

Field-scale Monitoring of Agricultural Ditches as Conduits of Nitrogen, Phosphorus, and Suspended Sediment in Response to Storm Events and Low-Input Drainage Management: A Case-Study of the Tchula Lake Farm

Samuel C. Pierce¹, Robert Kröger¹, Dan Prevost² & Troy Pierce³

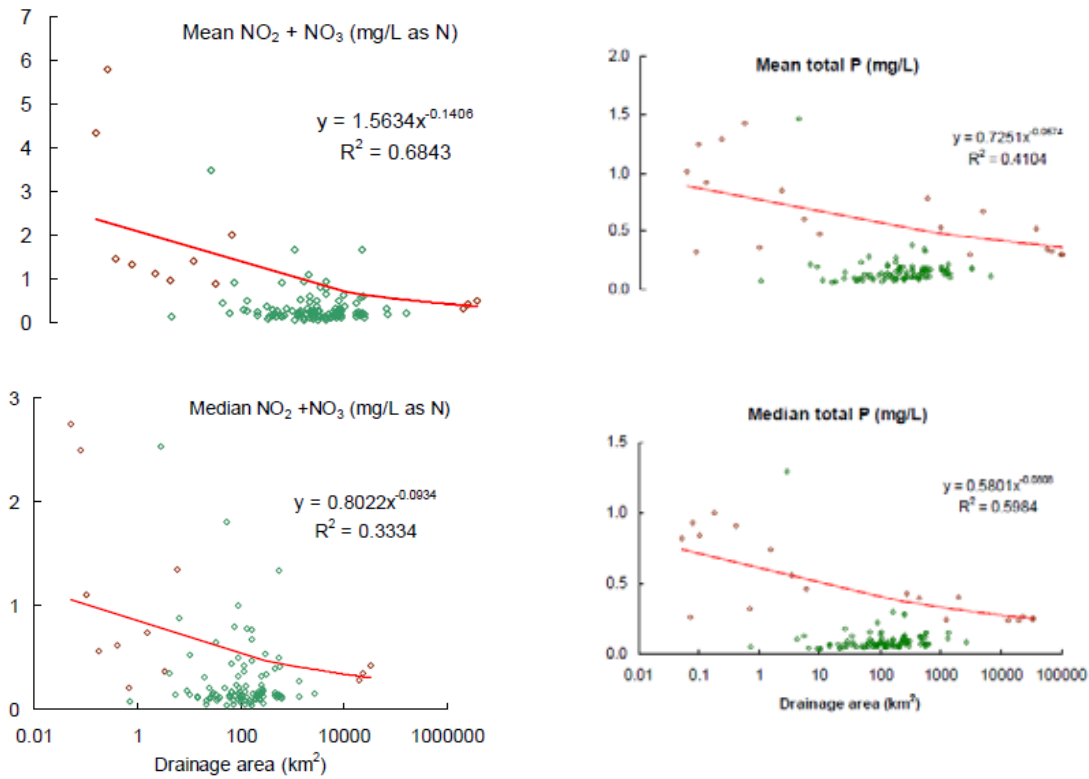
¹ MSU Dept of Wildlife, Fisheries, and Aquaculture

² Delta F.A.R.M.

