Changes in Water Quality in GLSM Watershed Following Manure Application Regulations

Stephen J. Jacquemin[1], Laura T. Johnson[2], Theresa A. Dirksen[3], Terry M. Mescher[4], Greg McGlinch[1]
[1] Wright State University – Lake Campus, Agricultural and Water Quality Educational Center
[2] Heidelberg University, National Center for Water Quality Research
[3] Mercer County Community and Economic Development Office, Agricultural Solutions
[4] Ohio Department of Agriculture, Division of Soil and Water

Research objective was to examine trends from 2008-2016 in sediment and nutrient water quality for changes concurrent with distressed watershed rules (OAC 901:13-1-11) phased in beginning 2011

- Testing the efficacy of the manure ban (December 15—March 1) of each year (pre-regulation vs. post-regulation)
- Data collected in Chickasaw Creek from 2008-2016 (by Heidelberg University), a sub-watershed of Grand Lake St. Marys (GLSM) Watershed
- Pre-regulation time period = 2008 through November 2011
- Post-regulation time period = December 2011 through October 2016
- Has there been a change? Nutrient loads are dependent on flow and season, which is all accounted for in the model
- Negative numbers mean a decrease in nutrients, demonstrating improved water quality. Parameters are arranged by equal flow percentiles

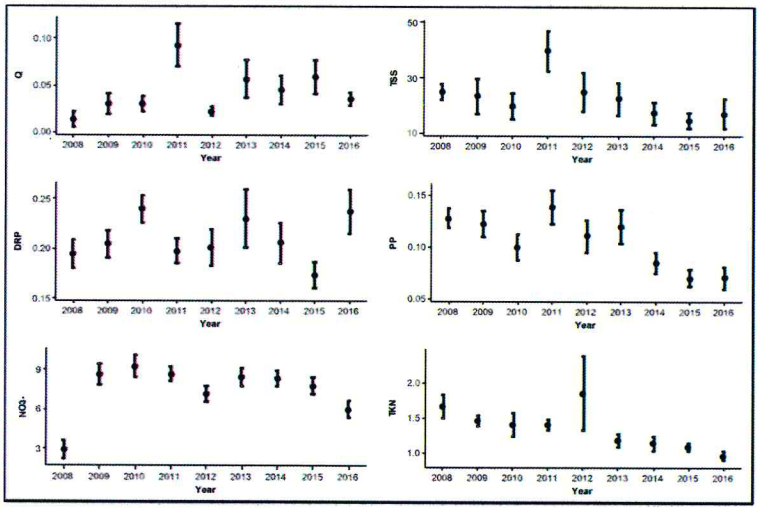
December 15 - March 1 (Manure Ban)	
Water Quality Parameter	**Pre vs Post Change (%)**
Total Suspended Solids (TSS)	
Low Flow	2
Medium Flow	-36
High Flow	-29
Particulate Phosphorus (PP)	
Low Flow	-55
Medium Flow	-57
High Flow	-46
Dissolved Reactive Phosphorus (DRP)	
Low Flow	-48
Medium Flow	-28
High Flow	-18
Nitrate (NO3-)	
Low Flow	-1
Medium Flow	-16
High Flow	-19
Total Kjeldahl Nitrogen (TKN)	
Low Flow	-39
Medium Flow	-42
High Flow	-36

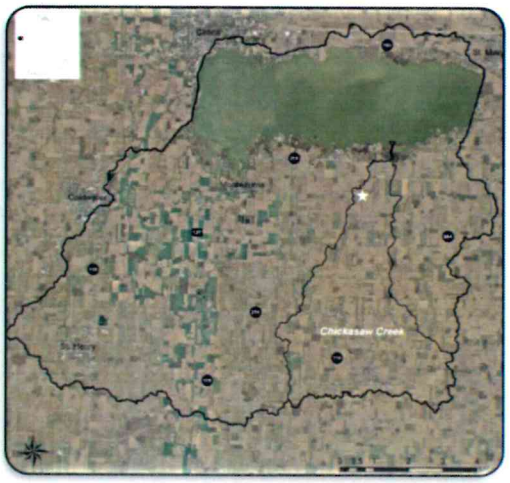
Tremendous efforts made by farmers in the watershed have made these decreases possible.

There is always room for more improvement! We must stay the course while also engaging in new practices.

THANK YOU FARMERS!

Annual Flow and Nutrient Summary



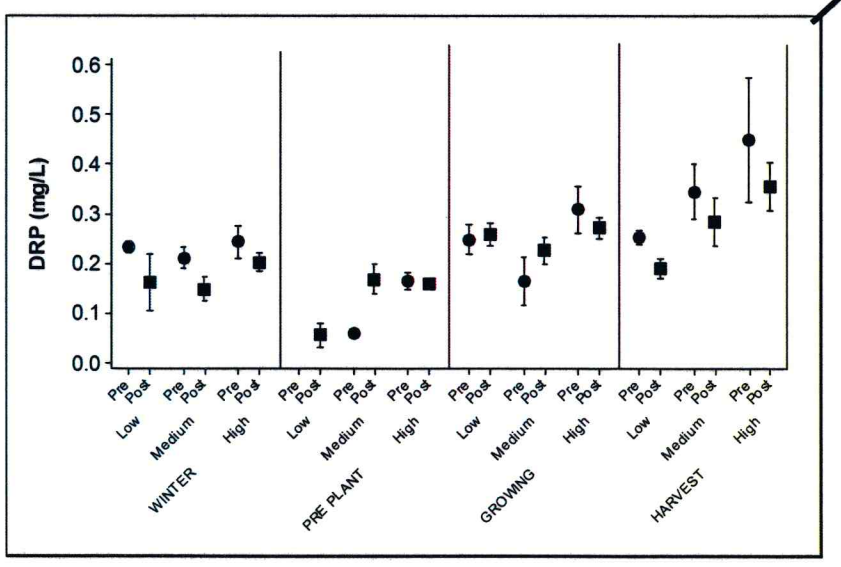


March 2 - December 14	
Water Quality Parameter	**Pre vs Post Change (%)**
Total Suspended Solids (TSS)	
Low Flow	4
Medium Flow	1
High Flow	-23
Particulate Phosphorus (PP)	
Low Flow	-10
Medium Flow	-13
High Flow	-12
Dissolved Reactive Phosphorus (DRP)	
Low Flow	-16
Medium Flow	44
High Flow	0
Nitrate (NO3-)	
Low Flow	50
Medium Flow	-41
High Flow	-32
Total Kjeldahl Nitrogen (TKN)	
Low Flow	3
Medium Flow	-14
High Flow	-22

Continuing Efforts

- ⇒ ***Continue ban on winter manure application***
- ⇒ ***Continue to maintain nutrient management plans for all livestock farms***
- ⇒ ***Potential projects to reduce legacy phosphorus in the soil***
- ⇒ ***Encourage moving manure out of the watershed***
- ⇒ ***Harvest two crops per year; more alfalfa/grass in rotation***
- ⇒ ***Encourage immediate incorporation of nutrients at all times***
- ⇒ ***Dewatering manure nutrients***
- ⇒ ***Other edge-of-field practices: retention ponds, saturated buffers, blind inlets, etc.***
- ⇒ ***Reduce commercial fertilizer applications (highly soluble)***

A closer look at dissolved reactive phosphorus:



This signifies the importance of the continuing efforts above. Largest increases of DRP (pre-regulation vs. post-regulation) are occurring during pre-plant season (March-May).