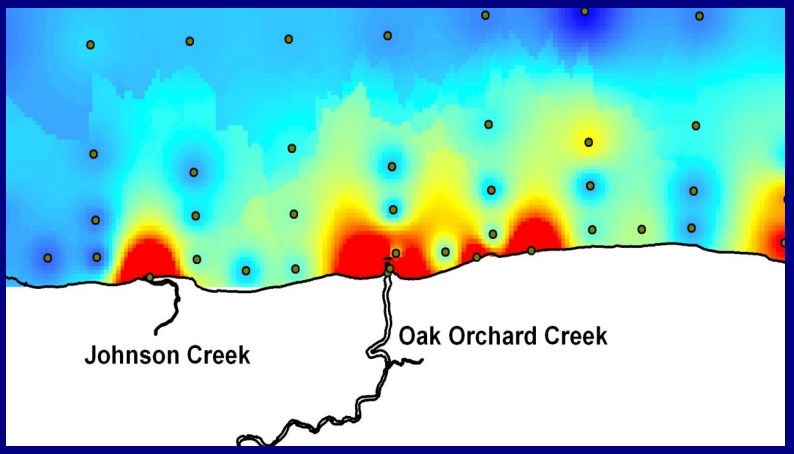
The Oak Orchard Soil Water Assessment Tool: A Support System for Watershed management



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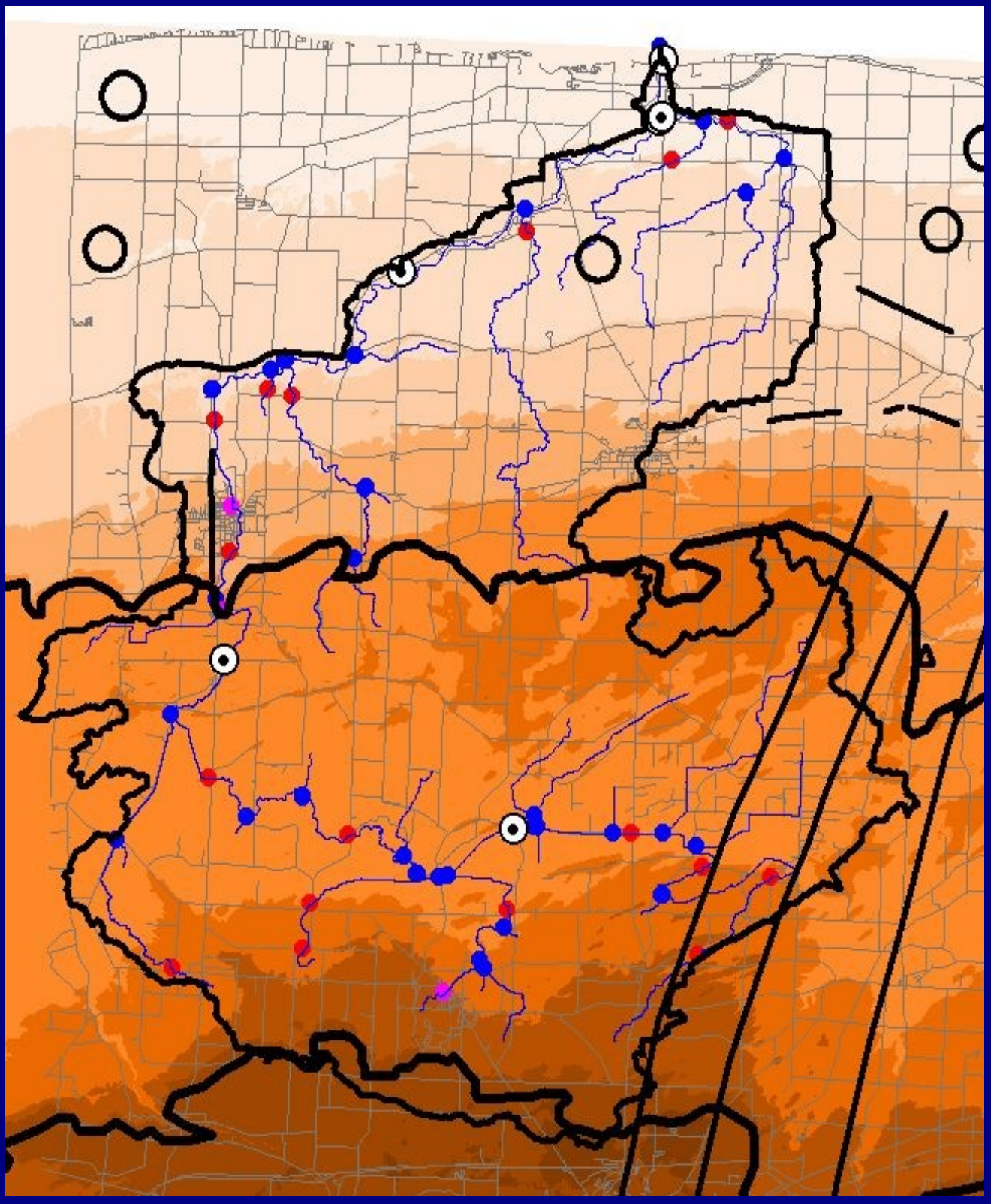
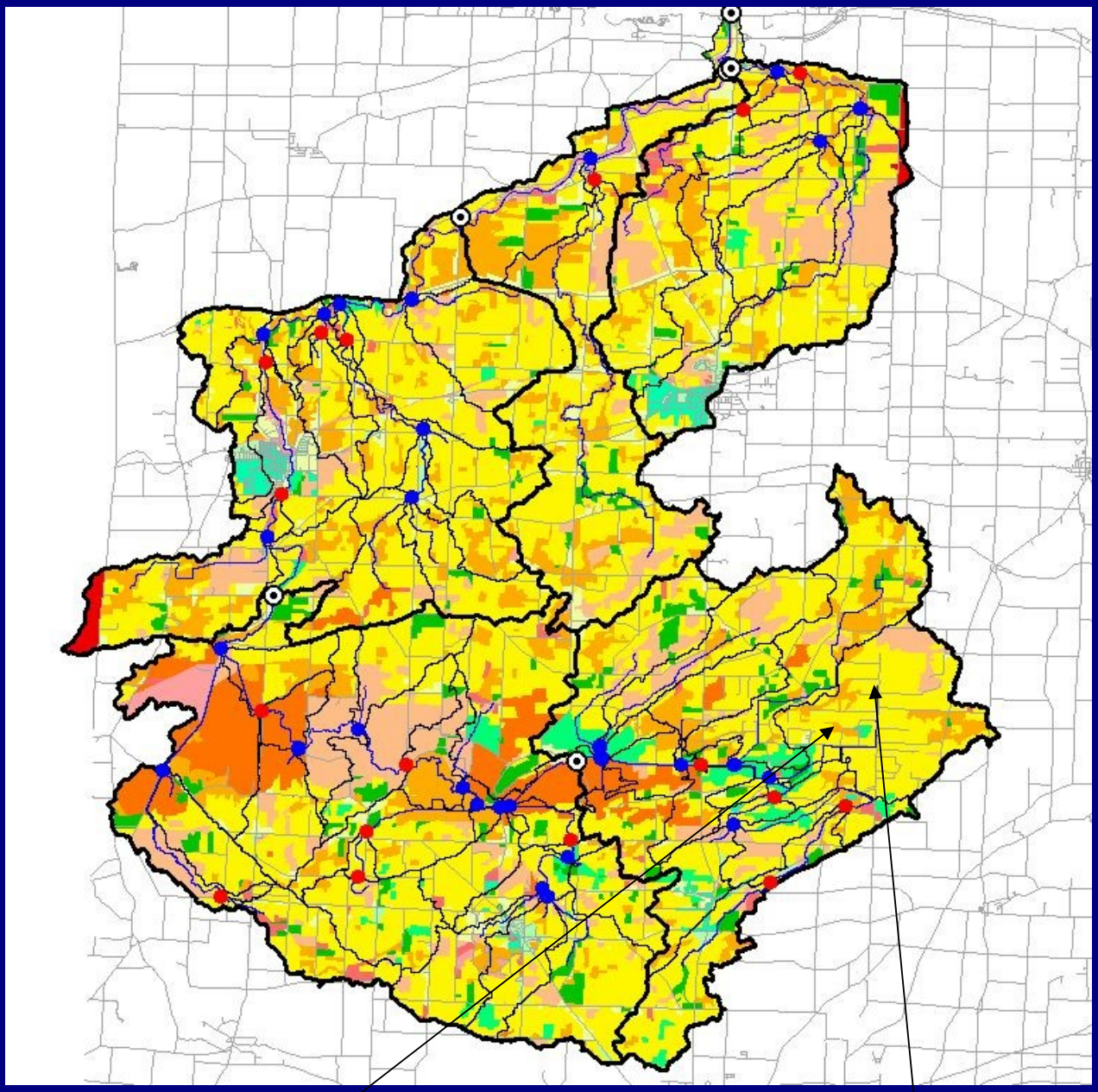
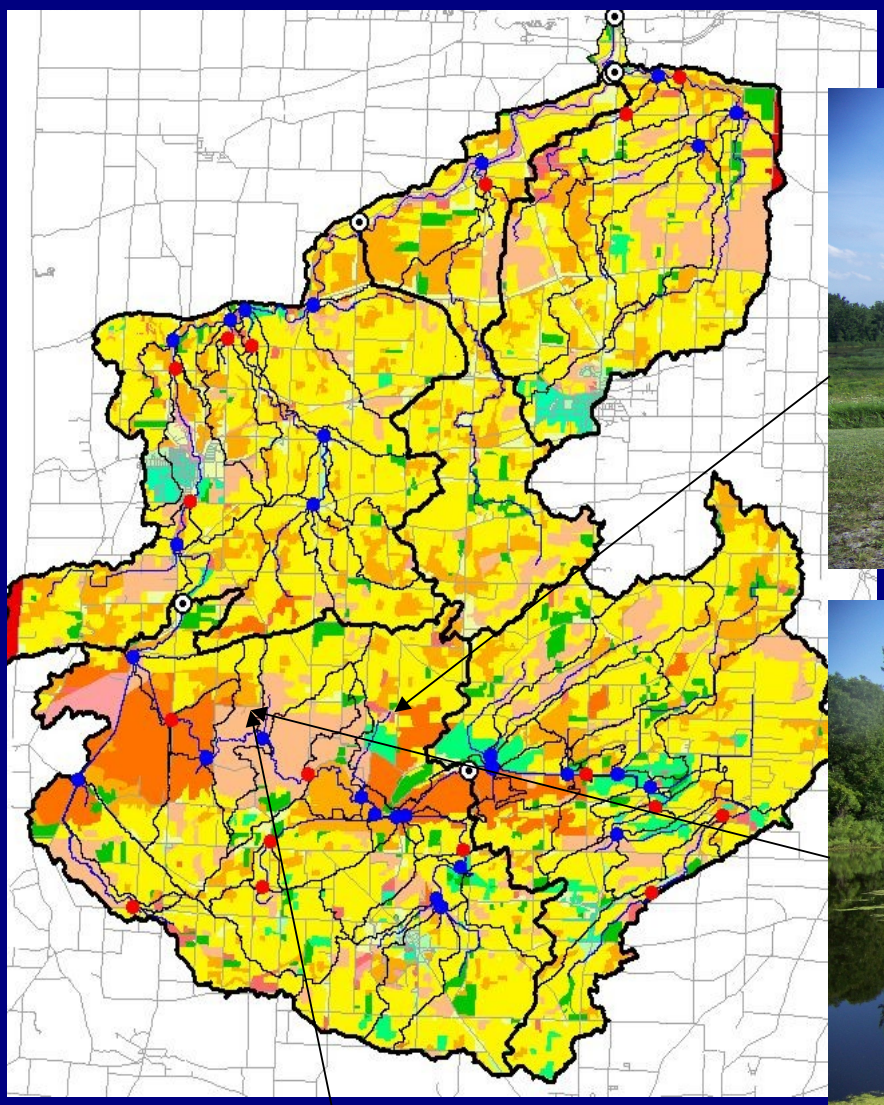
TOPOGRAPHY