³ USEPA Gulf of Mexico Program

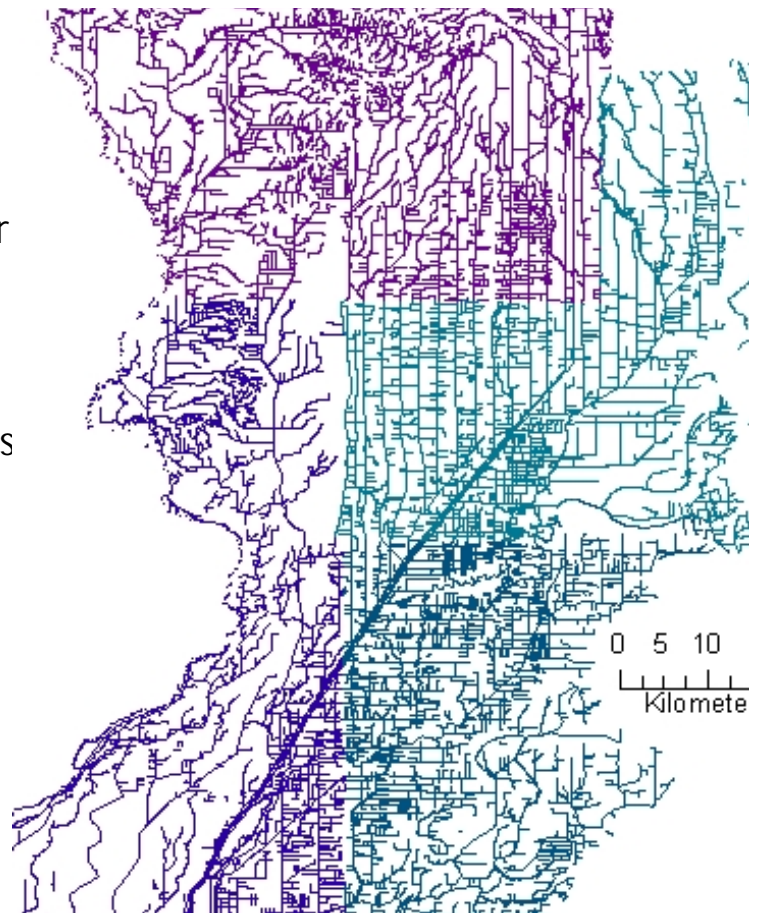
Causes and Sources of impairment

- Nonpoint source pollutants (NPS)
 - Sediment
 - Nutrients
 - Nitrogen
 - Phosphorus
- In Yazoo Basin % from agriculture (Shields et al., 2008)
 - 93% of the total N load
 - 90% of the total P load



From Shields et al., 2008

- Why ditches?
 - Left: St. Francis River (protected)
 - Right: remains of headwaters of Little River
 - Now 5 parallel canals
- In agricultural lowlands there are more “ditches” than “streams”



Questions

- When are NPS leaving the fields?
 - Storm events or baseflow
 - Specifically when during the storm events
 - Month
- Do they differ progressing upstream?
- Structures for lower NPS
 - In-stream
 - Edge-of-stream

NPS Monitored

- Concentrations
 - Total Suspended Solids
 - Turbidity
 - Nitrate
 - {Nitrate + Nitrite} - Nitrite
 - Total Inorganic Phosphorus
 - Dissolved Inorganic Phosphorus
- Pre-implementation: Jan-April 2011
- Post-implementation: Jan-March 10 2012

