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

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SUNY Brockport (Lead Institution)
SUNY Geneseo
Rochester Institute of Technology
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Livingston County Soil and Water Conservation District
Livingston County Planning Department
Livingston County Farm Service

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

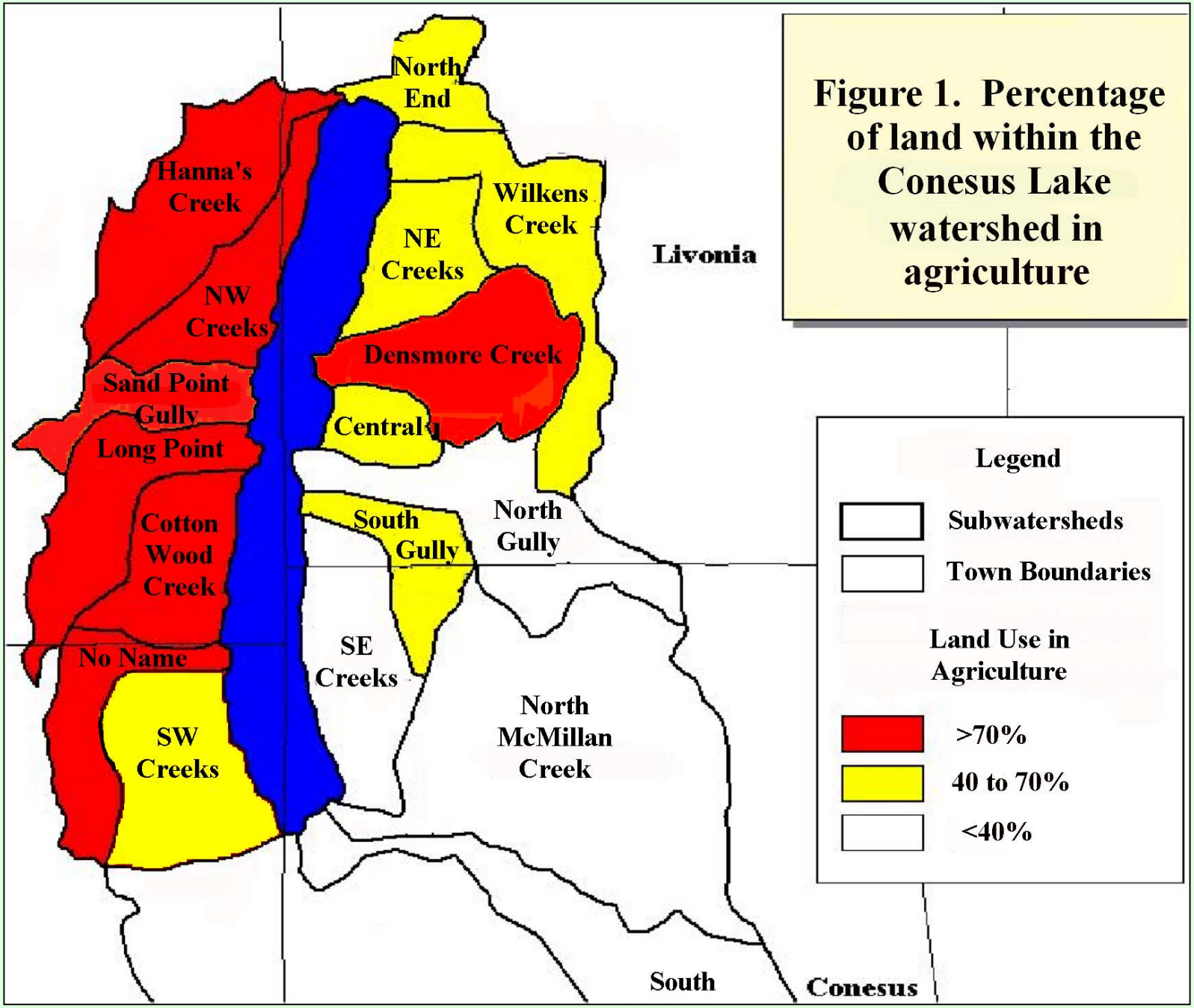
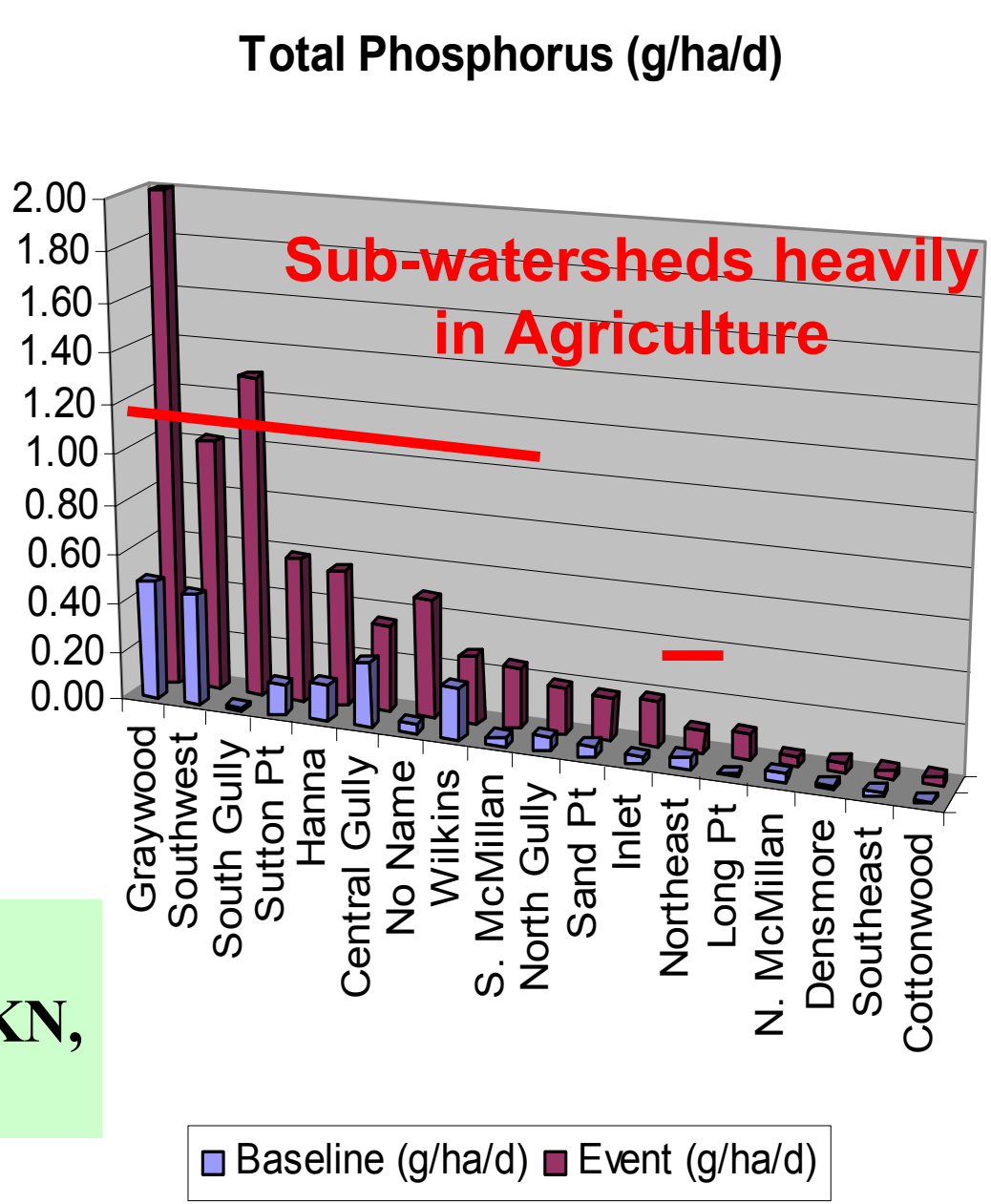
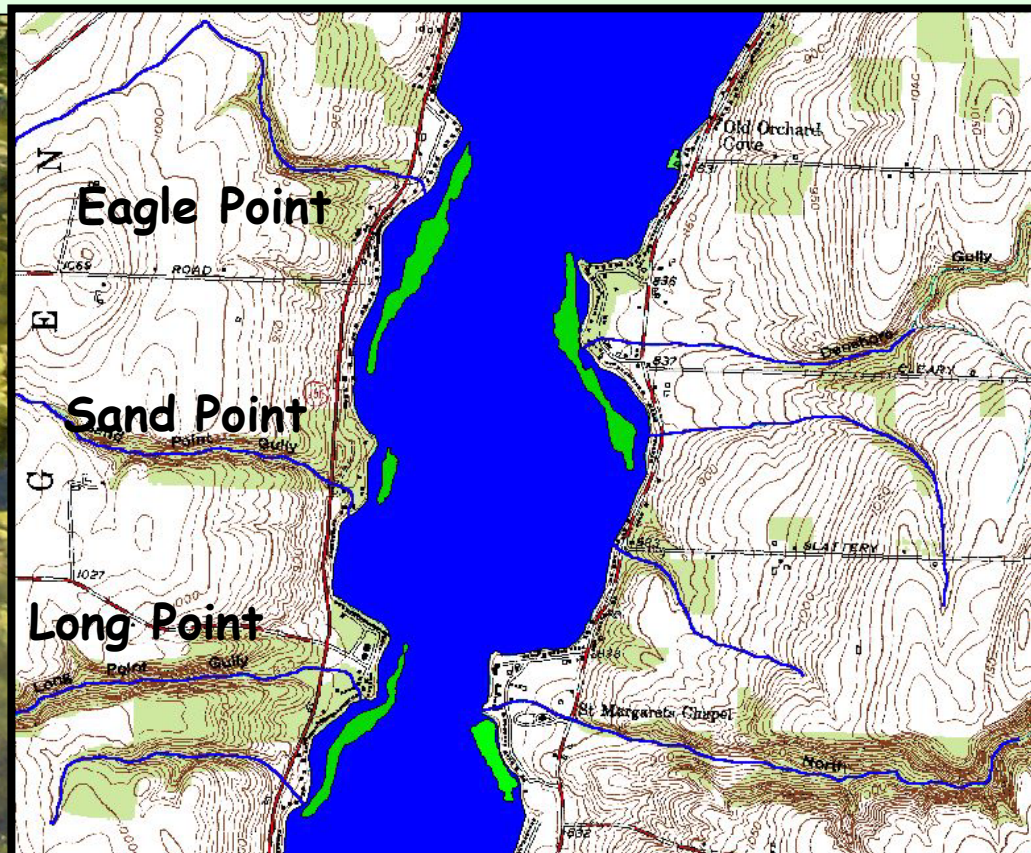


