2019
Silver Creek Stakeholder Meeting

Erin Houghton

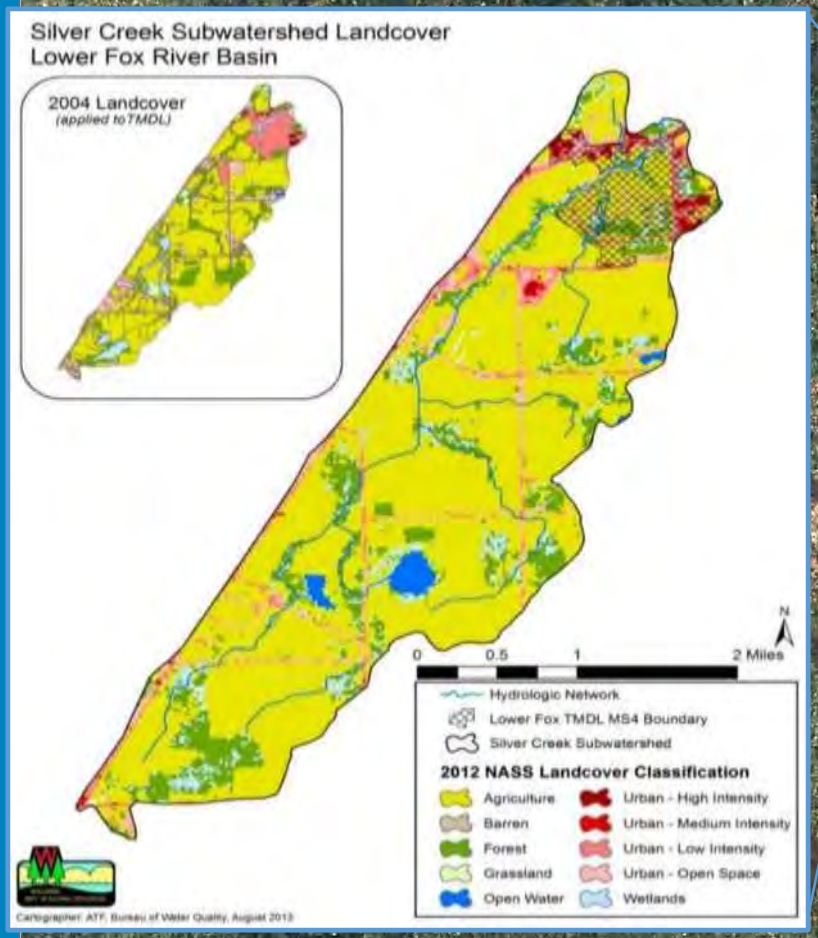
Watershed Programs Manager

Silver Creek Project
Partnering for Water Quality

NEW Watershed Program
Partnering for Water Quality

Today's Agenda:

- *7:30 – 8 am Refreshments & Social*
- 8 am Welcome & Introduction
- 8:10 – 8:30 am Accomplishments and Partners
- 8:30 – 10:30 am Partner Project Highlights
- 10:30 – 10:40 am BREAK
- 10:40-10:50 am Silver Creek Final Report
- 10:50 – 11:20 am LFR Watershed Efforts: P/K GLRI, WQ Pact, Basin Leadership Council
- 11:30 – 11:45 am grab lunch
- 11:45 – 12:15 pm Silver Creek Partner Feedback
- 12:15 – 12:45 pm ACDC Plans and Next Steps
- 12:45 – 1 pm Final Discussion & Wrap-up



NEW
Water

- Watershed Size: 4,800 Acres
- Land Use: 48%Agriculture
- Stream Length: 15 Miles

Silver Creek Key Accomplishments:

2014 – Project Kickoff

- Developed project partners
- Water quality sampling
- Soil sampling
- Stream surveys

2015 – Watershed Inventory

- Comprehensive field evaluations
- Arc GIS tablet application
- Conservation planning meetings
- Developed conservation and enhanced nutrient mgmt. plans

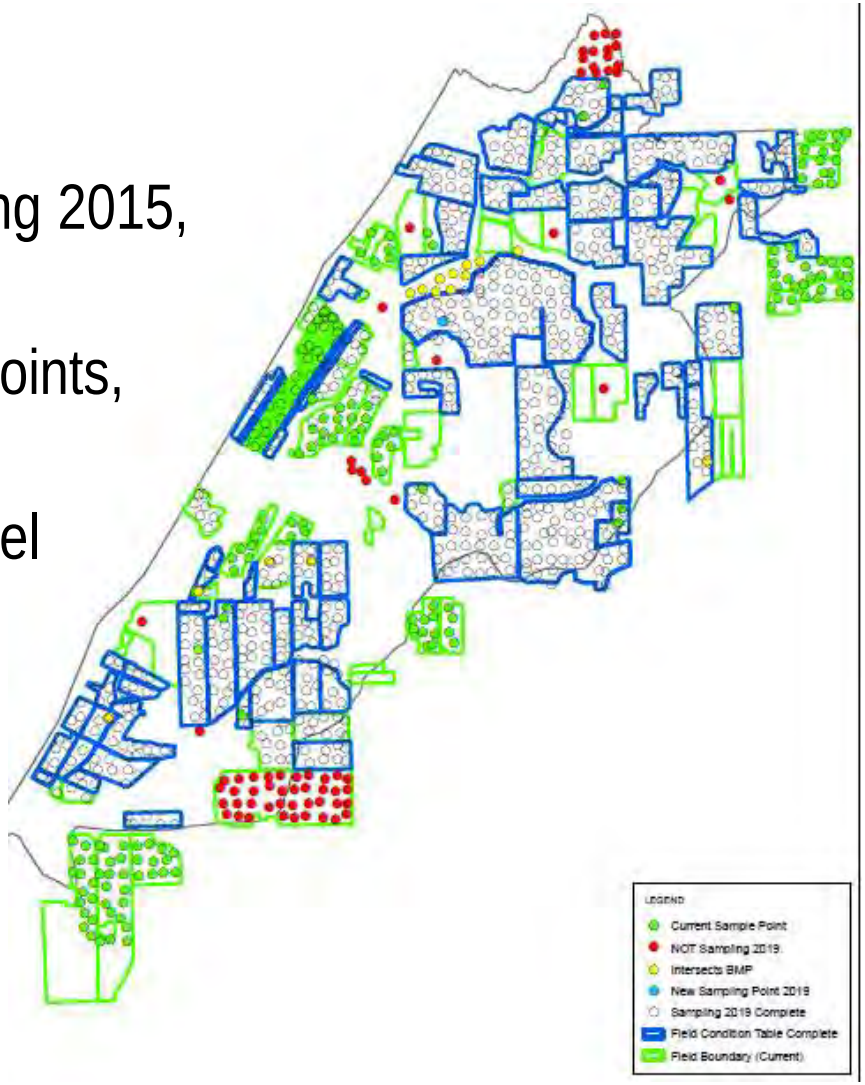
Silver Creek Key Accomplishments:

2016 – 2019 - Project Implementation

- Water quality monitoring
- Field planning
- Cost share agreements
- Best Management Practice (BMP) installation
  - Filter strips (buffers)
  - Critical area plantings
  - Grassed waterways
  - wetlands
  - Cover Crops
  - Residue Management
  - Low Disturbance Manure Application
  - Etc.
- Verification of installed BMPs
- GIS Database modifications
- Coordination, coordination, coordination….

Fall 2019 Final Soil Sampling

- Silver Creek Final Soil Sampling underway
  - Fall 2019: >75% complete
- Compare to initial Fall 2014-Spring 2015, pre BMP implementation
- Same technique, same sample points, similar time of year sampled
- How did soils respond to field level changes?