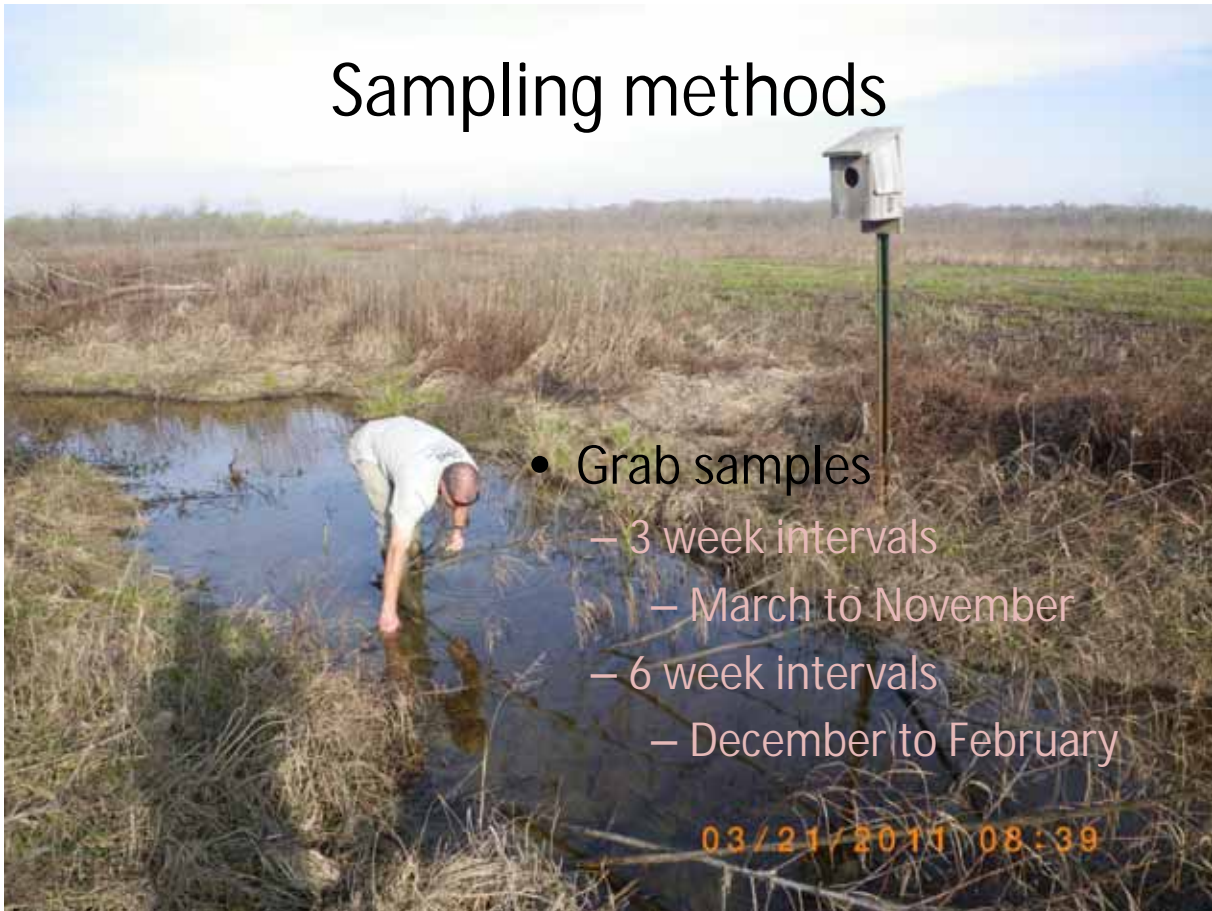


Sampling methods

- Storm Samples
ISCO sampler
 - Triggered by water level
 - First 6 samples at 10-minute intervals
 - Last 18 samples at 1-hour intervals



Sampling methods



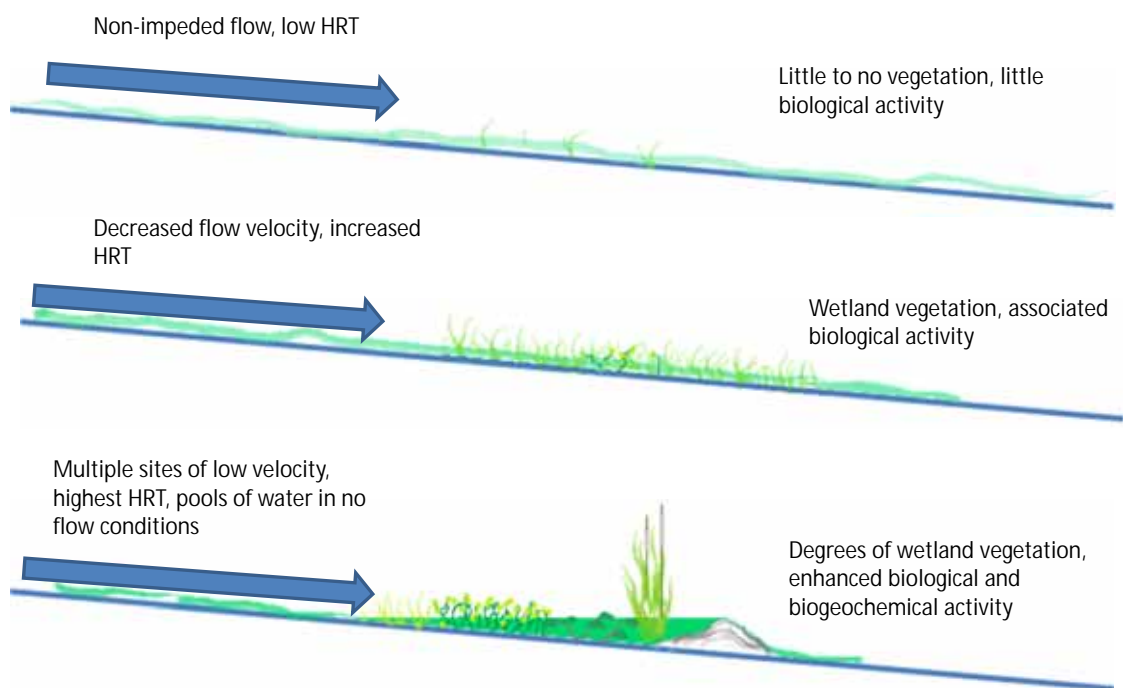
- Grab samples
 - 3 week intervals
 - March to November
 - 6 week intervals
 - December to February