Figure 1. Percentage of land within the Conesus Lake watershed in agriculture
North End
Hanna's Creek
Wilkens Creek
NE Creeks
Livonia
NW Creeks
Densmore Creek
Sand Point Gully
Central
Long Point
South Gully
North Gully
Cotton Wood Creek
SE Creeks
No Name
North McMillan Creek
SW Creeks
South Conesus
Legend
Subwatersheds
Town Boundaries
Land Use in Agriculture
>70%
40 to 70%
<40%

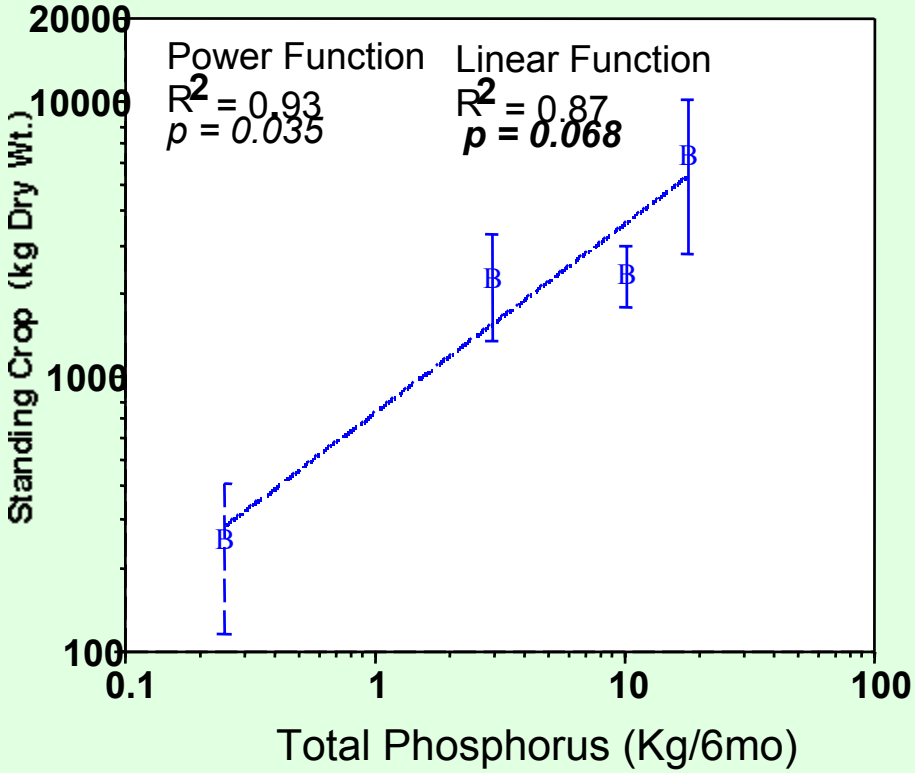


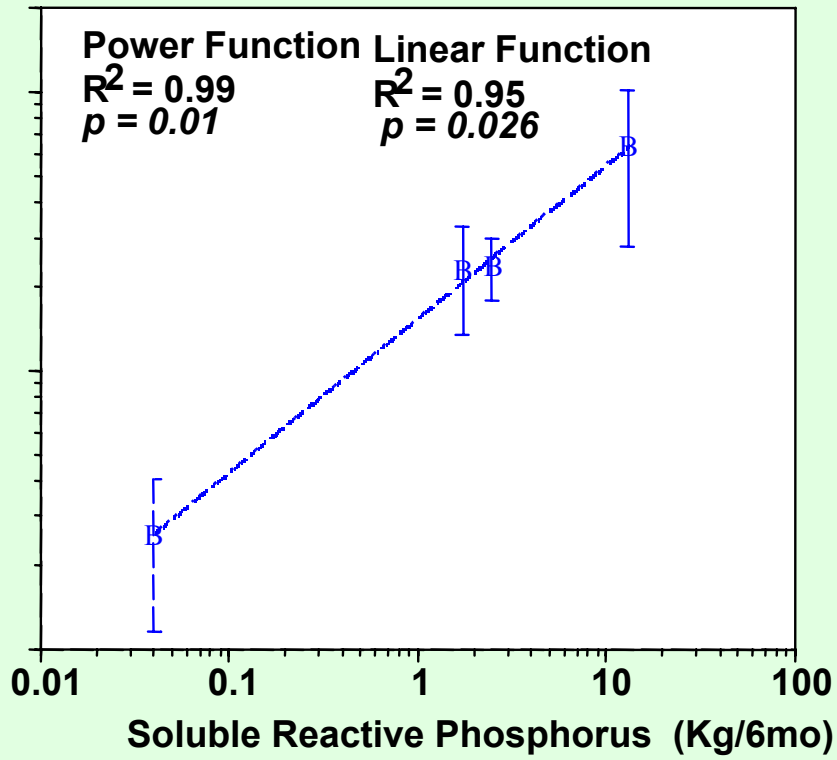
High Losses NO_3, SRP, TKN, TP Soil, Na

During each of the last three years we have mapped the position of milfoil beds (I.e. > 75% milfoil) in Conesus Lake (beds are shown in green for the central part of the lake) using GPS technology. Excessive growth of filamentous algae on or around milfoil beds is related to near loss of nutrients from watersheds heavily used for agriculture. The surface area measurements we obtain by GPS are multiplied by biomass quadrat measures to estimate the standing crops of milfoil at each site.



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.

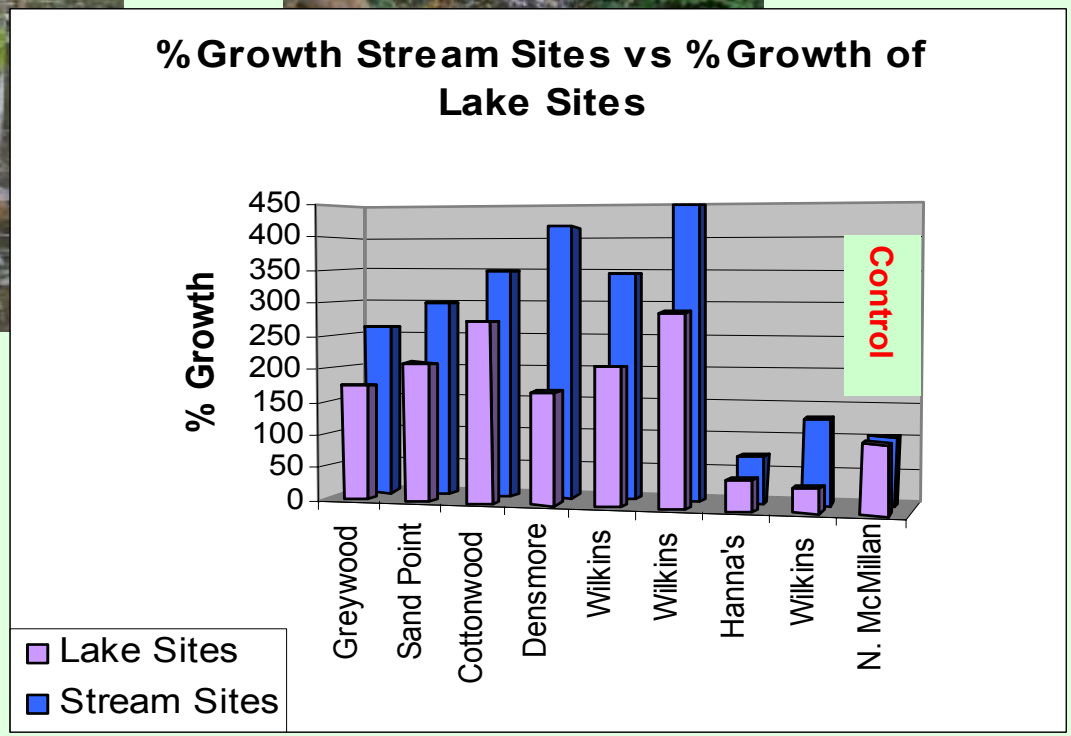




INCUBATION CHAMBER RESULTS:

Stream Loading Contributes to Increased Algae Biomass.

