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

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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.
Sub-watersheds heavily in Agriculture

High Losses NO₃, SRP, TKN, TP, Soil
The loading of total and soluble reactive phosphorus were good predictors 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 NO₃, 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
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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 downstream 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
Figure 1. Percentage of land within the Conesus Lake watershed in agriculture.

Legend:
- Subwatersheds
- Town Boundaries
- Land Use in Agriculture
  - >70%
  - 40 to 70%
  - <40%

Forested
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

Cooperative State Research, Education and Extension Service: Nutrient Science for Improved Watershed Management
Agricultural Environmental Management (AEM) Planning (Exp. Watersheds)

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

SRP = 210 mg SRP/L
TKN = 1000 mg N/L
Gully Erosion - Loss of 133 tons per year
Dairy Knoll Farms, 700 cows, 2200 acres, Manure Issue
Design: Four experimental and three control watersheds.
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 - Macropytes 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
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.
WELCOME TO CONESUS LAKE WATERSHED
HELP PROTECT OUR WATER SUPPLY
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