MUCKLANDS



WETLANDS (INWR)



LONGITUDAL RIVER PROFILE

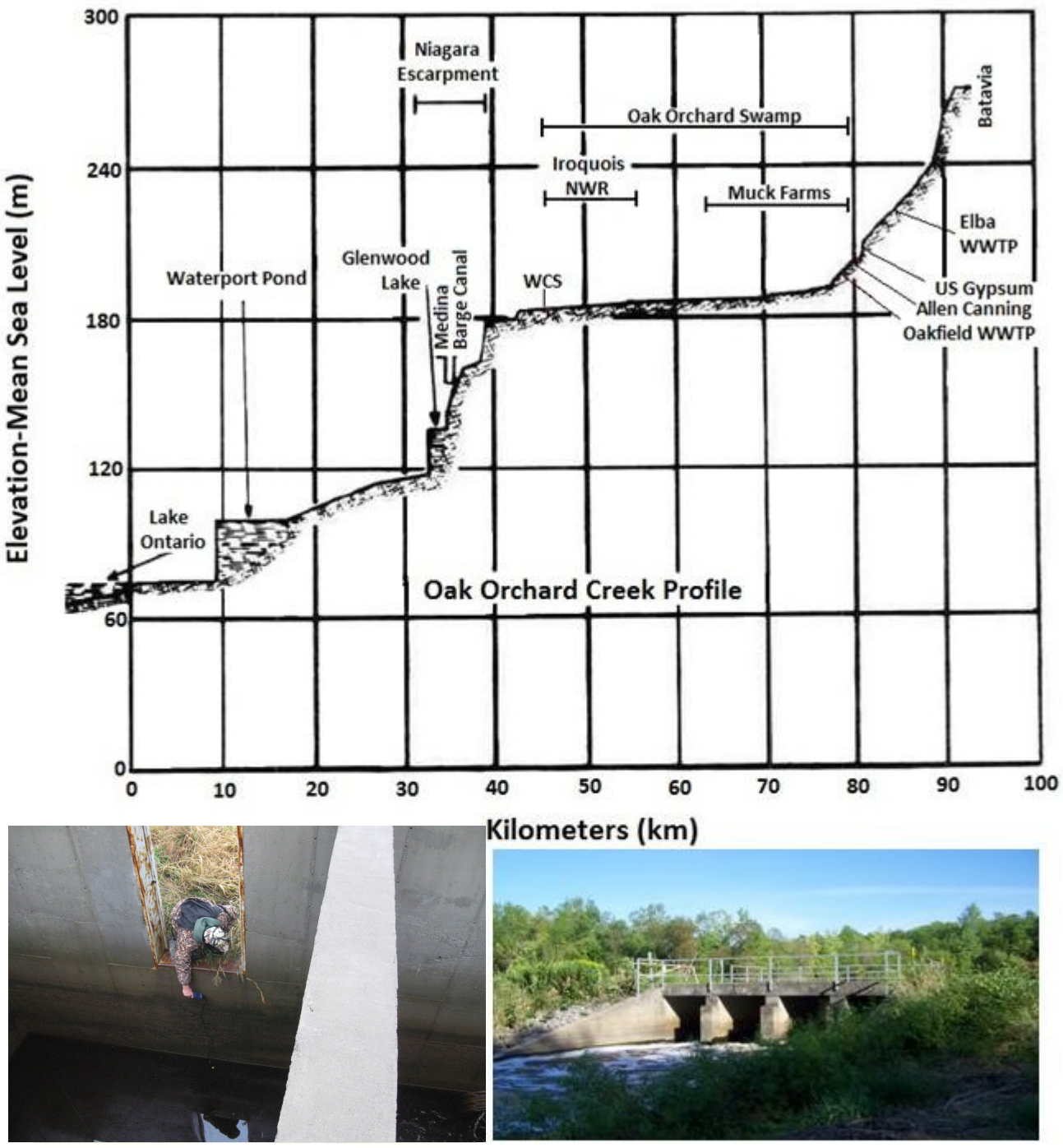


Figure 1 Longitudal profile of Oak Orchard River from its headwaters to the south to its discharge in Lake Ontario. Note the very low-sloped profile of the southern part of the river where the Muck Lands, INWR refuge and wetlands are. Many of the point sources of the watershed (including outflow from the muck farms, left inset photo) are trapped within this zone of low conveyence. This area probably represents an area where sequestration of particulates are significant. The water control structure (right inset photograph) operated by the Fish and Wildlife Service at the INWR is probably an important regulator of fluxes from this part of the watershed. Modified after Longabucco and Rafferty, 1988.