Applied Nested ANOVA:



Pre- BMPs Results

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

Elevated levels of NO_3, 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

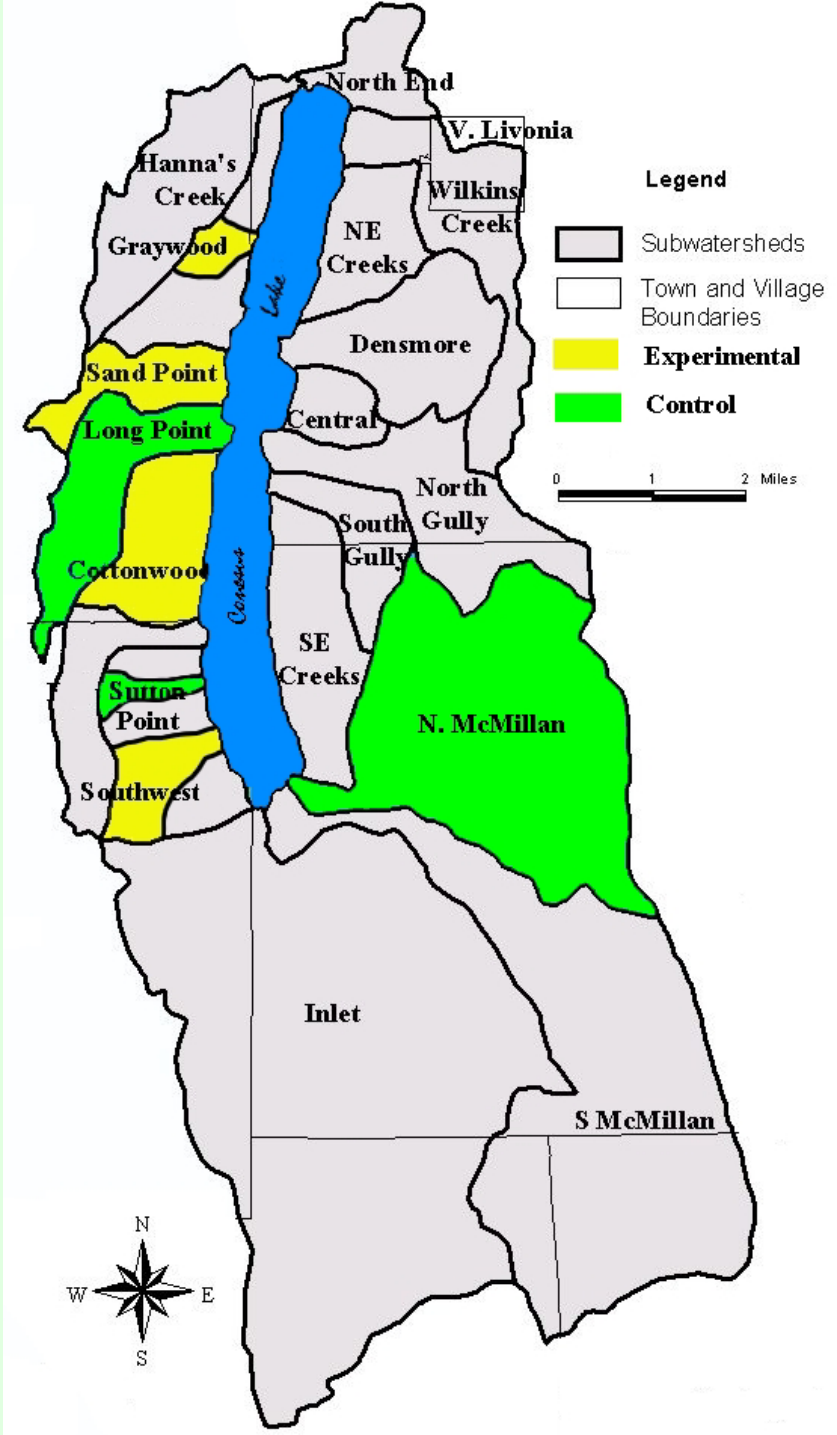
Goals

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.