Next Steps In Silver Creek

- Update conservation plans
- Planning for 2020 growing season
- Meetings with growers looking ahead
- Continue installation of needed operational BMPs 2020
- Continued contact, resource assistance, and verification of implemented work

- Continue water quality monitoring beyond 2020
  - Reduced effort
- Silver Creek will continue alongside ACDC
- Future updates included in ACDC outreach efforts

Partnerships in the Silver Creek Pilot Project:

- Stakeholder: actively interested in, affected by, or may benefit from shared knowledge of project success
- Partner: actively contributes time and resources to assist with the success of the pilot project
- *Collaborations and Partnerships have been crucial to the success of the Silver Creek Project*

Partnerships in the Silver Creek Pilot Project:

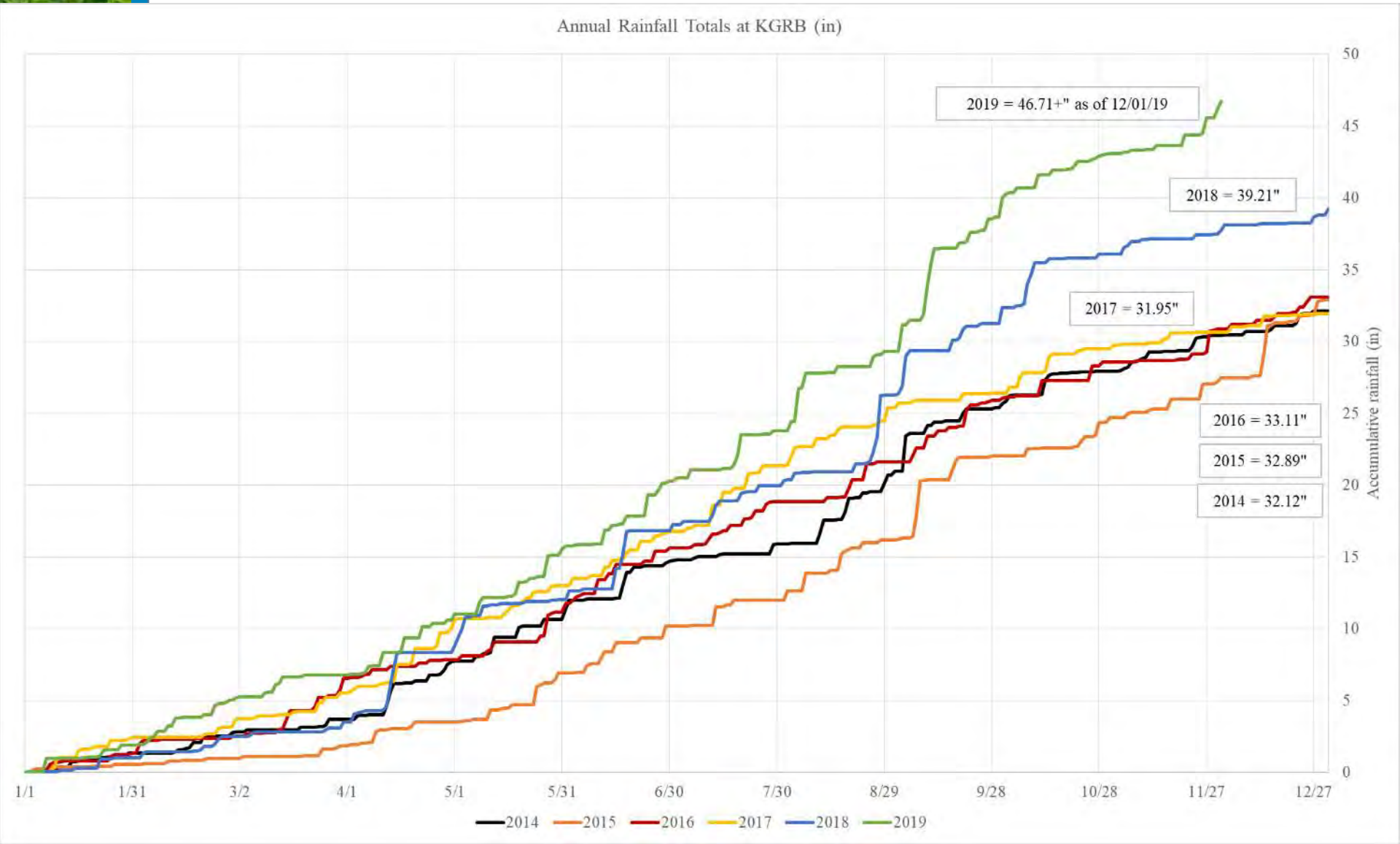
- Early working groups evolved with the project needs
- Key Ag Implementation Roles:
  - County Conservation staff
  - Tilth Agronomy staff
- Key Watershed Restoration Roles:
  - Wetland and biological partners
  - UWGB partners
  - USFWS partners
  - USGS
- Key Project Development Roles:
  - CH2M (now Jacobs)
  - Outagamie County
- Key Project Support:
  - Oneida
  - Brown County
  - UW-Extension

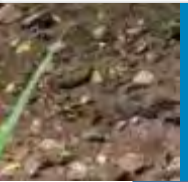
Silver Creek Pilot Project: Water Quality Review 2014-2019