THE MODEL

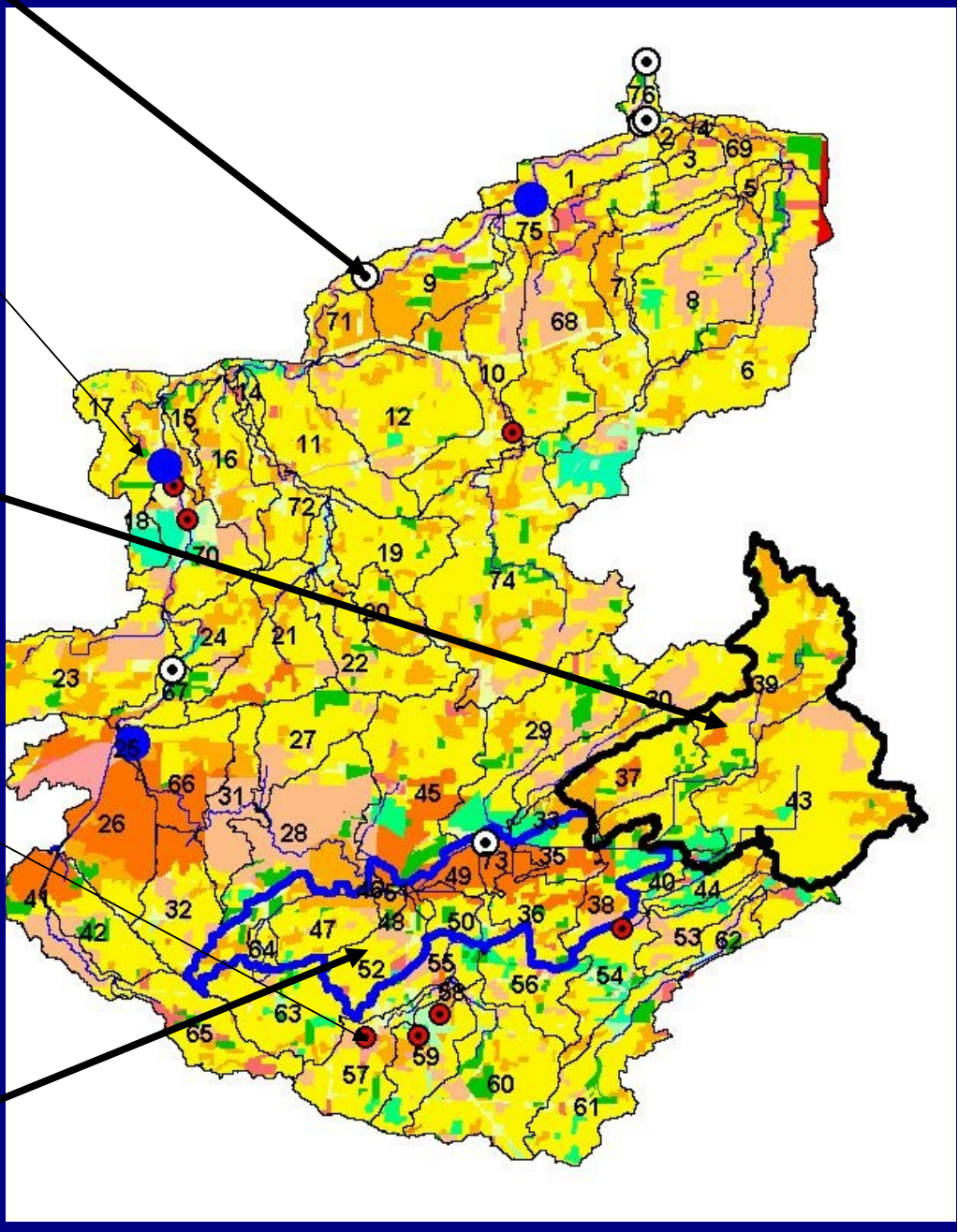
Calibration point

Three Reservoirs

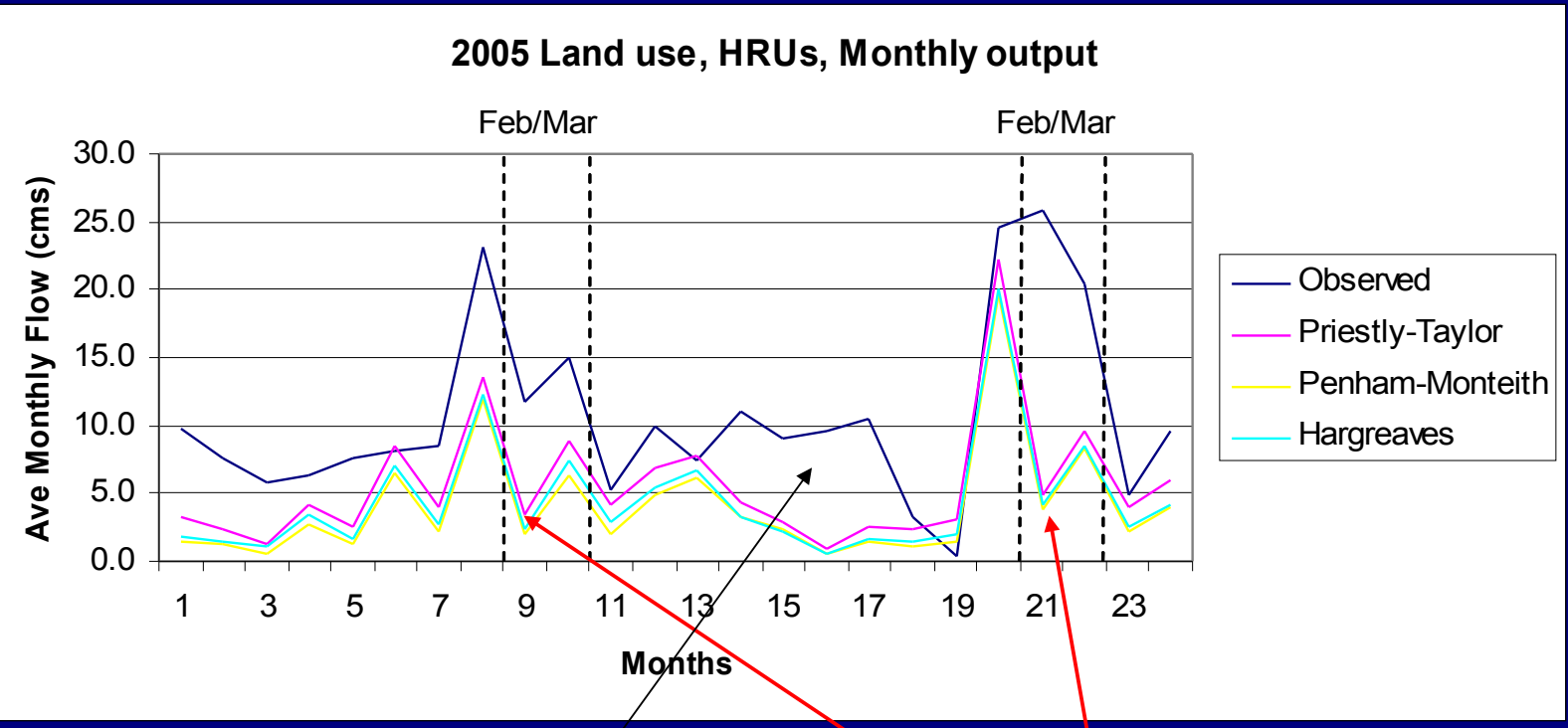
Tile Drained Subbasins intensely farmed with onions (no rotation).

Six Point Sources

11 subbasins parameterized to receive groundwater from outside the watershed (the Onondaga Escarpment)



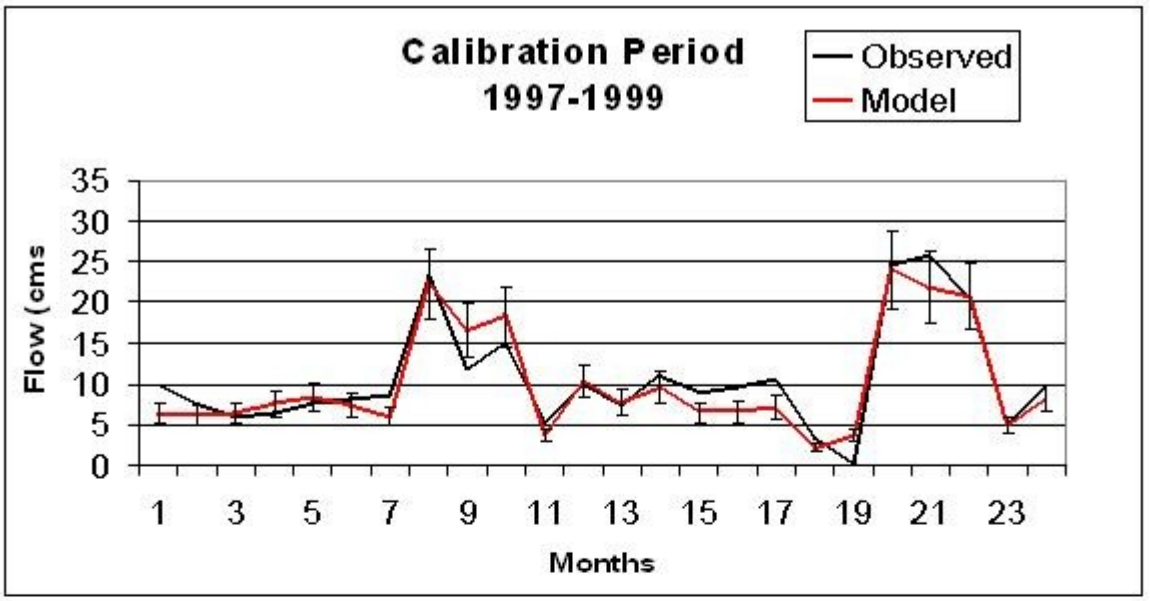
The Model includes Groundwater and inputs from the Erie Canal



Groundwater Flow from the Onondaga Escarpment ?