Collaborative approach of local agencies, farming community and academics


North End
V. Livonia
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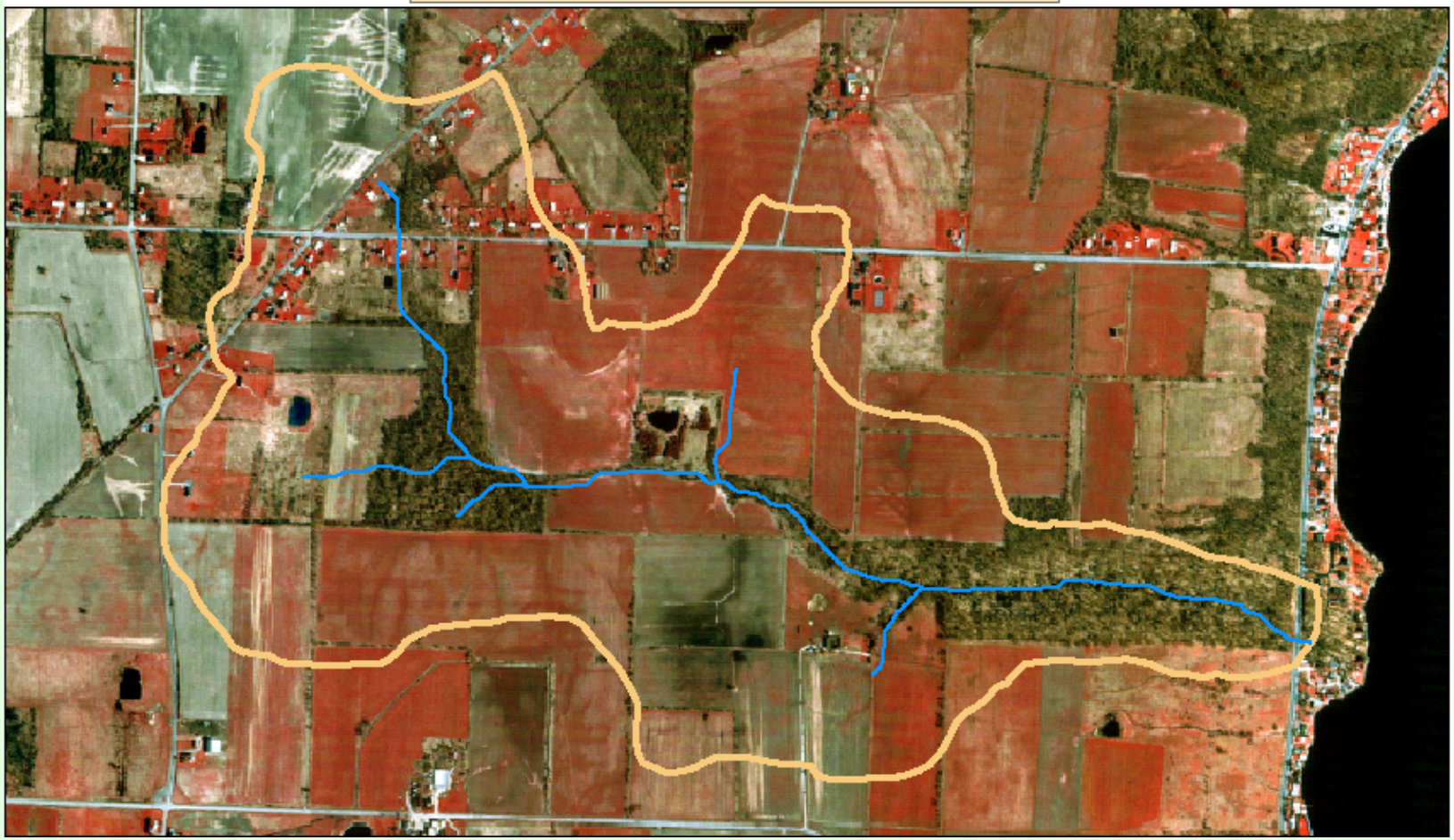
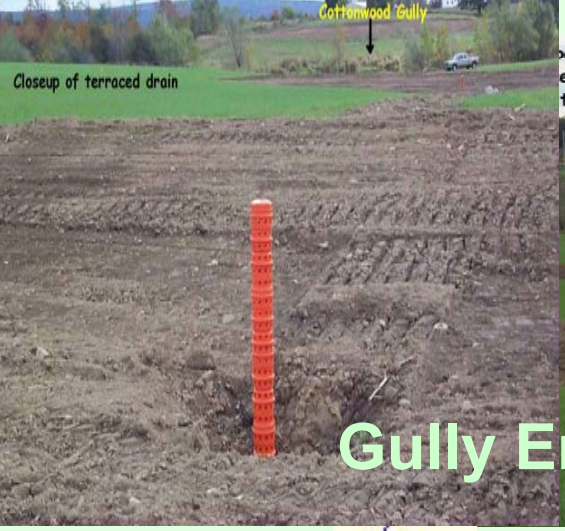
Sand Point
Central
Long Point
North Gully
South Gully
Cottonwood
SE Creeks
Sutton Point
N. McMillan
Southwest
Inlet
S McMillan
Legend
Subwatersheds
Town and Village Boundaries
Experimental
Control
0 1 2 Miles
N
W
E
S