Ben Young

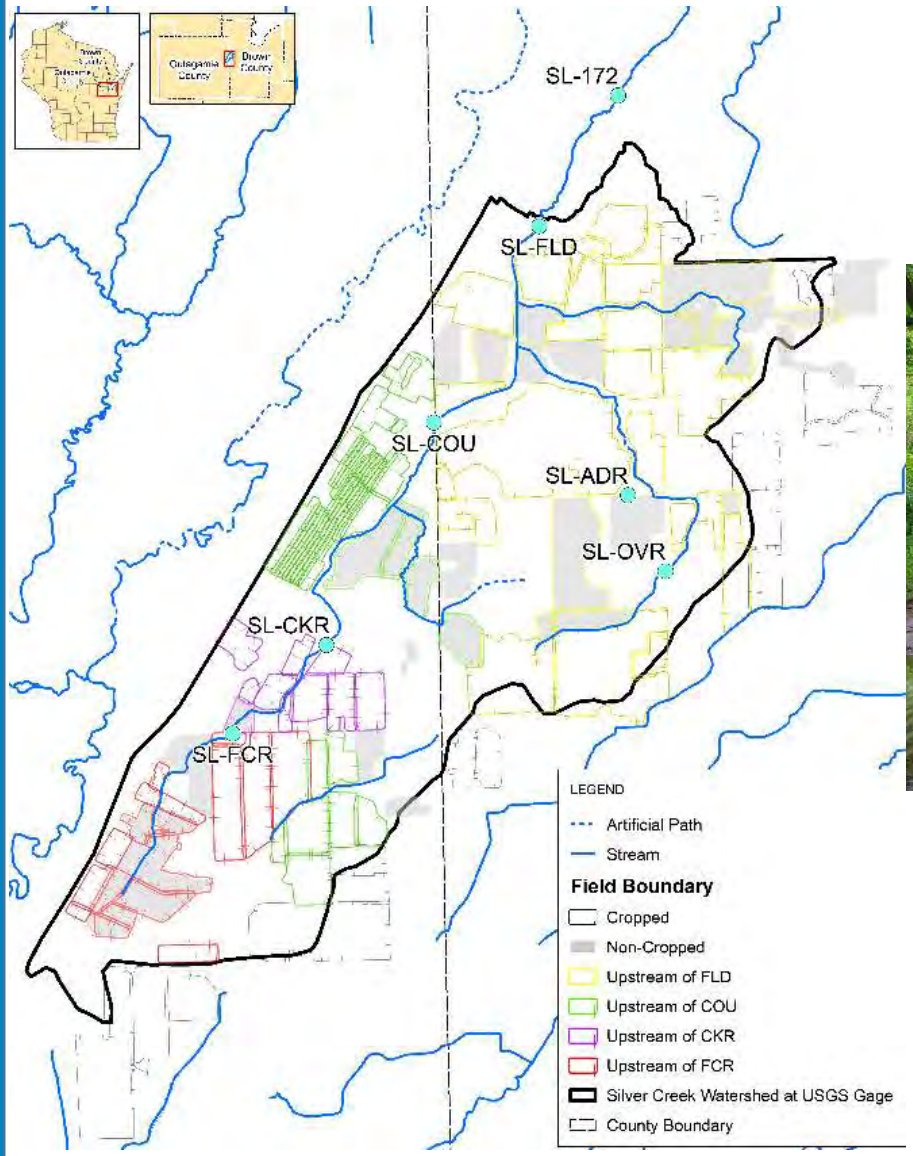
NEW Water

Watershed Specialist


Annual Rainfall Totals at KGRB (in)
2019 = 46.71+" as of 12/01/19
2018 = 39.21"
2017 = 31.95"
2016 = 33.11"
2015 = 32.89"
2014 = 32.12"
Accumulative rainfall (in)
0
5
10
15
20
25
30
35
40
45
50
1/1
1/31
3/2
4/1
5/1
5/31
6/30
7/30
8/29
9/28
10/28
11/27
12/27
2014
2015
2016
2017
2018
2019



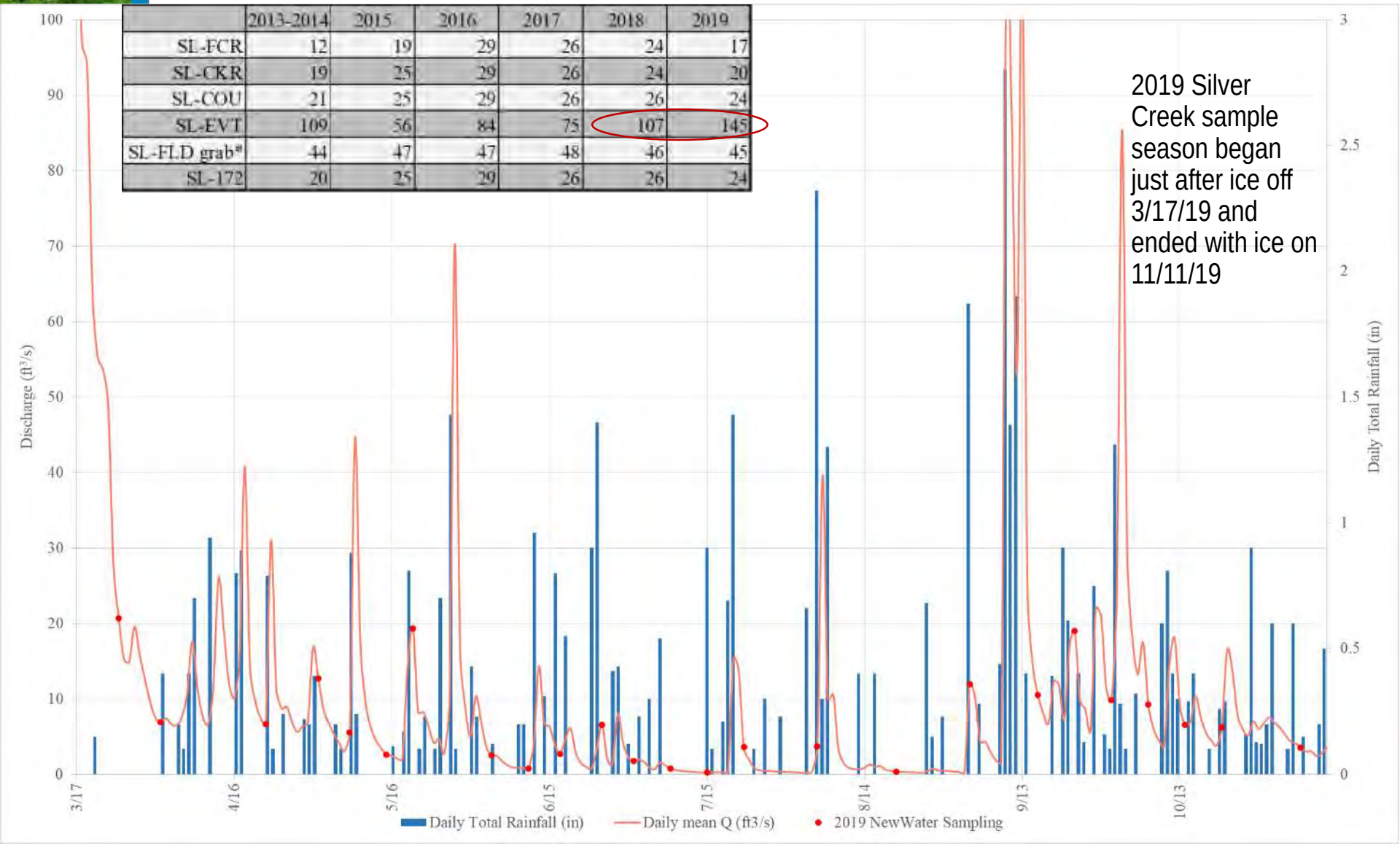
Water Quality Sampling Sites in Silver Creek



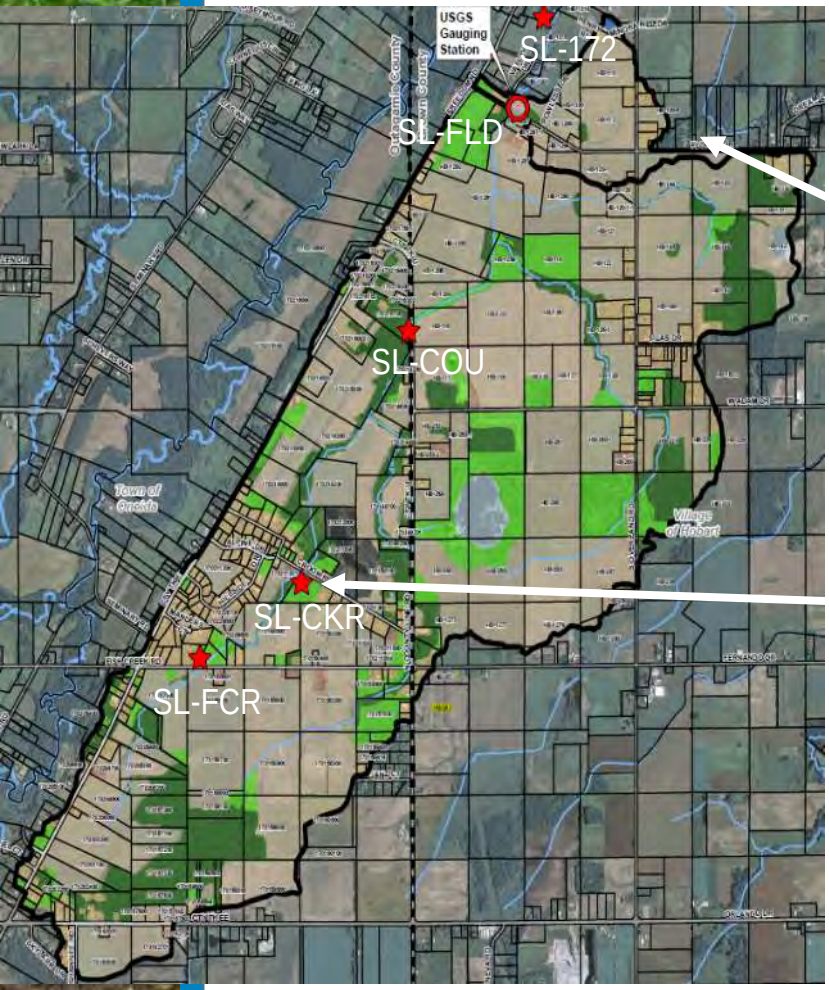
Silver Creek Water Quality Sample Collection Summary