ERIE CANAL INPUTS ?

RESULTS



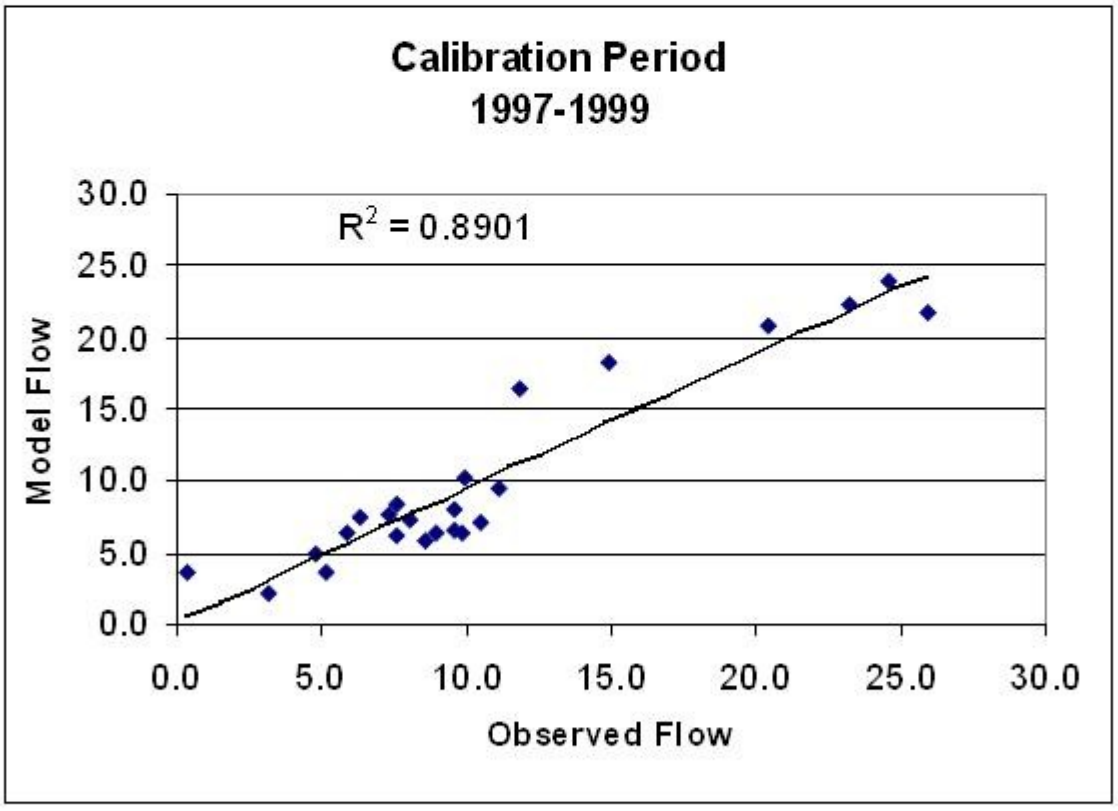
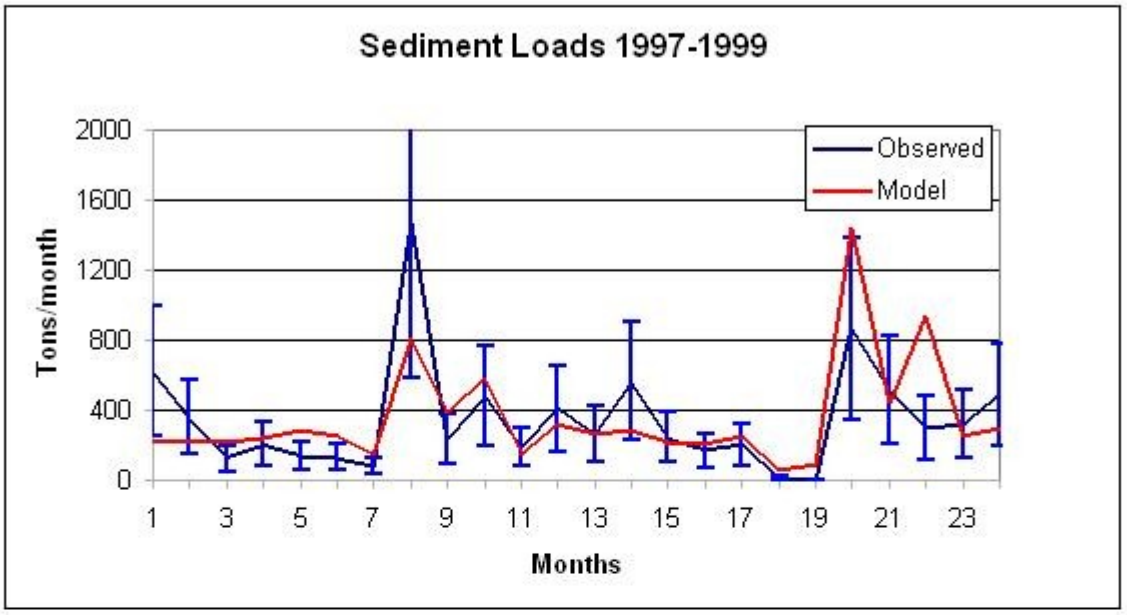


Figure 8 Monthly observed and model flows for the calibration gage site in subbasin 72. The Nash-Sutcliffe prediction efficieny was excellent for the calibration period (NS = 0.81). The R square for the model and observed flow was 0.83. Model flow under predicted total observed flow by 2%. Uncertainty for the observed data was considered to be 20% based on the measurement technique.