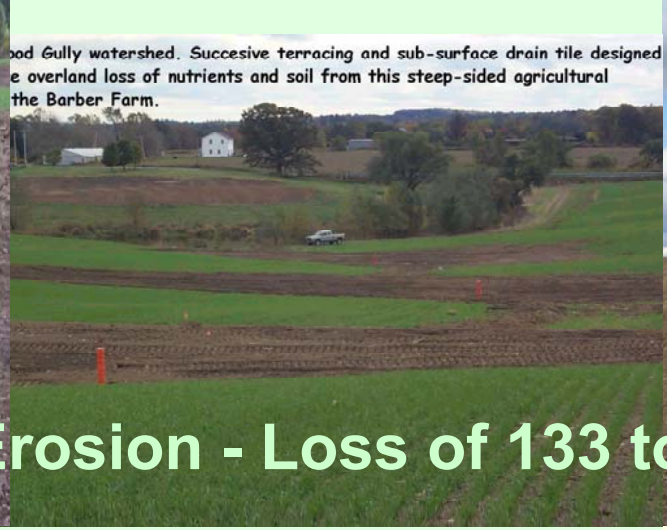
Sand Point Gully

SUNY BROCKPORT

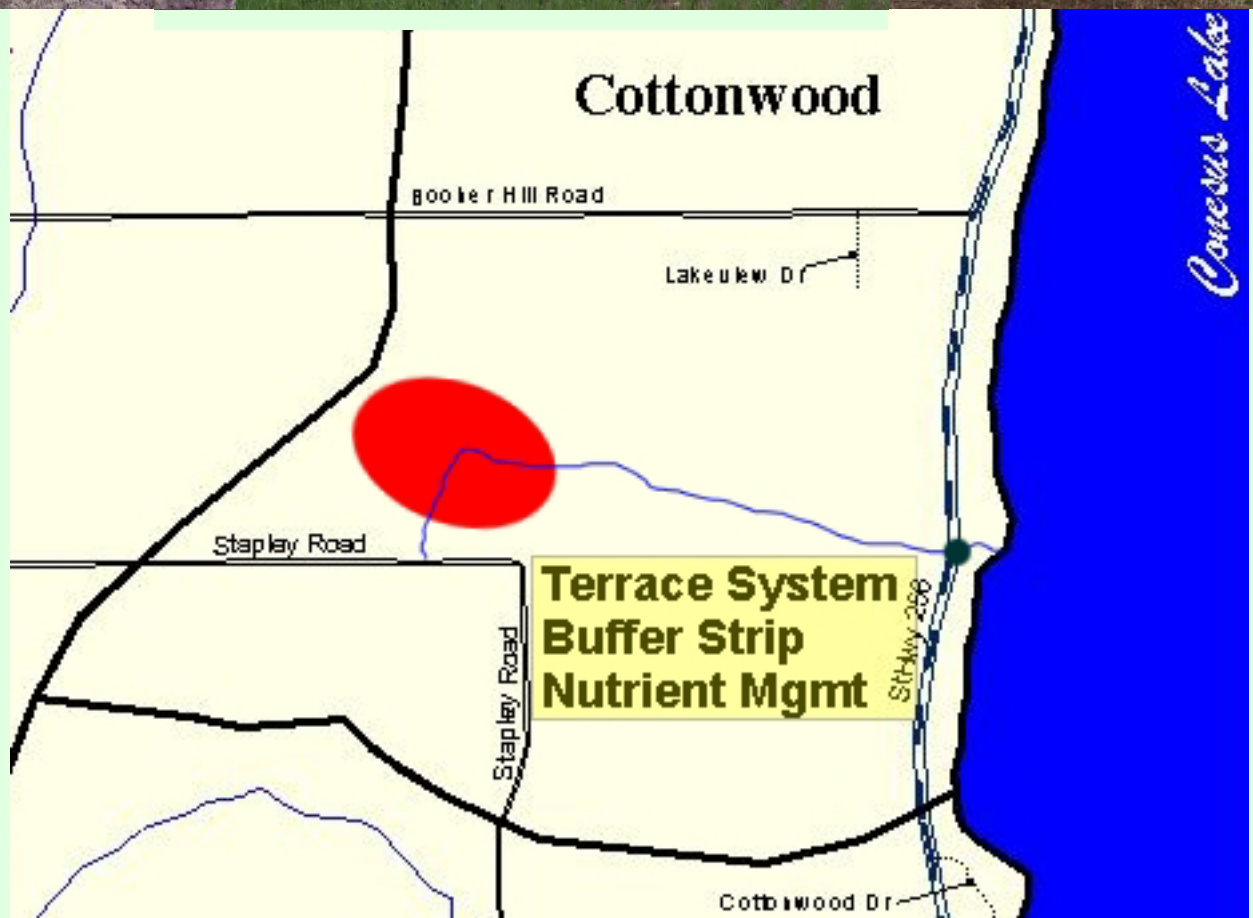
0 162.5 325 650 Meters



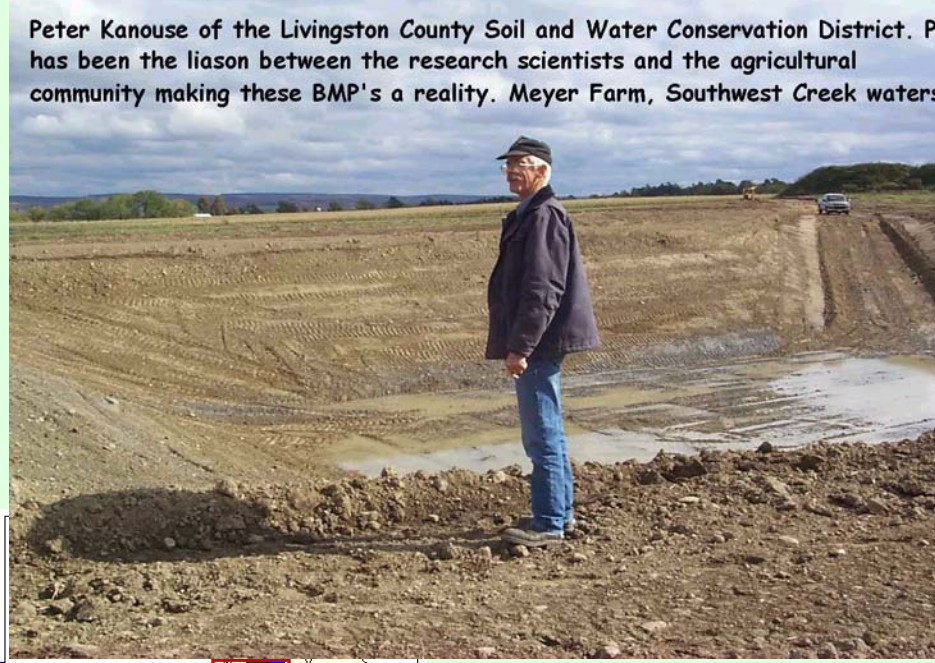




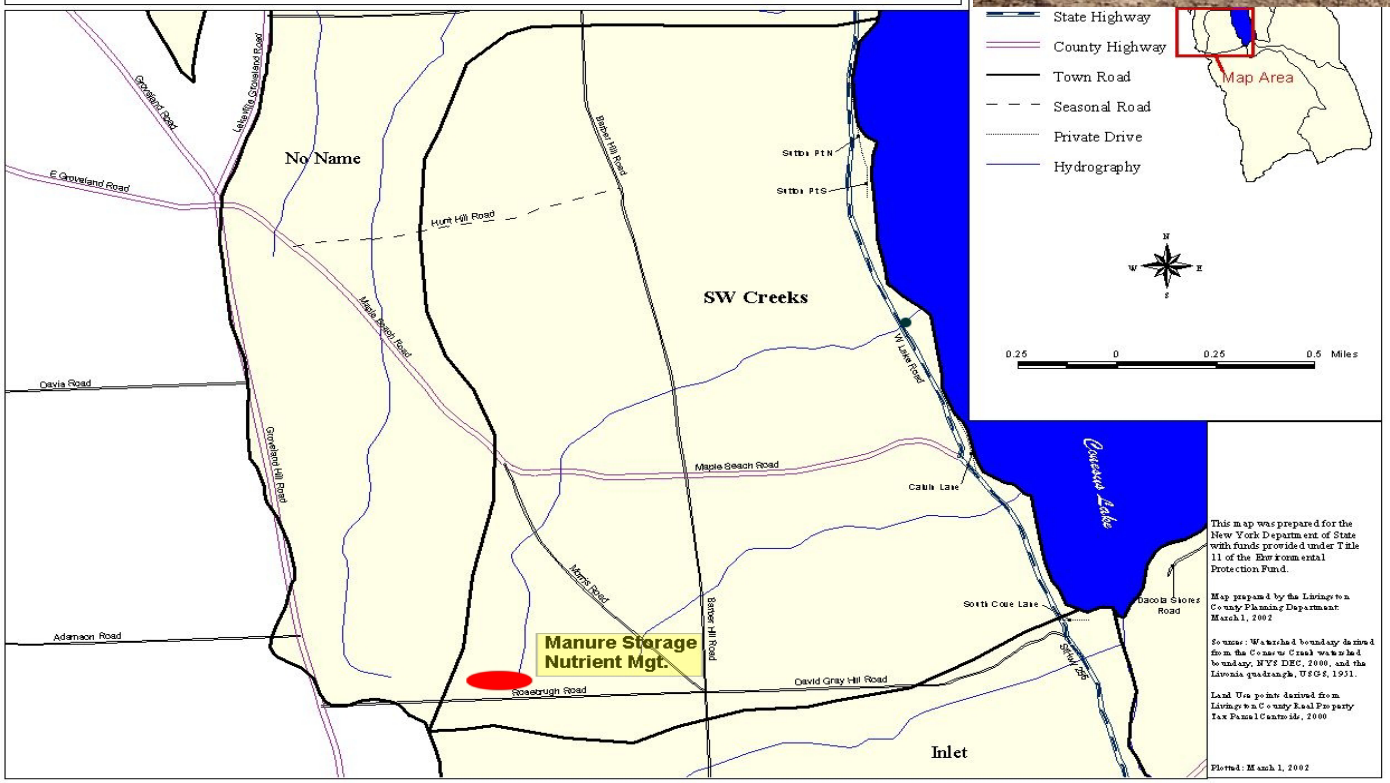
Gully Erosion - Loss of 133 tons per year