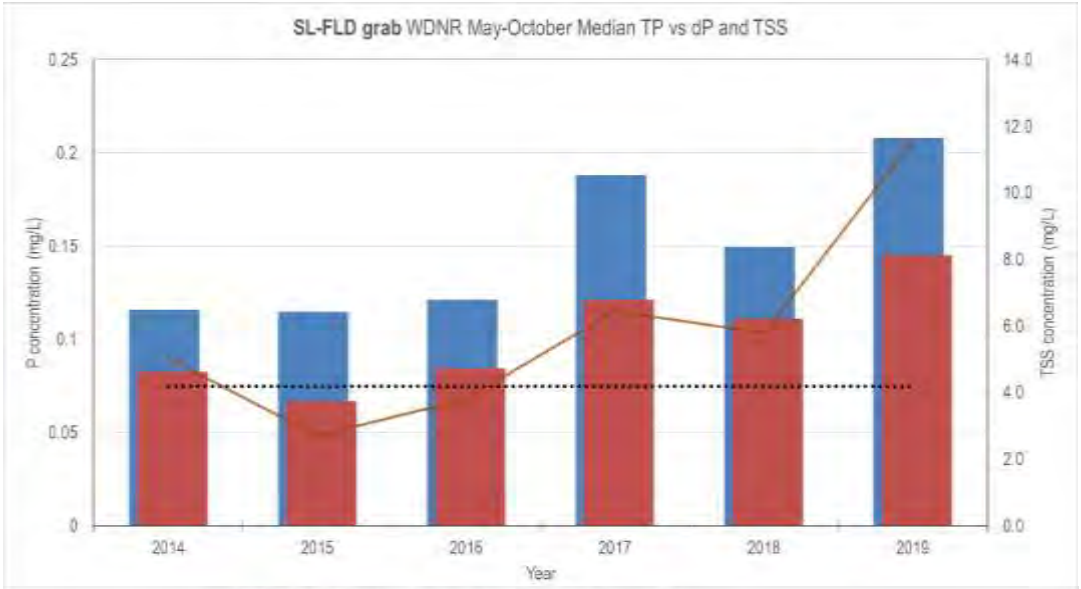
	2013-2014	2015	2016	2017	2018	2019
SL-FCR	12	19	29	26	24	17
SL-CKR	19	25	29	26	24	20
SL-COU	21	25	29	26	26	24
SL-EVT	109	56	84	75	107	145
SL-FLD grab*	44	47	47	48	46	45
SL-172	20	25	29	26	26	24

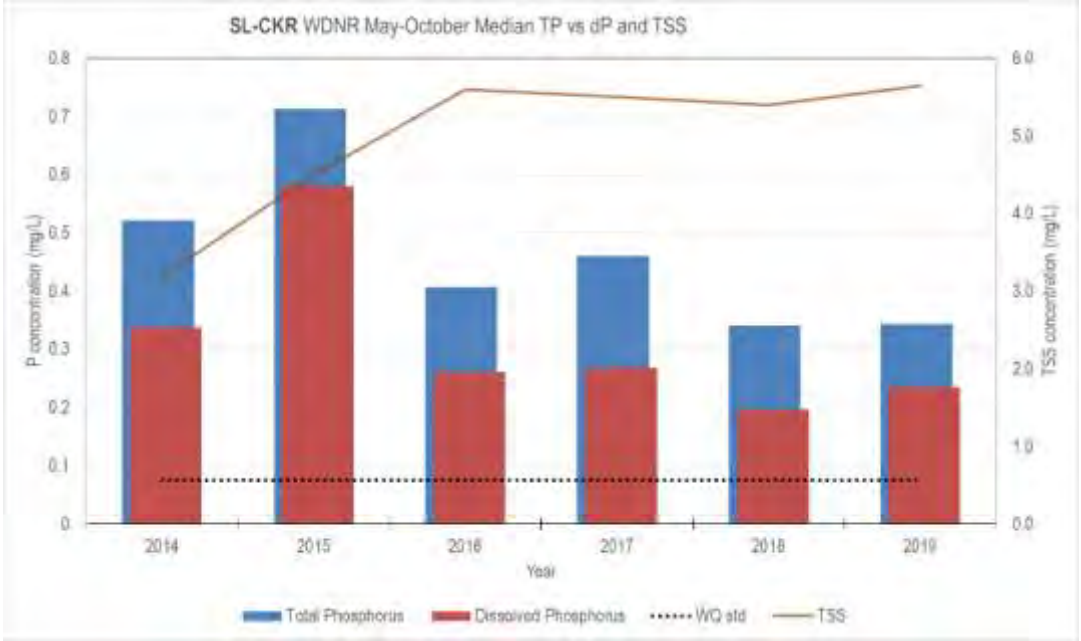
2019 Silver Creek sample season began just after ice off 3/17/19 and ended with ice on 11/11/19



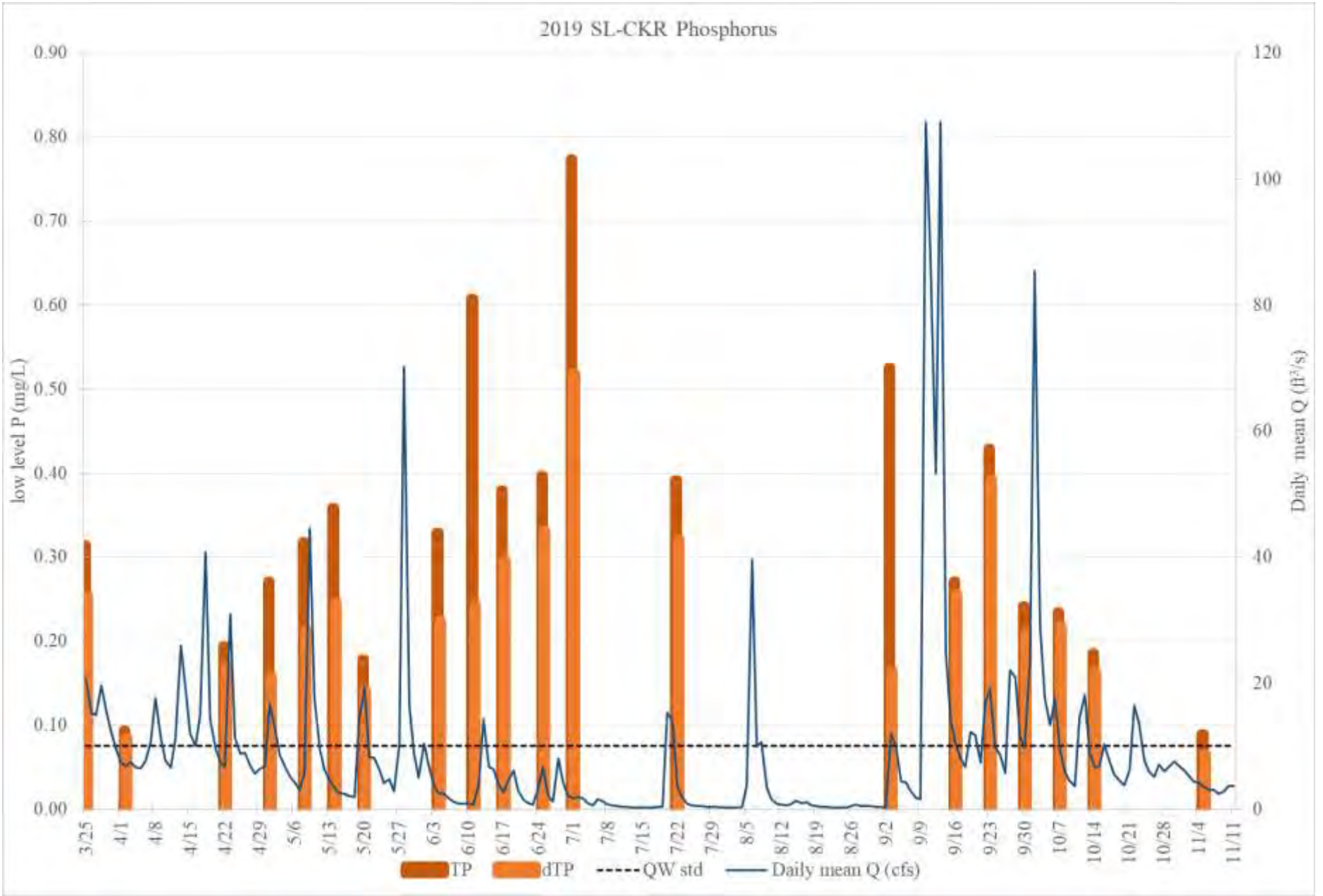
2014-2019 Silver Creek Main Stem Water Quality