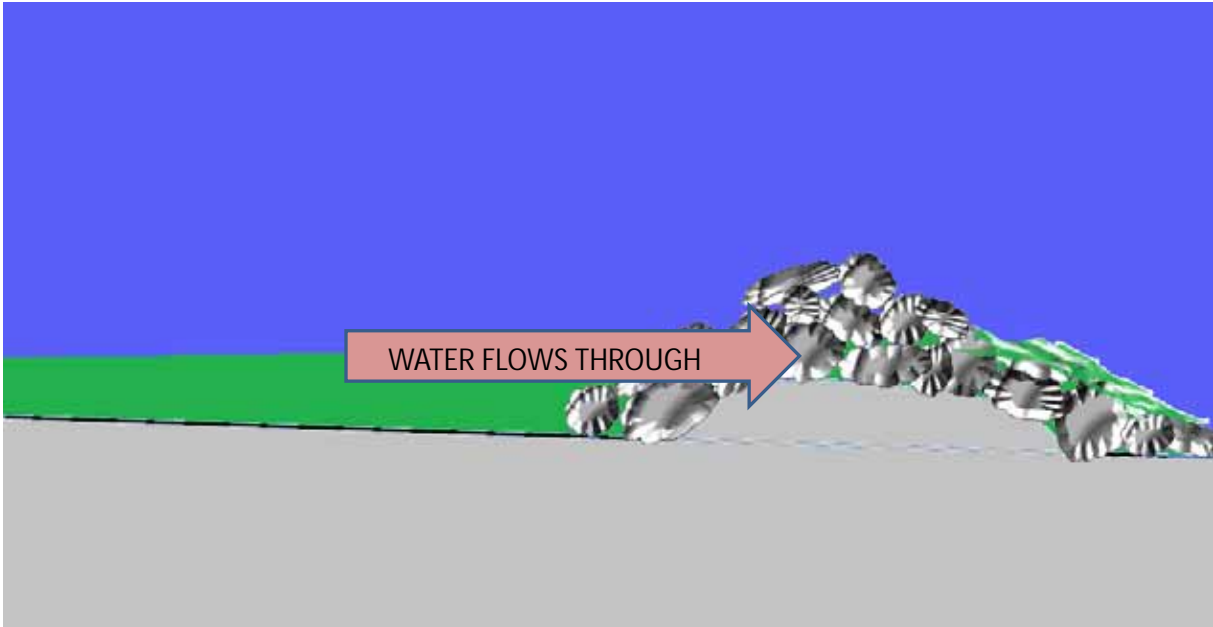


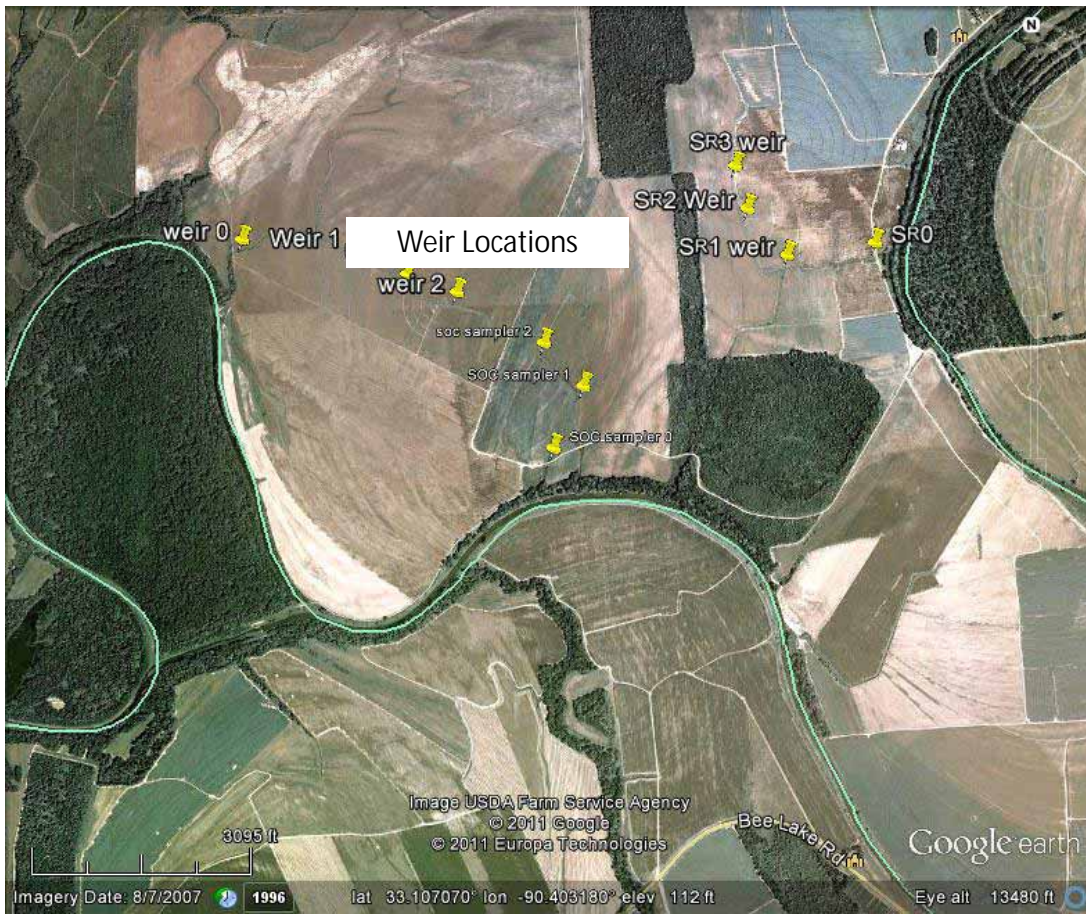




Implementation of Water Control







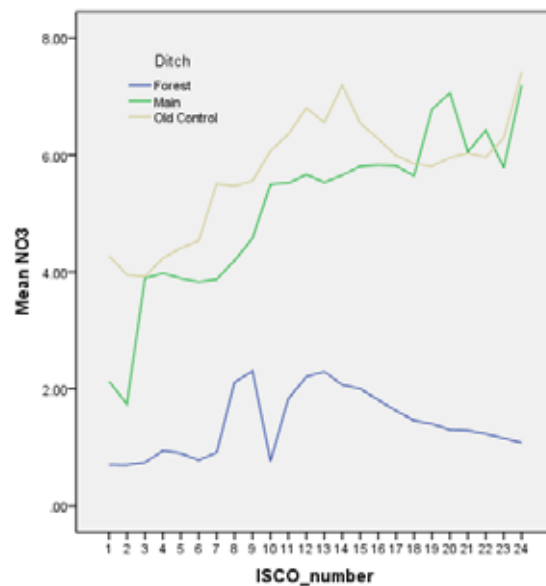