RESULTS



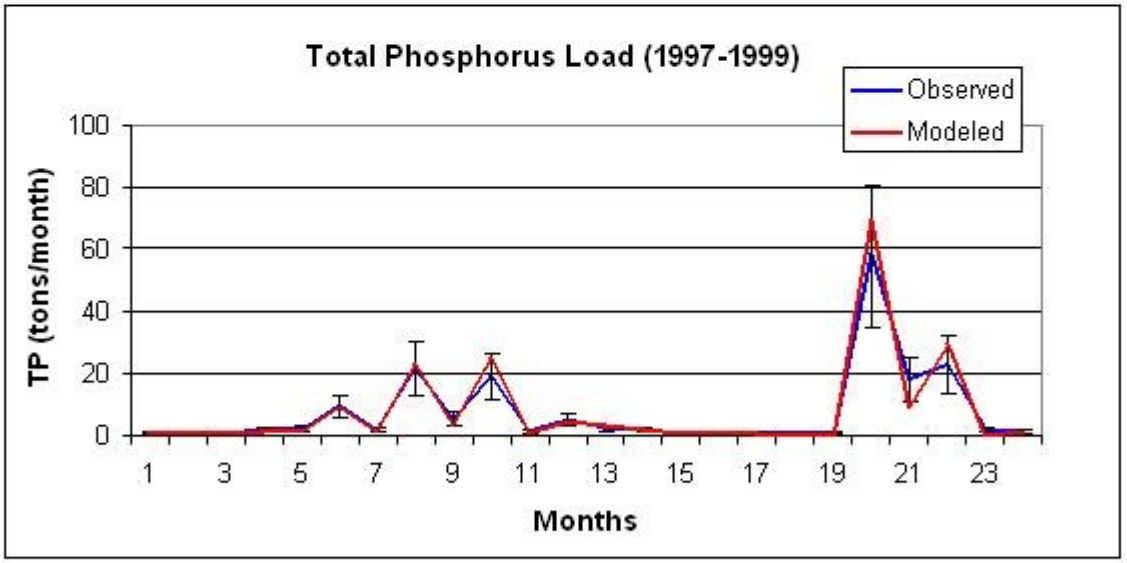
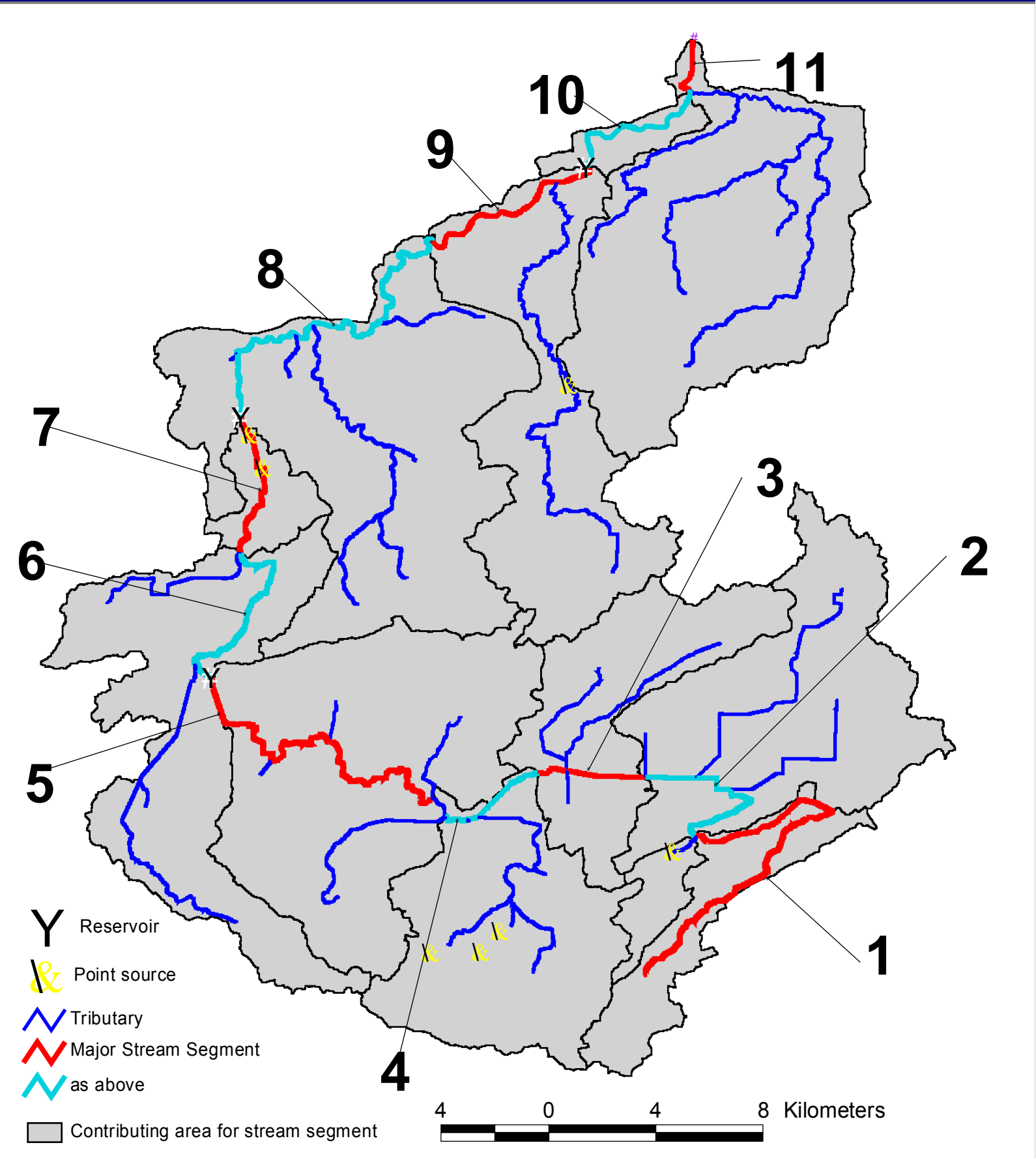
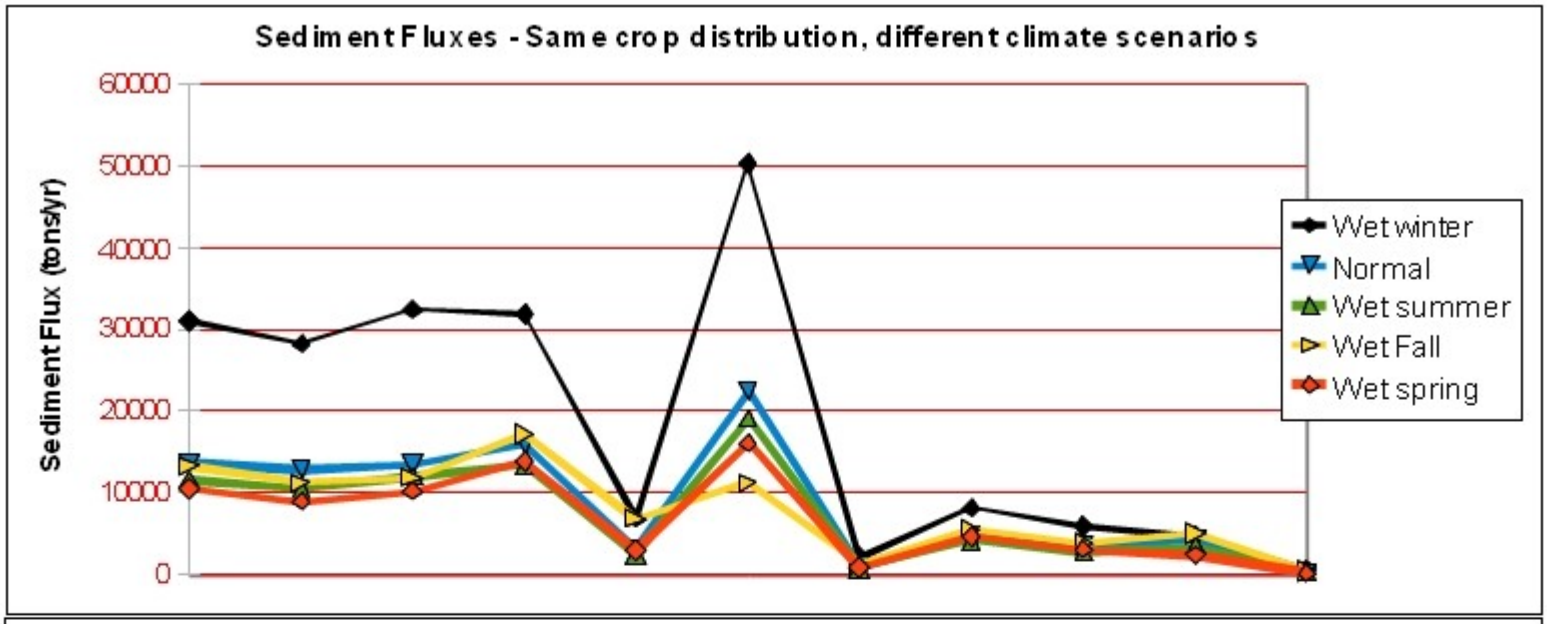
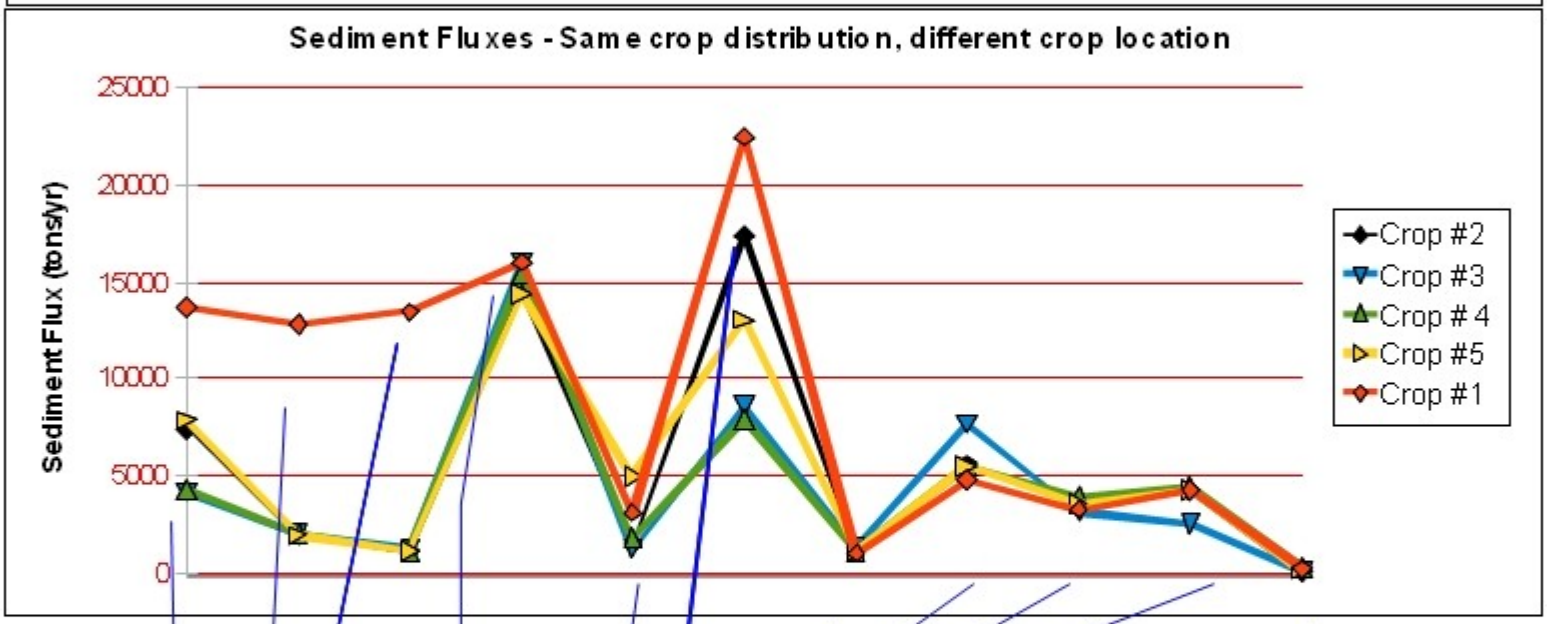