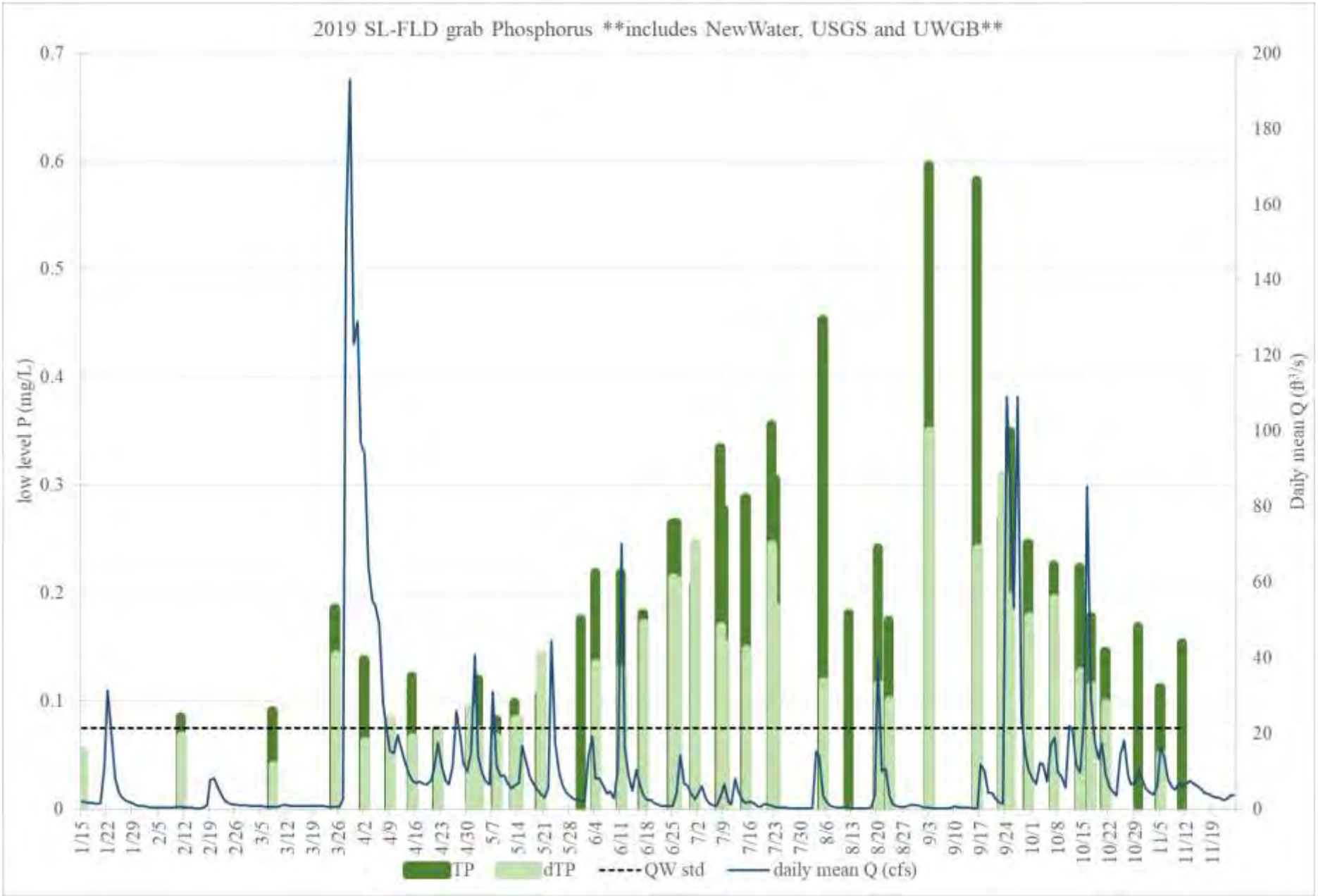




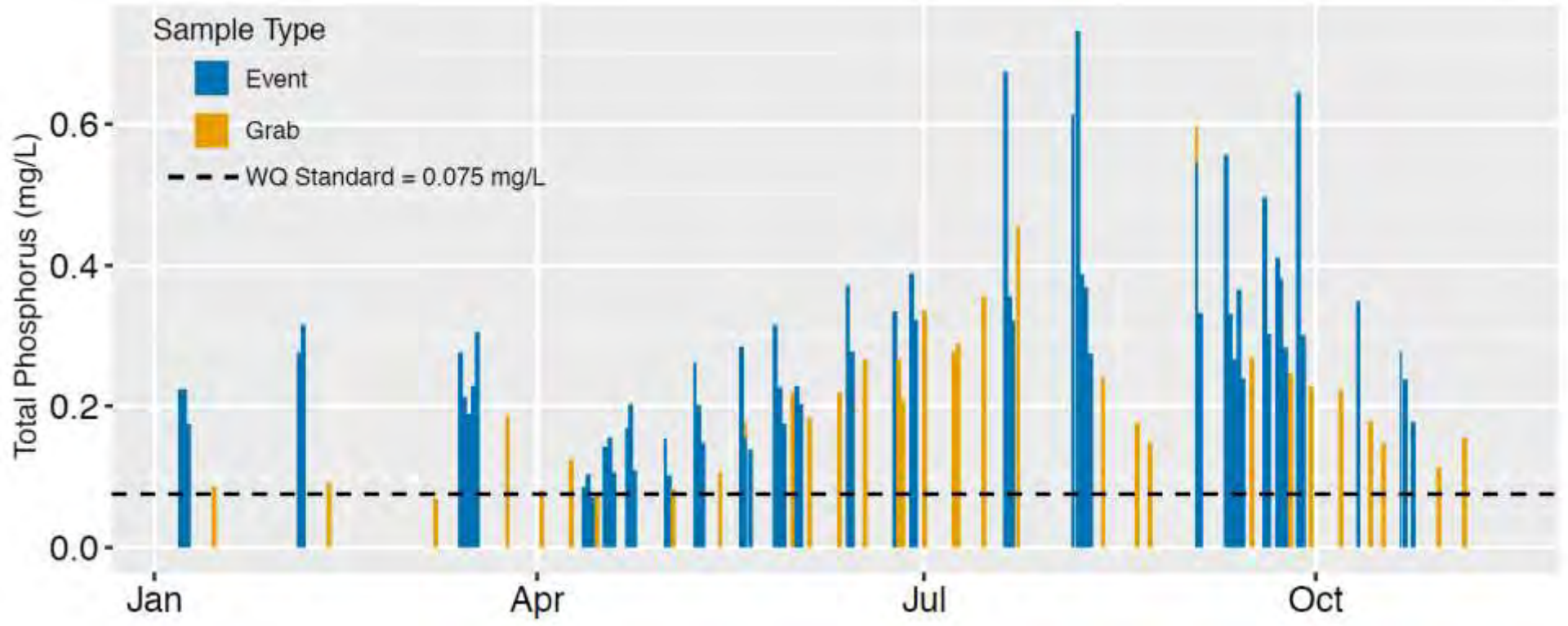
2019 Crook Road (CKR) Total Phosphorus



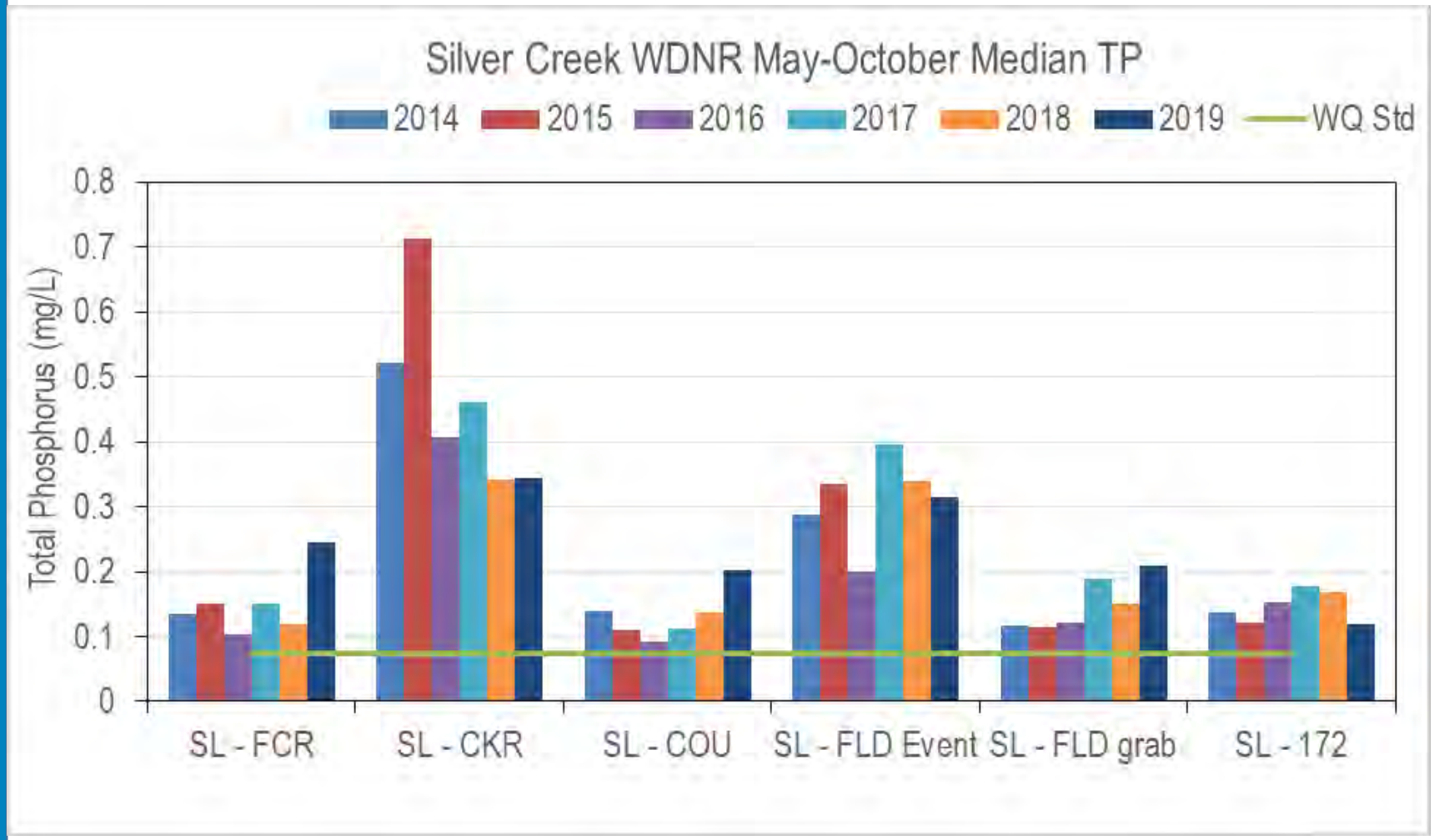
2019 Florist Drive (FLD, Grab) Total Phosphorus



