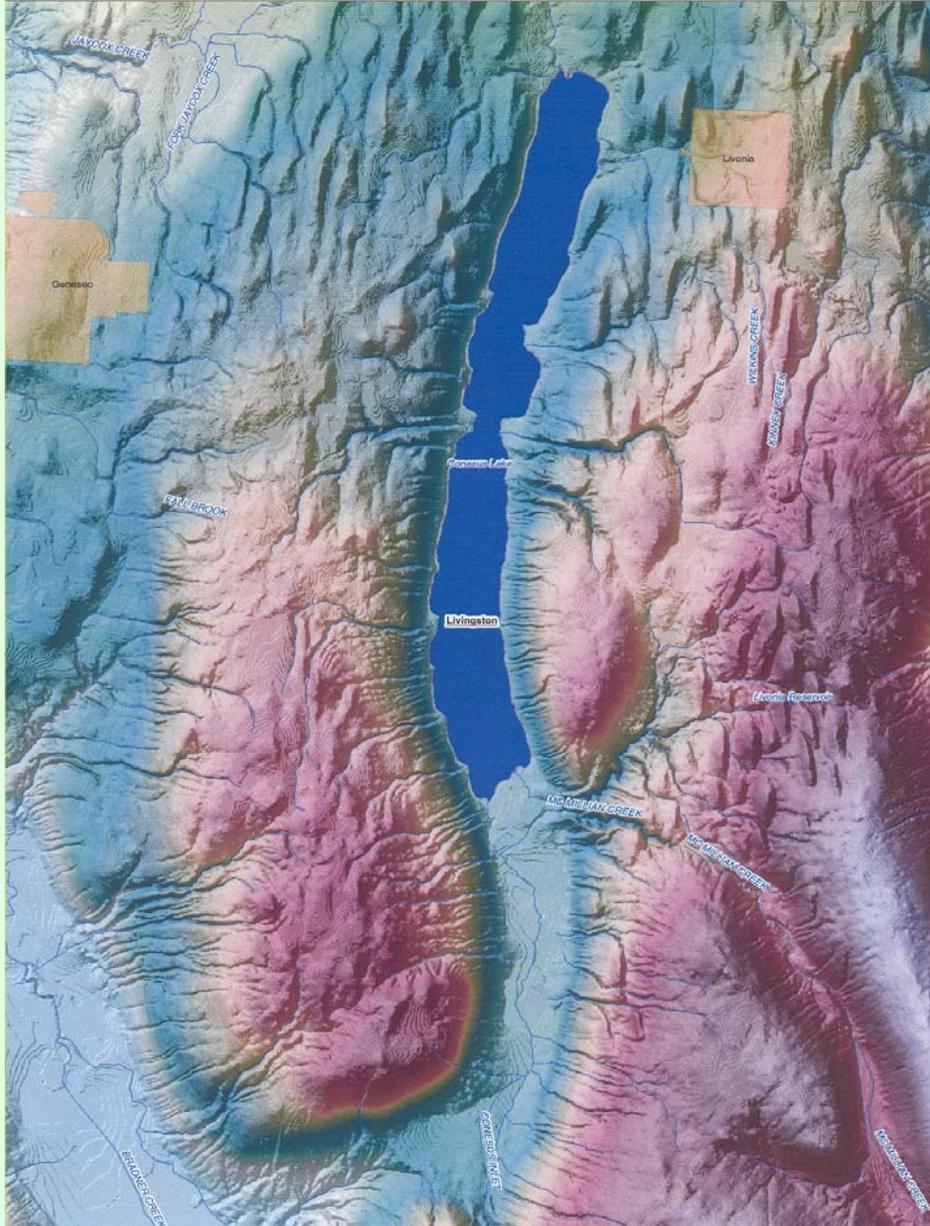
South Conesus

# Conesus Lake



SUNY BROCKPORT

0 1.25 2.5 5 Kilometers



**Finger Lakes  
7- 30 miles in length**

**Steep-sided watershed  
in agriculture**

**Corn, soybean, hay**

**CAFO operations**

## Collaborative approach of local agricultural agencies, the farming and academic community



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# Agricultural Environmental Management (AEM) Planning (Exp. Watersheds)

- \*Total farm planning
- \*Nutrient Reduction
- \*Runoff reduction
- \*Silage
- \*Strip cropping

Maxwell Farm, Graywood Gully Watershed, September 2002. Future site of strip cropping, diversion ditches and terracing.