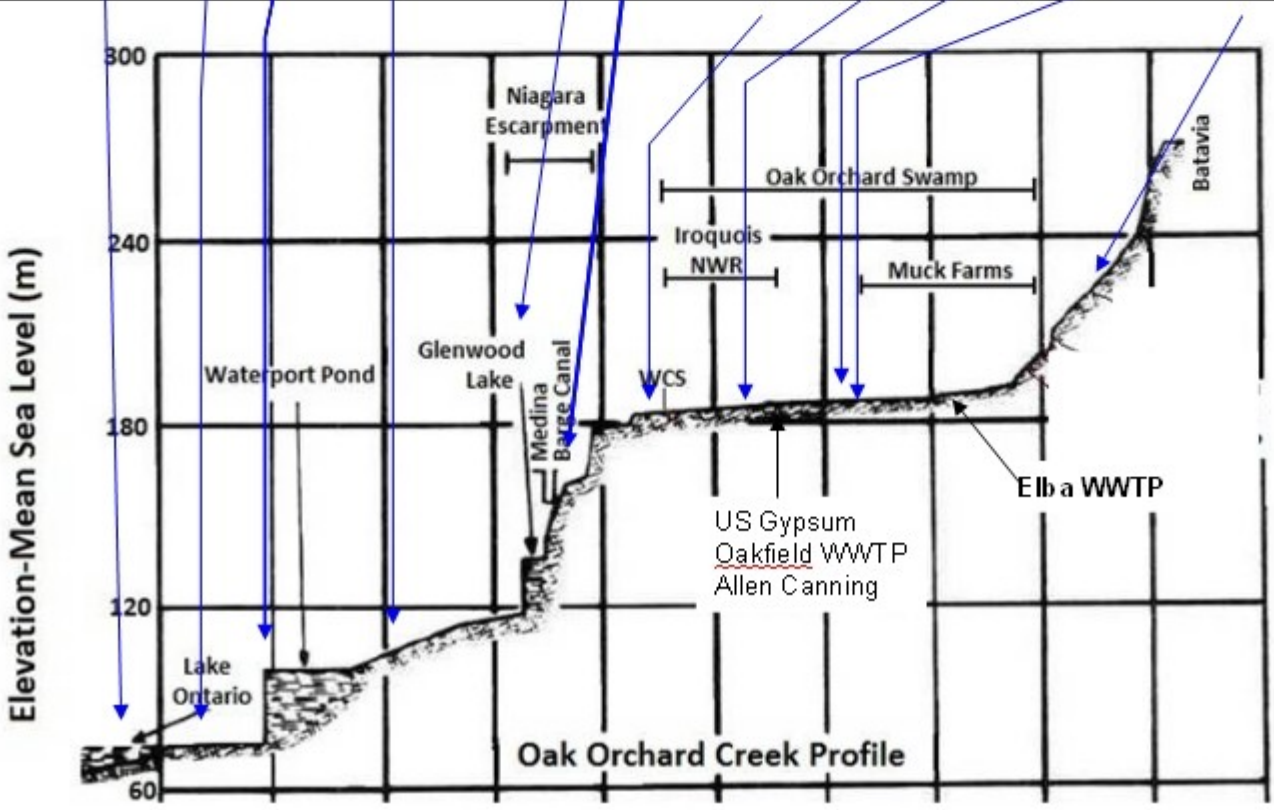
Figure 9 Monthly observed and modeled loads for sediment and phosphorus over the calibration time period. Uncertainty in the observed data was judged to be 60% and 40% for sediment and phosphorus respectively. Total cumulative load prediction was within 2% for Sediment and phosphorus.