2019 Silver Creek Florist Grab vs. Event Total Phosphorus



2014-2019 Silver Creek Main Stem Water Quality Review



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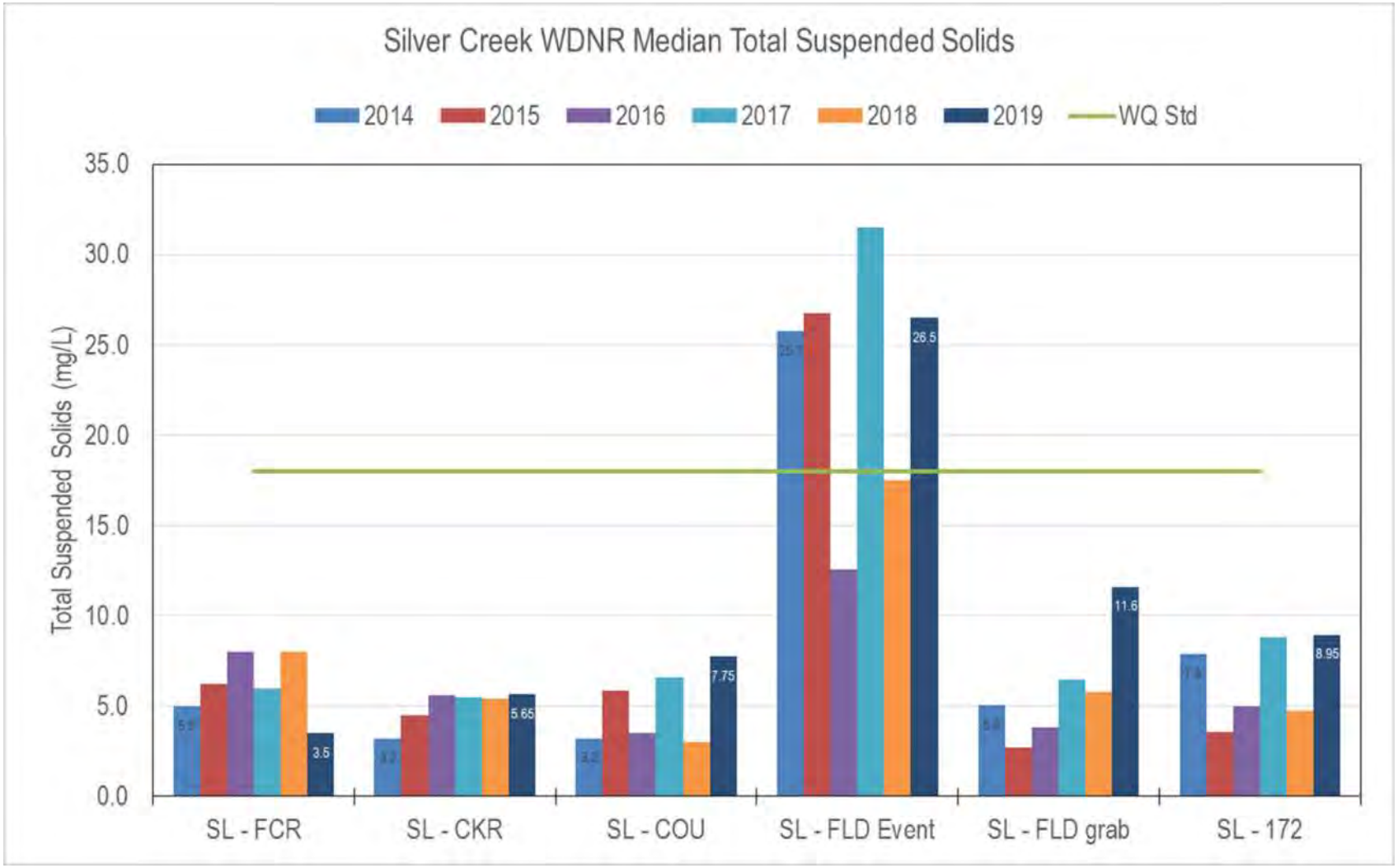
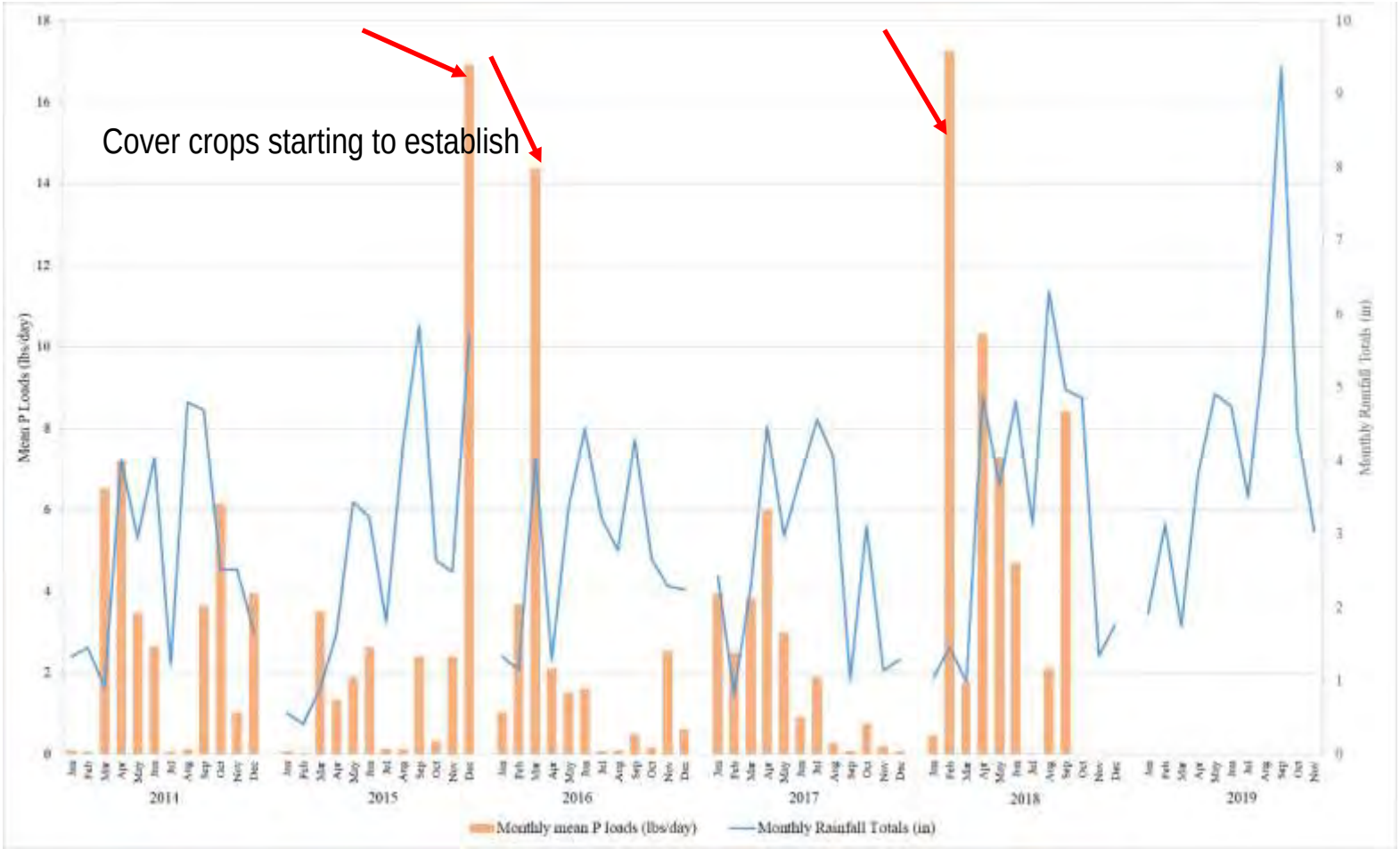
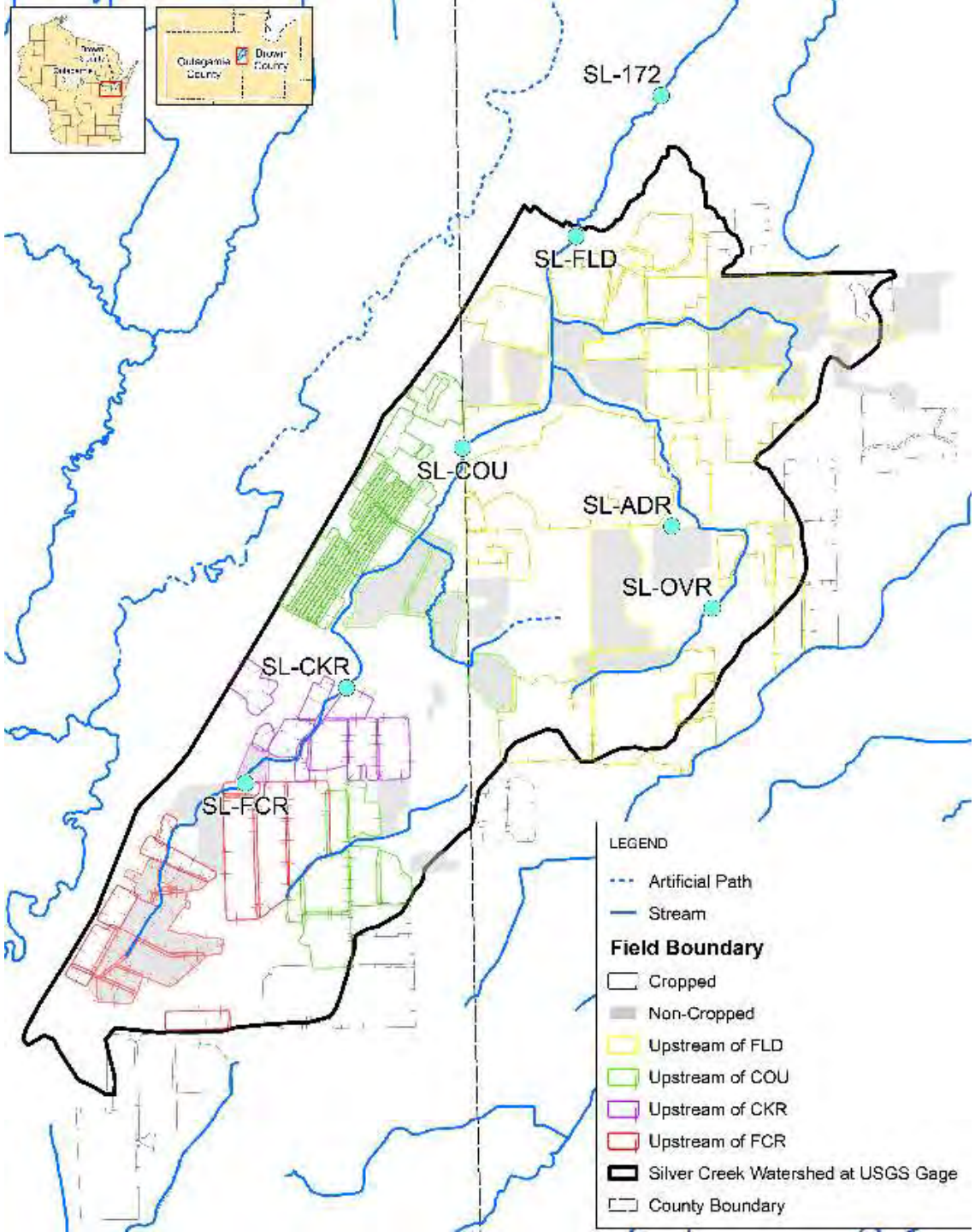