Diversion Ditch, Terracing

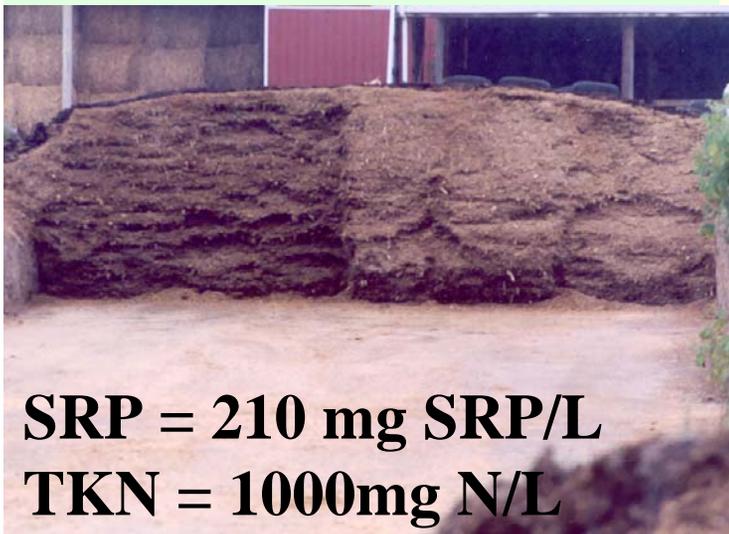
Graywood

Strip Cropping Nutrient Mgmt

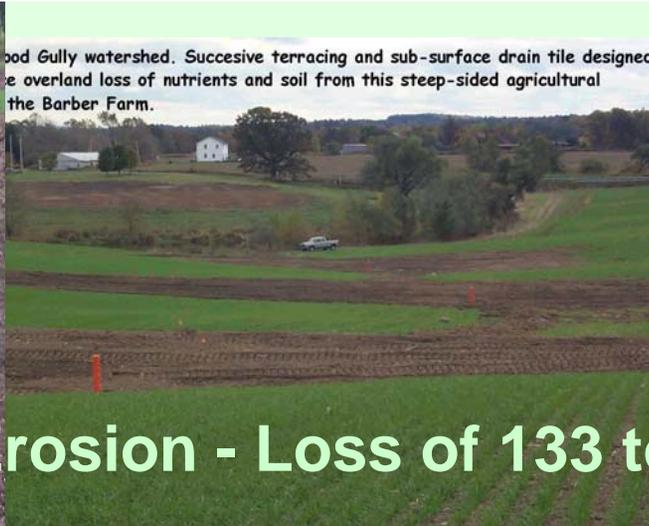
W Lake Road

Eagle Point Dr.