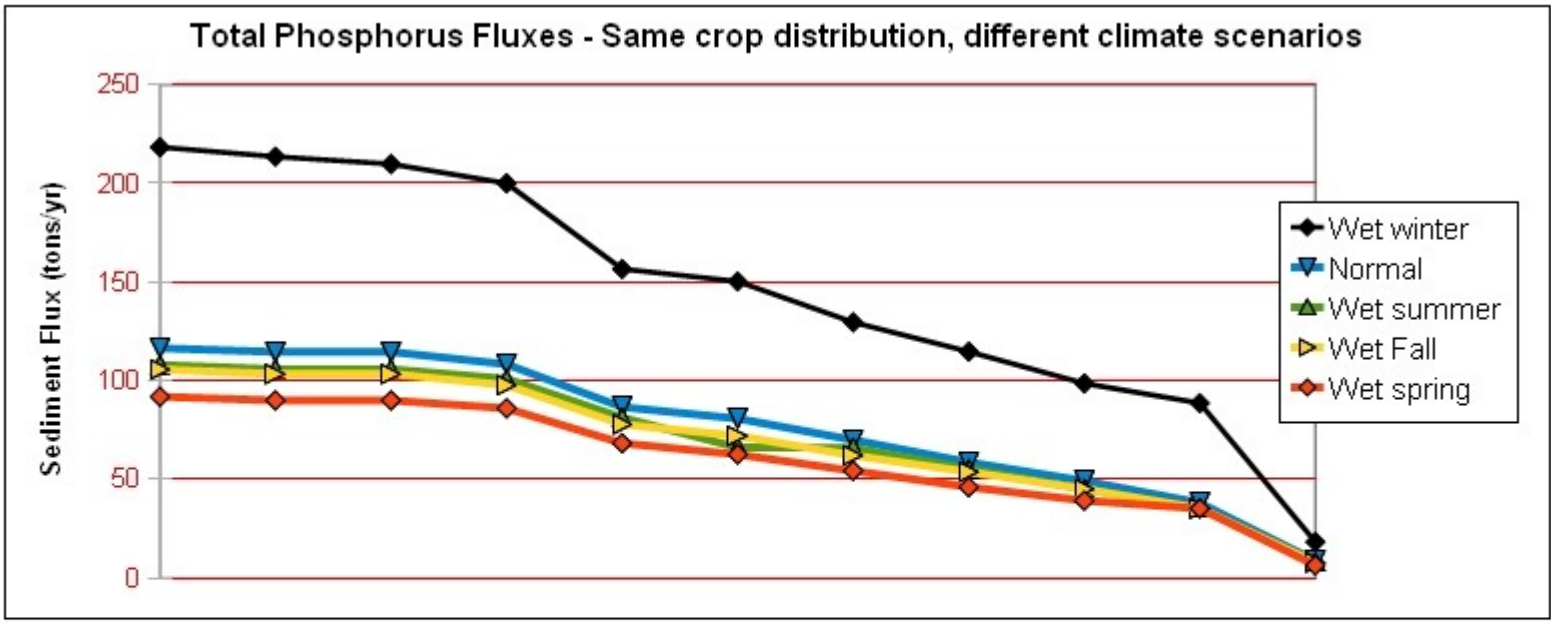
RESULTS

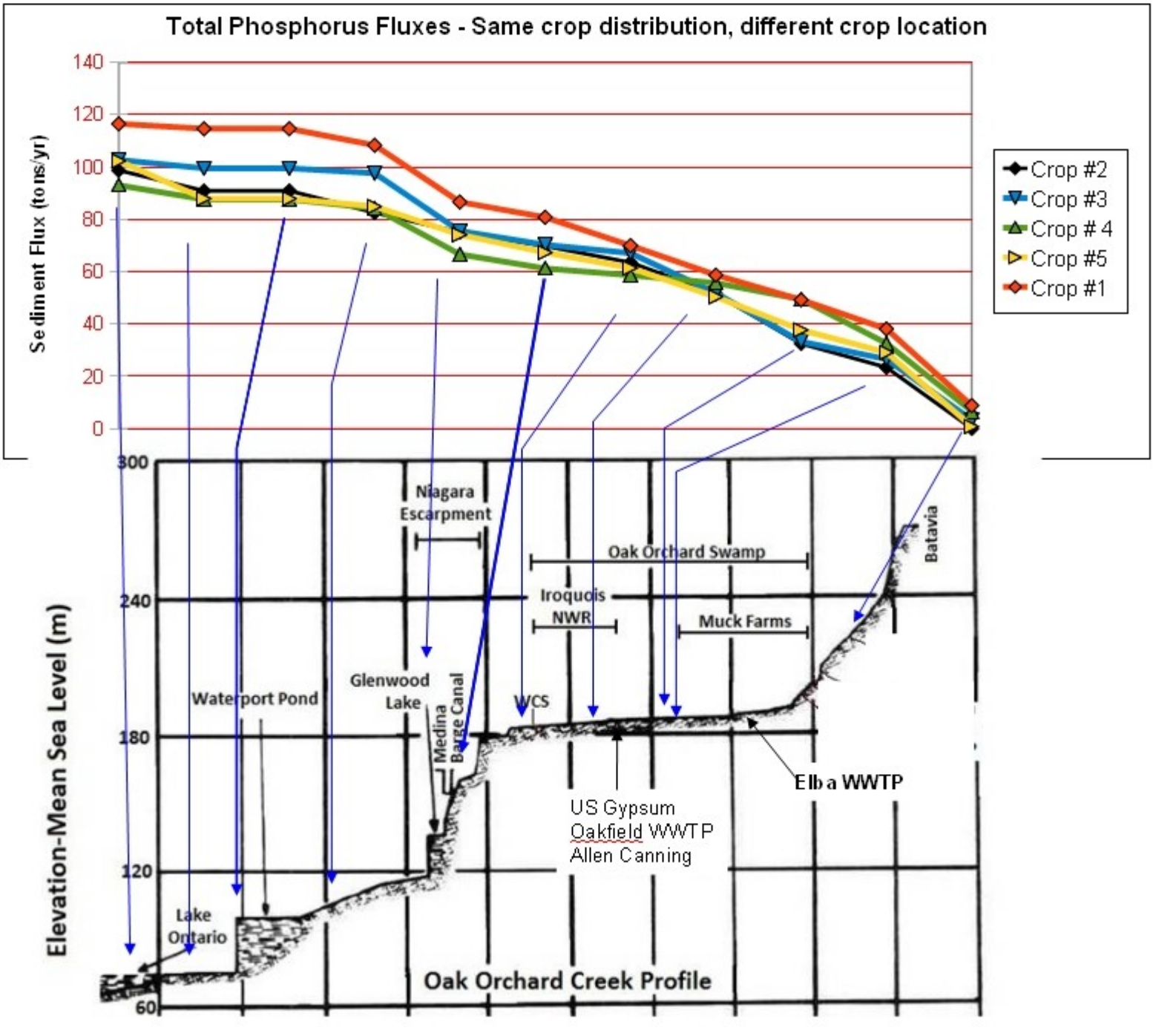

11
10
9
8
7
6
5
4
3
2
1
Reservoir
Point source
Tributary
Major Stream Segment
as above
Contributing area for stream segment
4 0 4 8 Kilometers


Sediment Fluxes - Same crop distribution, different climate scenarios
Sediment Flux (tons/yr)
60000
50000
40000
30000
20000
10000
0
Wet winter
Normal
Wet summer
Wet Fall
Wet spring

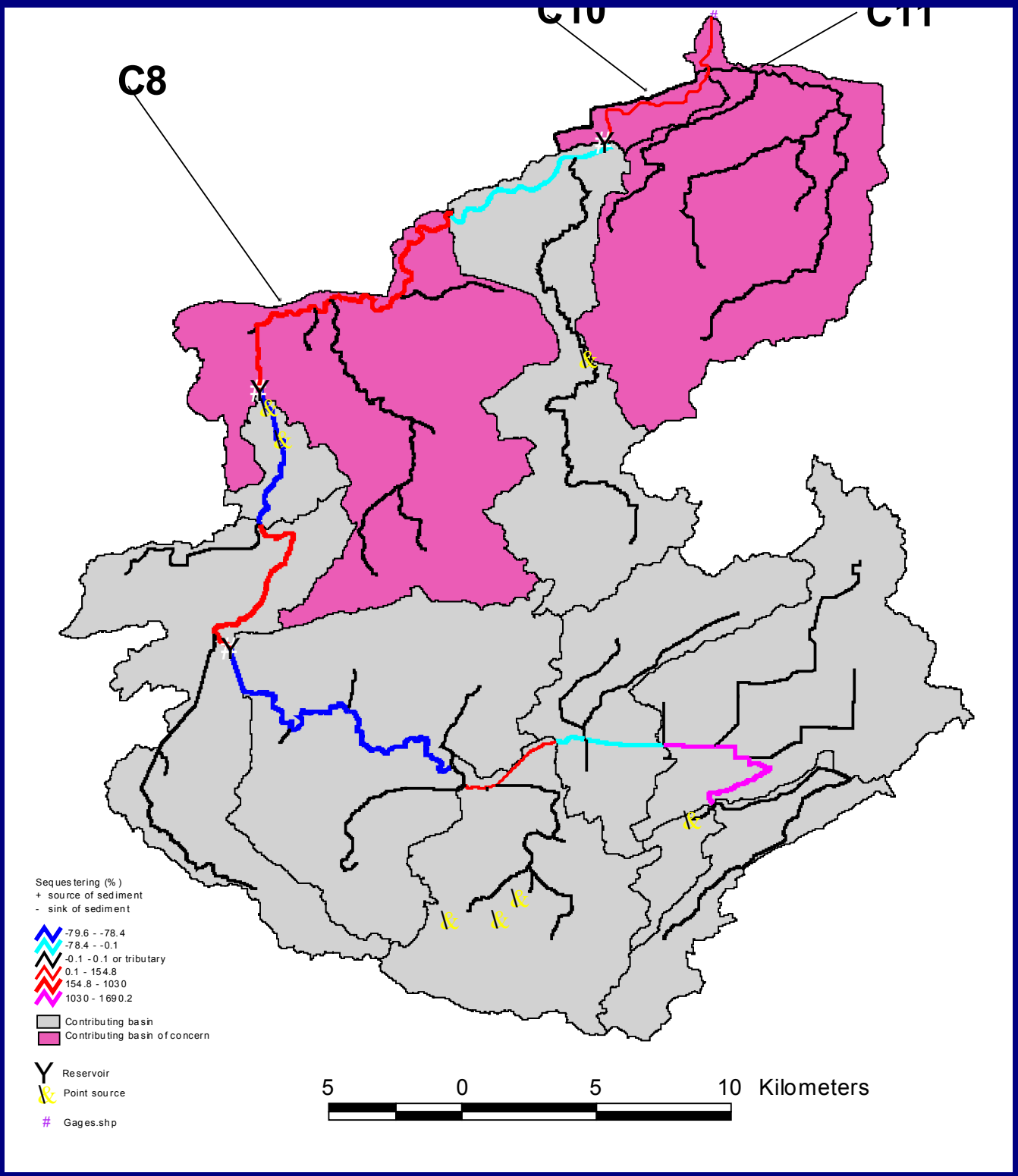

Sediment Fluxes - Same crop distribution, different crop location
Sediment Flux (tons/yr)
25000
20000
15000
10000
5000
0
Crop #2
Crop #3
Crop # 4
Crop #5
Crop #1


Elevation-Mean Sea Level (m)
300
240
180
120
60
Niagara Escarpment
Oak Orchard Swamp
Batavia
Iroquois NWR
Muck Farms
Waterport Pond
Glenwood Lake
Medina Barge Canal
WCS
Elba WWTP
US Gypsum
Oakfield WWTP
Allen Canning
Lake Ontario
Oak Orchard Creek Profile