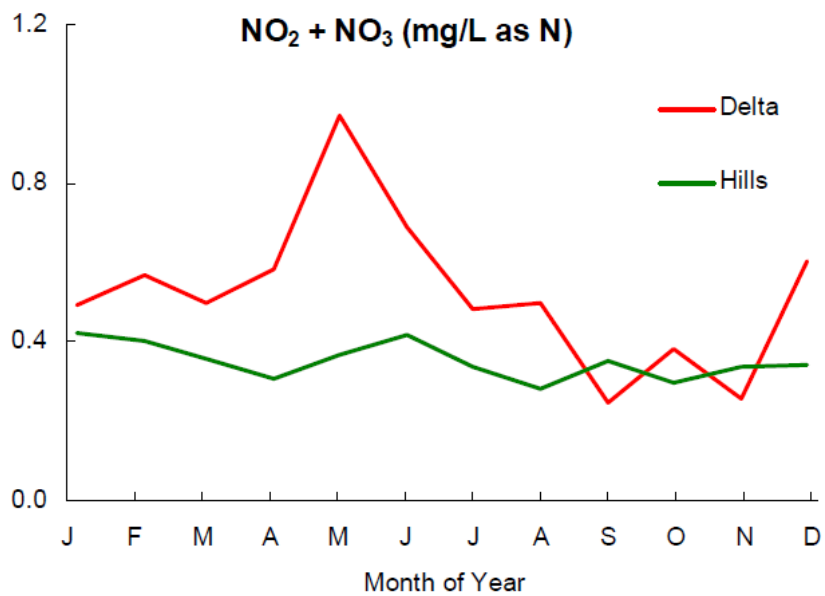
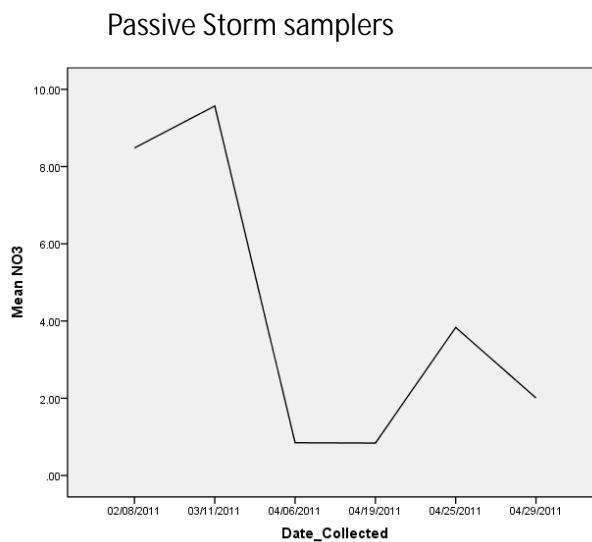
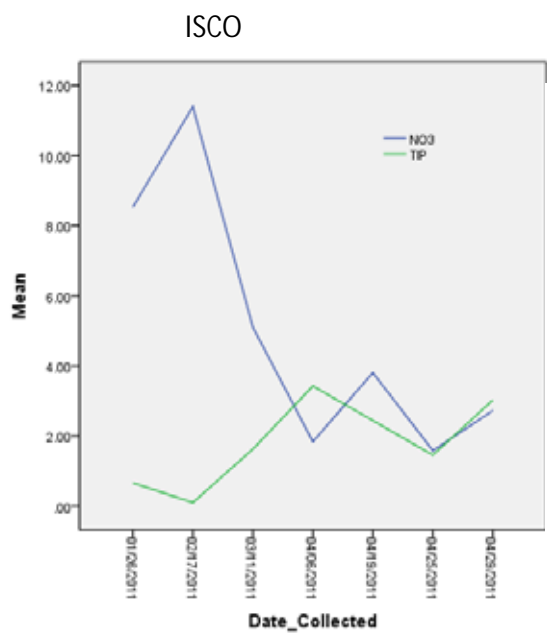
Data Collected

- When?
 - ISCO samples
 - Differences During storm event