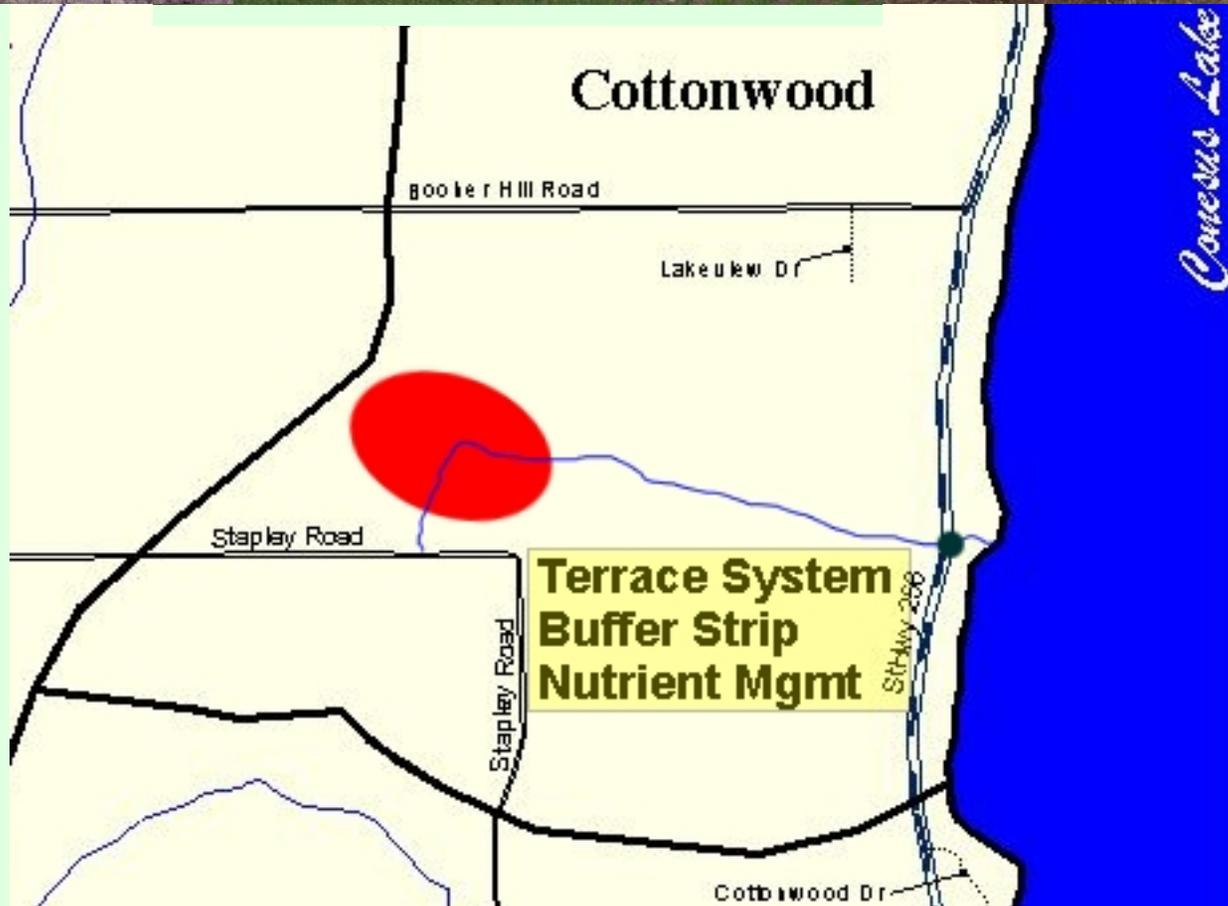
Chattahoochee



SRP = 210 mg SRP/L  
TKN = 1000mg N/L



**Gully Erosion - Loss of 133 tons per year**





# Design: Four experimental and three control watersheds



Pre- and Post- BMP monitoring of stream sites (continuous flow and chemistry)

## **Monitoring Post- Best Management Plans**

### **SUNY Brockport**

- Joe Makarewicz** – Organization, Nutrient and hydrologic data
- Ted Lewis** - Web, Field and Laboratory work
- Mark Noll** - GIS and Sediment Phosphorus
- Jim Zollweg** - Watershed Models

### **SUNY Geneseo**

- Sid Bosch** - Macrophytes and metaphyton
- Bob Simon** - Bacterial abundance -coliforms, BST