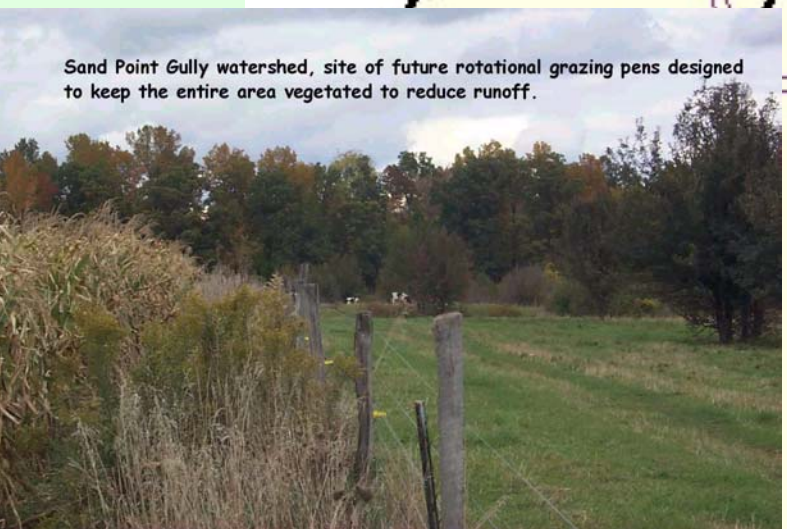
Dairy Knoll Farms, 700 cows, 2200 acres, Manure Issue



Southwest Creeks Subwatershed

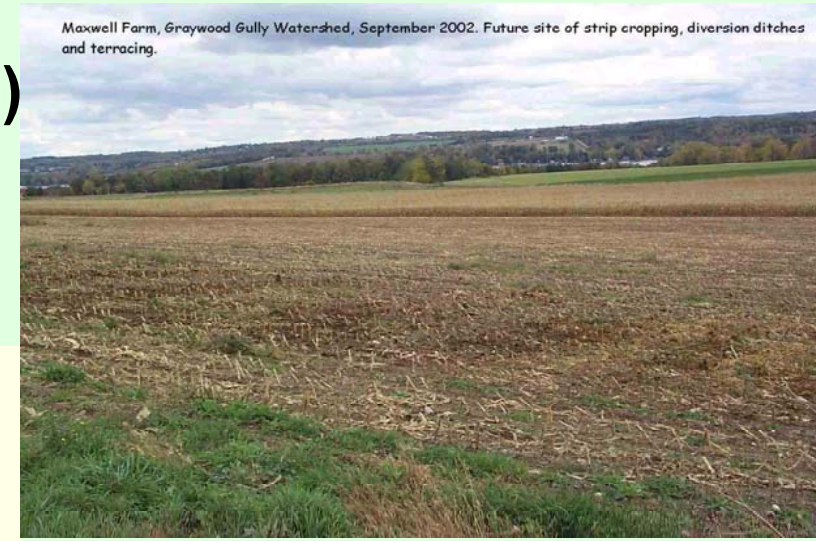


50 tons of soil from Gully Erosion, Installation of Gully Plugs, surface inlets and underground outlets on the McClellan Farm.