 - All samples
 - By month
- How?
 - Grab
 - ISCO
 - Storm
- Where?
 - Grab
 - Storm

ISCO samples

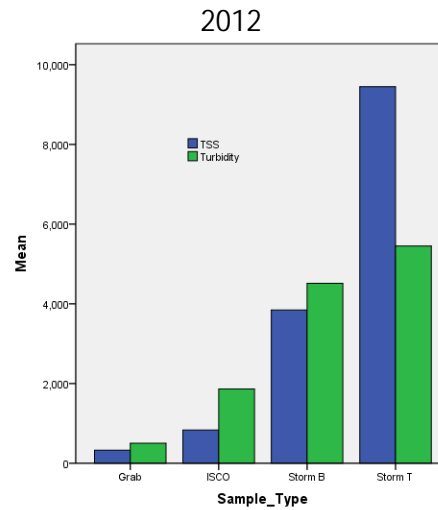
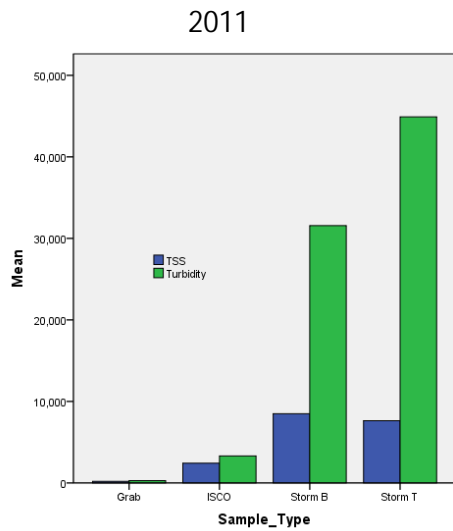
2011