### **Rochester Institute of Technology**

- Tony Vodacek** - Stream mouth modeling and imagery

### **Cornell Cooperative Extension**

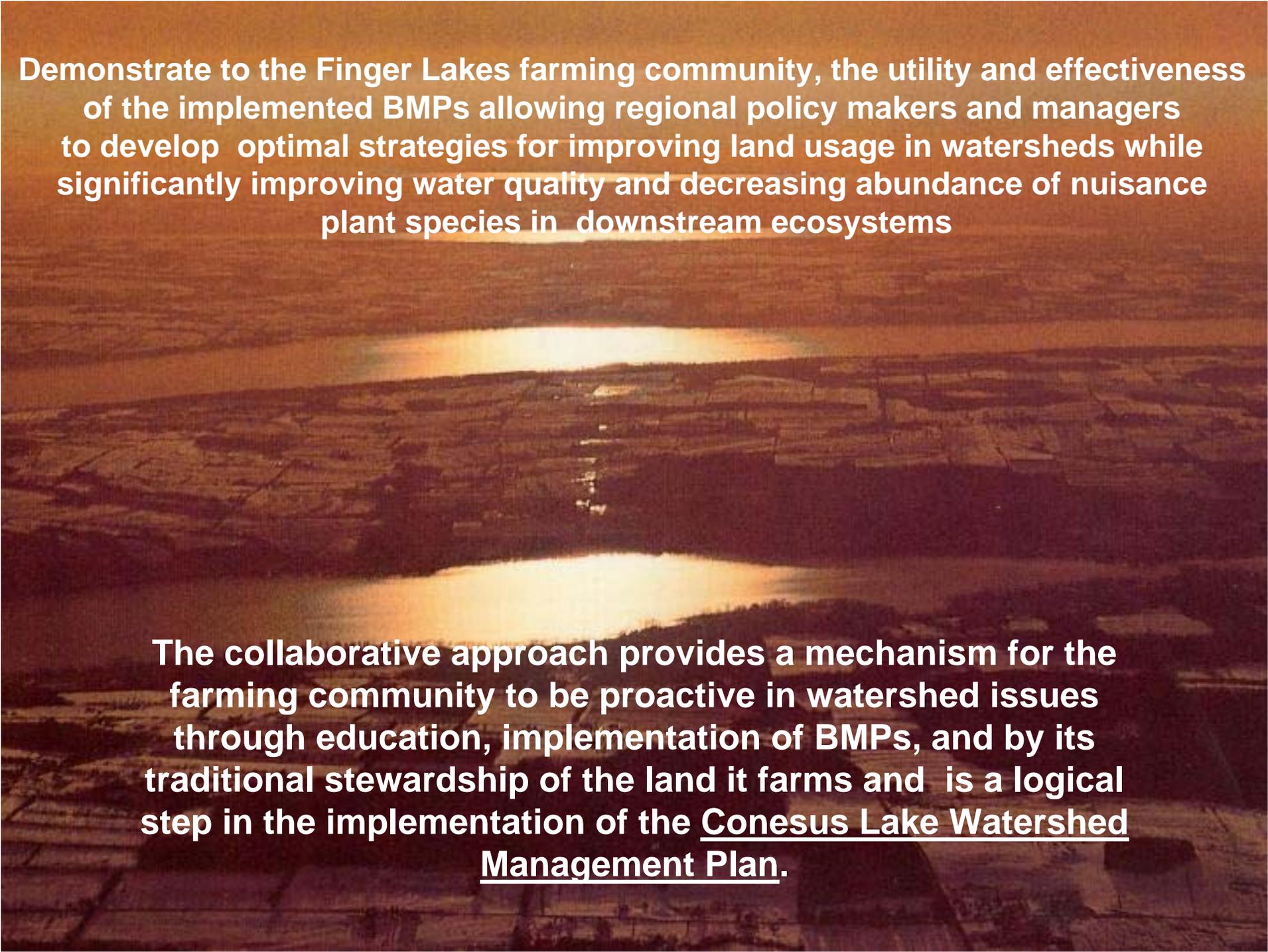
- Nate Herendeen** – AEM, Soil analysis, soil nutrient assessment, outreach

### **Livingston County SWCD**

- Pete Kanouse** - Construction, liason

### **Livingston County Planning**

- David Woods** - Liason

An aerial photograph of a large, calm lake in a rural landscape. The lake is surrounded by fields and trees, with a small stream or inlet visible. The overall scene is peaceful and scenic, with a mix of green and brown tones.

**Demonstrate to the Finger Lakes farming community, the utility and effectiveness of the implemented BMPs allowing regional policy makers and managers to develop optimal strategies for improving land usage in watersheds while significantly improving water quality and decreasing abundance of nuisance plant species in downstream ecosystems**

**The collaborative approach provides a mechanism for the farming community to be proactive in watershed issues through education, implementation of BMPs, and by its traditional stewardship of the land it farms and is a logical step in the implementation of the Conesus Lake Watershed Management Plan.**



# Runoff and Soil Moisture Modeling with SMR

- SMR – The Soil Moisture Routing Model
- Product of Zollweg's Thesis
- GIS is the Ideal Environmental Modeling Platform
- Spatially-distributed, Physically-based