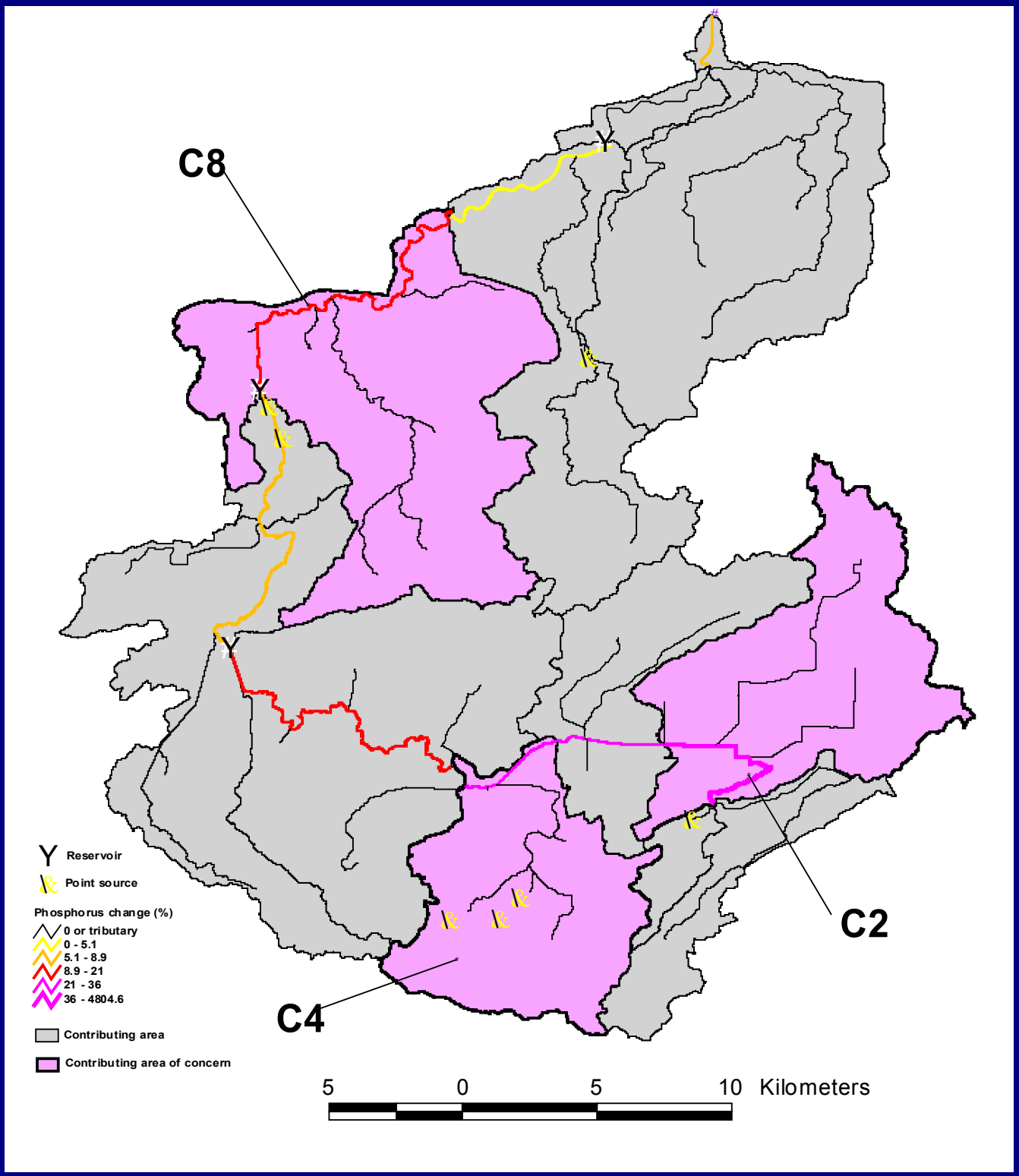

Total Phosphorus Fluxes - Same crop distribution, different climate scenarios
Sediment Flux (tons/yr)
250
200
150
100
50
0
Wet winter
Normal
Wet summer
Wet Fall
Wet spring


Total Phosphorus Fluxes - Same crop distribution, different crop location
Sediment Flux (tons/yr)
140
120
100
80
60
40
20
0
Crop #2
Crop #3
Crop # 4
Crop #5
Crop #1
Elevation-Mean Sea Level (m)
300
240
180
120
60
Niagara Escarpment
Oak Orchard Swamp
Iroquois NWR
Muck Farms
Batavia
Waterport Pond
Glenwood Lake
Medina Barge Canal
WCS
Elba WWTP
US Gypsum
Oakfield WWTP
Allen Canning
Lake Ontario
Oak Orchard Creek Profile

Areas of concern: SEDIMENTS



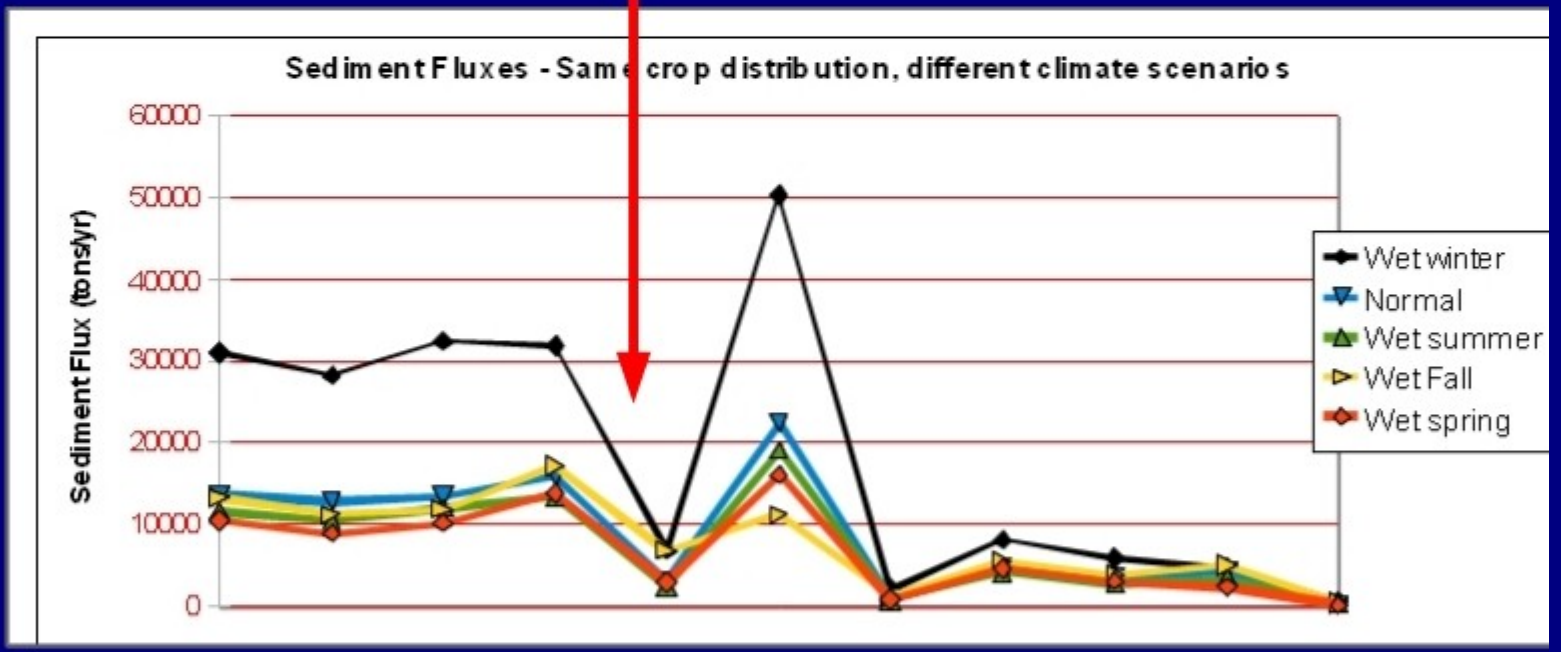
Areas of concern: TOTAL PHOSPHORUS



Conclusions

- INWR and Glendale reservoirs sequester a significant amount of sediment, but no total phosphorus.

- A significant source of sediment is the high gradient stretches between Glendale and Waterport dam



- Groundwater from outside the watershed appears to be significant from Jan thru March. This comes from the Onondaga escarpment outside of the watershed.

ACKNOWLEDGEMENTS

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