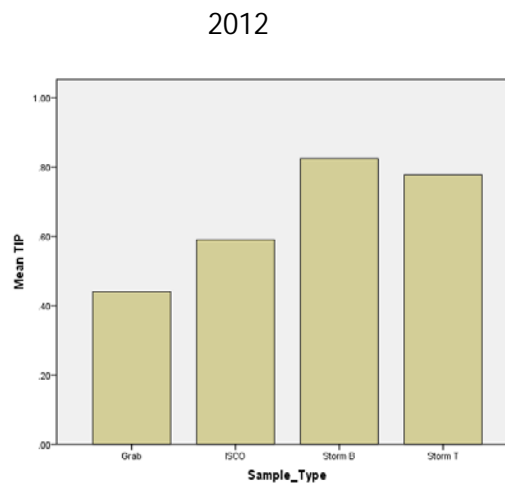
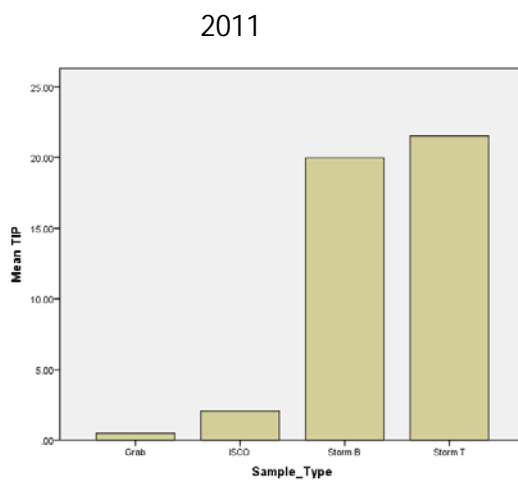


Shields et al., 2008

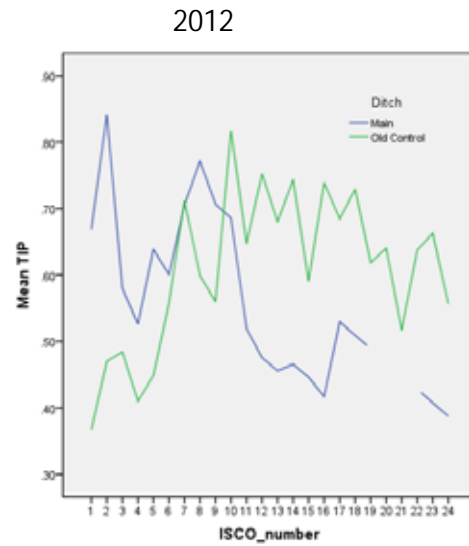
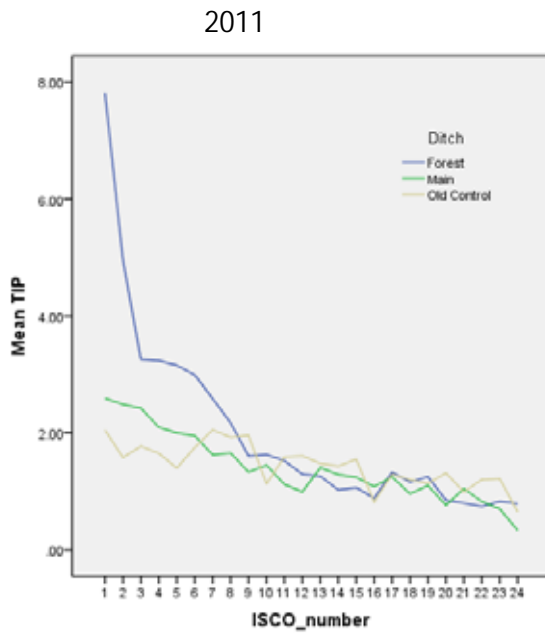
Sample Type All ditches at outflow



Effects on Phosphorus

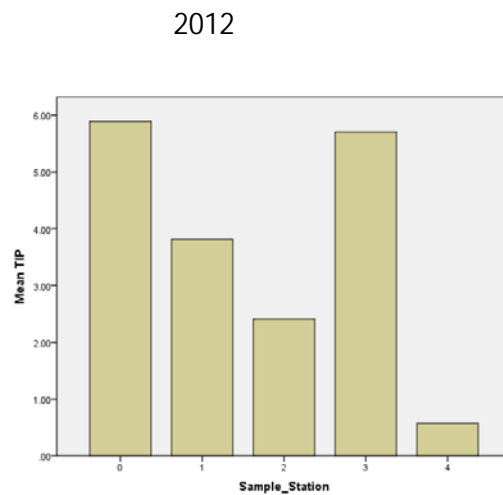
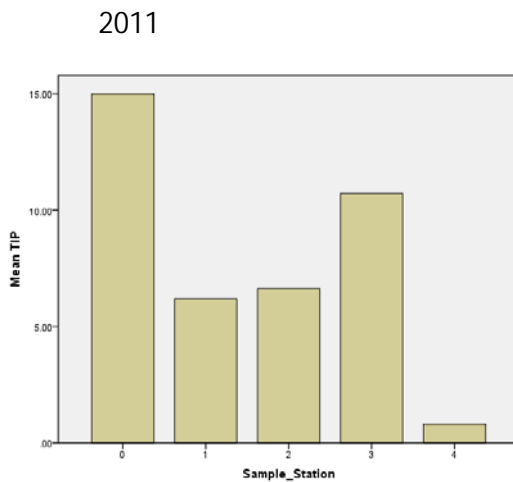