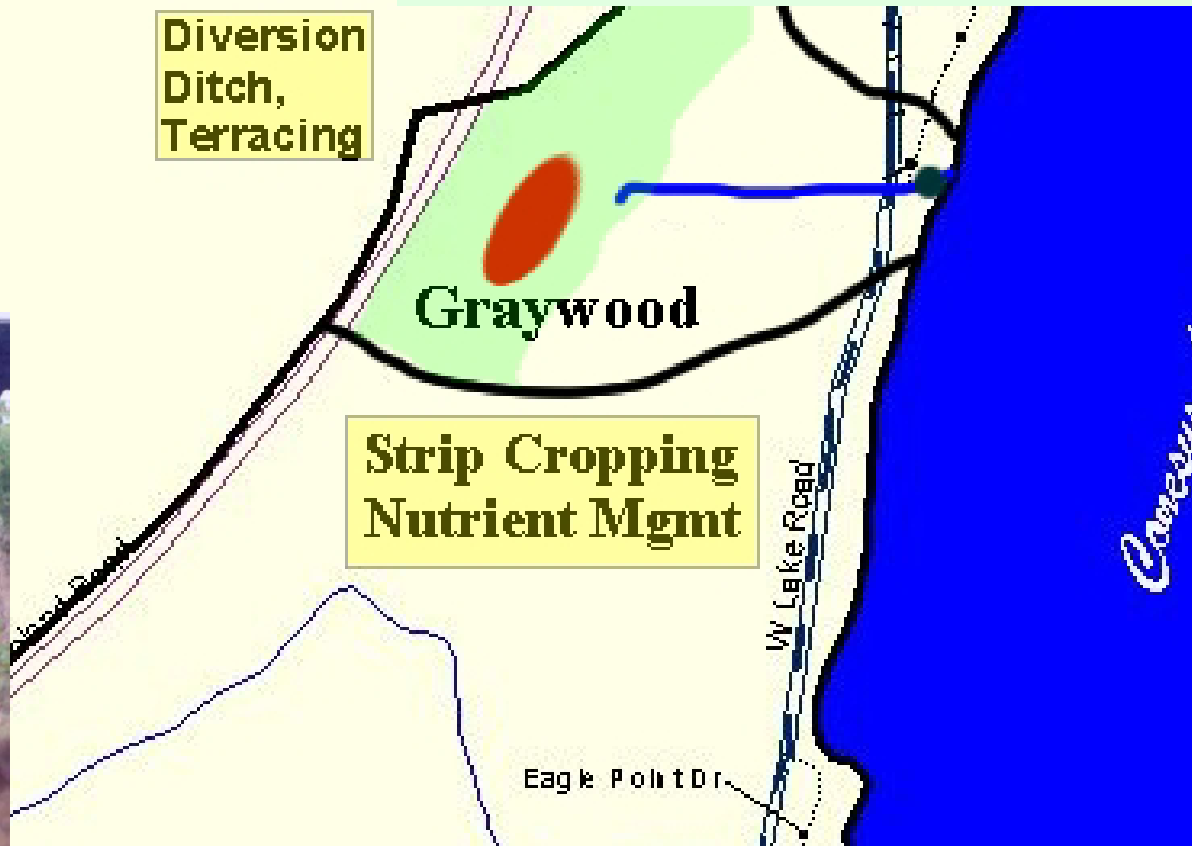


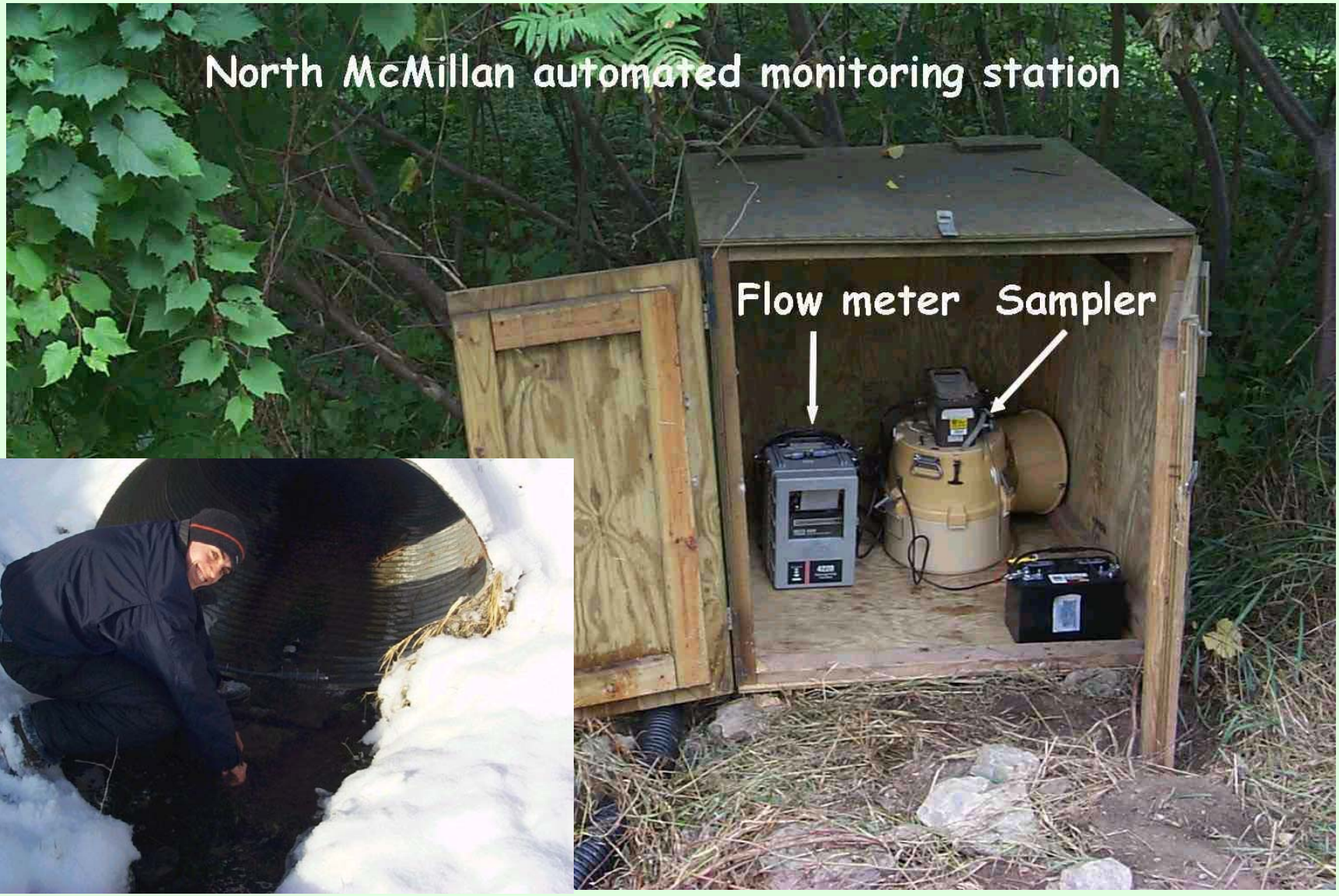
AEM Planning (All Exp. Watersheds)

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



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





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
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