ISCO samples

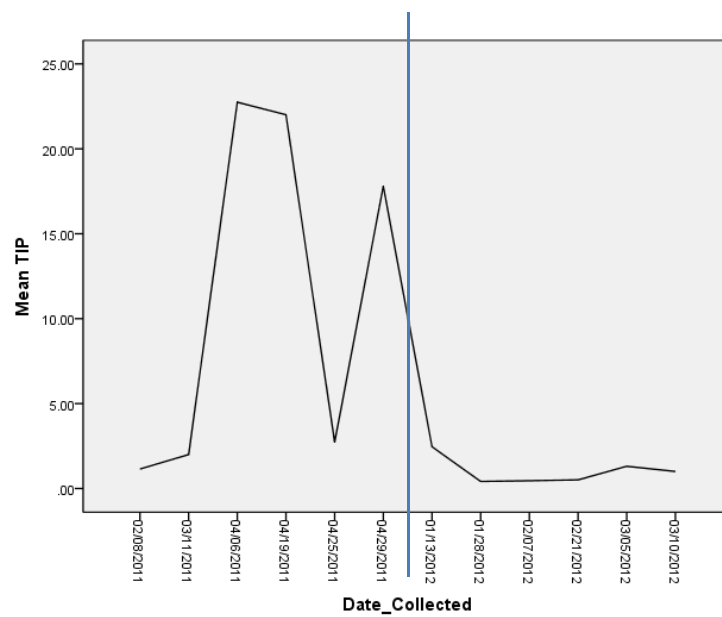
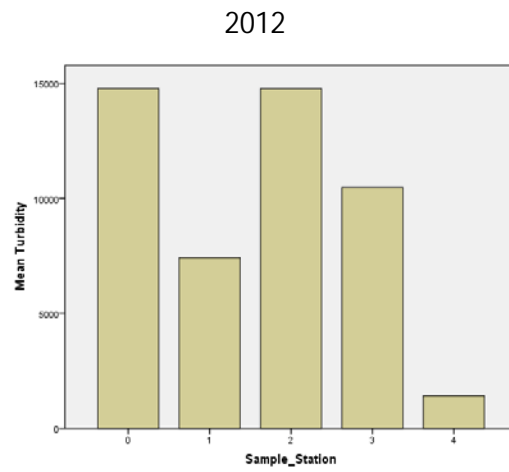
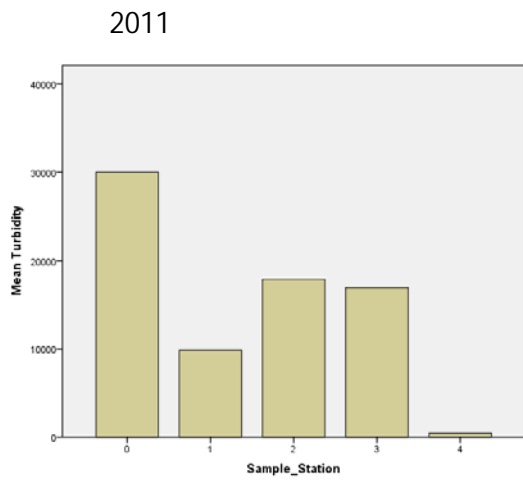


"Stream" Reach

- No difference for grab samples



- Storm samples
- Turbidity $p = 0.089$



Conclusions

- Ditches are moving large amounts of TIP and sediment in the initial hours of storm events
- Nitrate concentrations show a gradual increase during storms
- NPS patterns are influenced by seasonal and agricultural practices

Future Directions

- Effect of Water Control Structures on Nitrate
- Interpretation in relation to hydrology
- Load calculations
- Soil testing
- Application rates

Acknowledgements



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