2014-2019 Silver Creek Main Stem Water Quality Loads

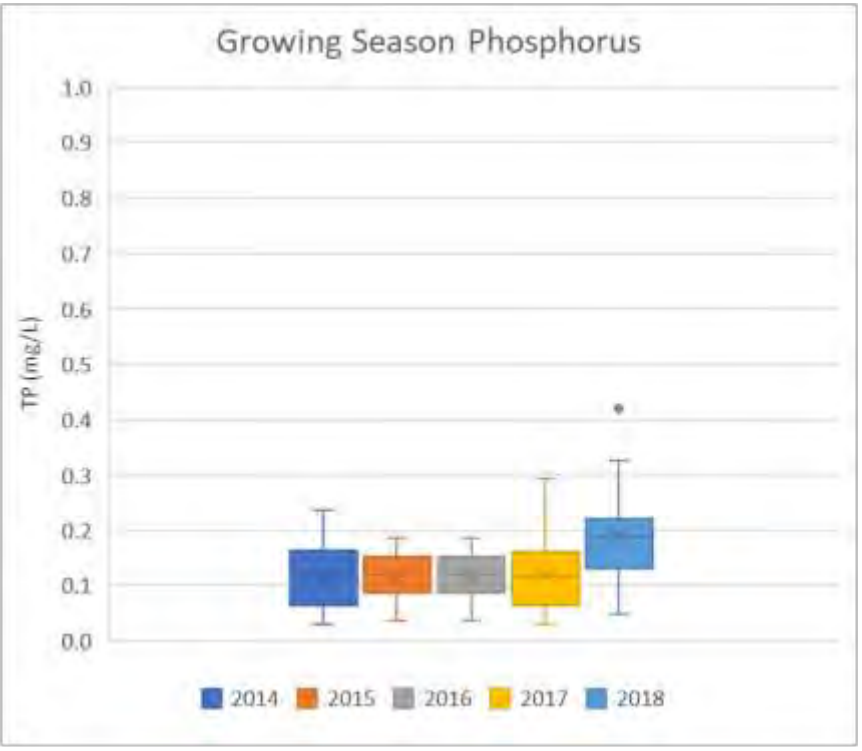


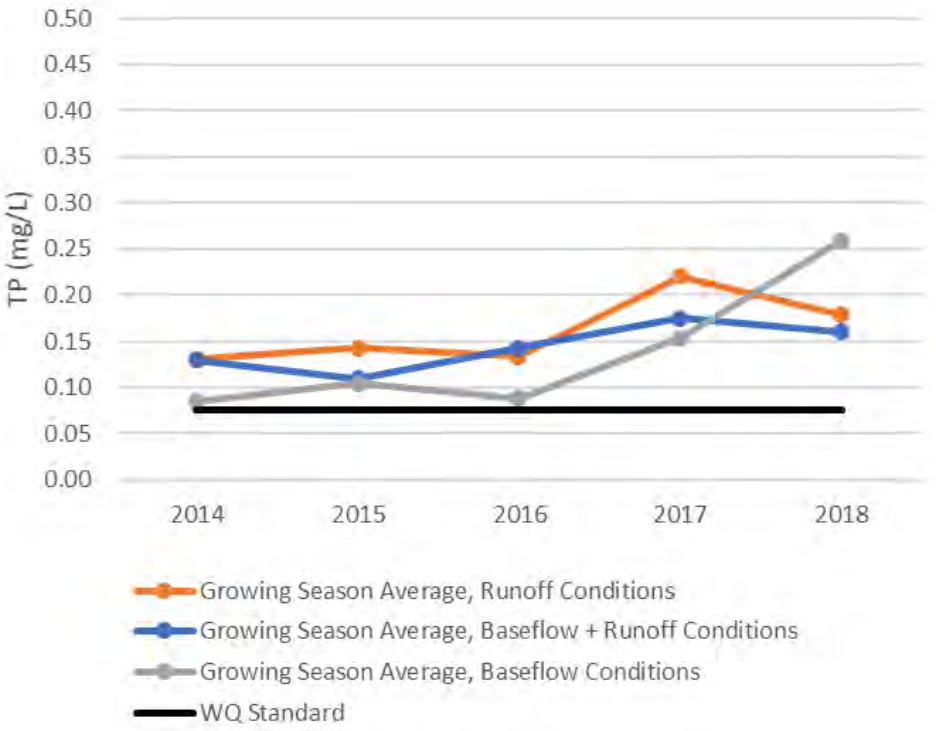
Water Quality & Watershed Interactions in Silver Creek

Natalie Lenz
Jacobs Engineering



Florist Drive (FLD, Grab)
Total Phosphorus





"Note: ""Runoff Conditions"" approximated as >0.75"" precipitation in previous 6 days (including day of sampling). ""Baseflow Conditions"" approximated as <0.20"" precipitation in previous 6 days (including day of sampling)."

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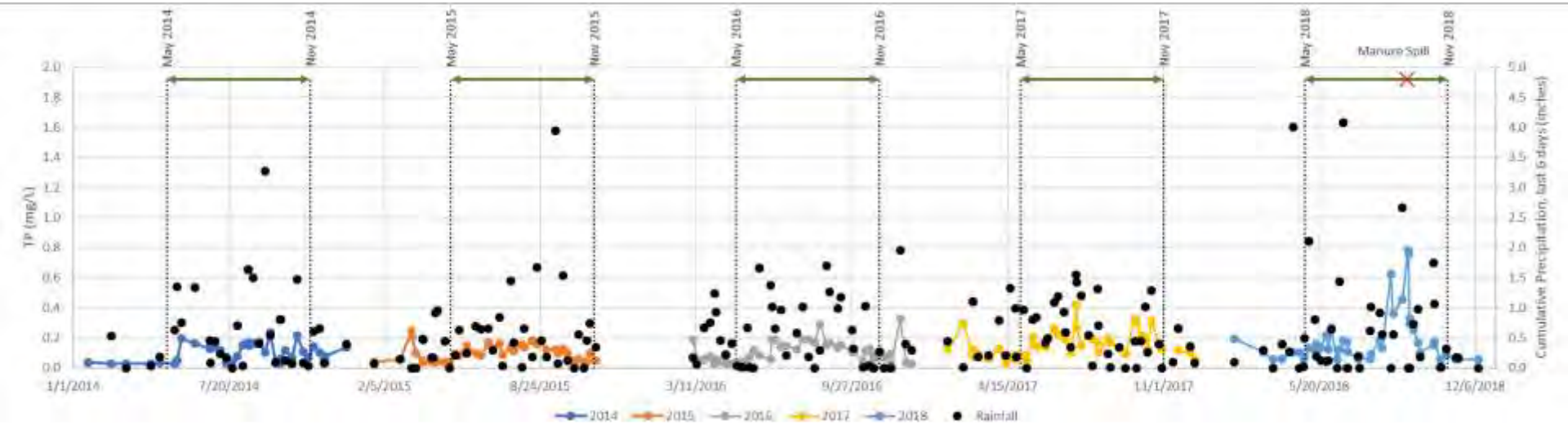

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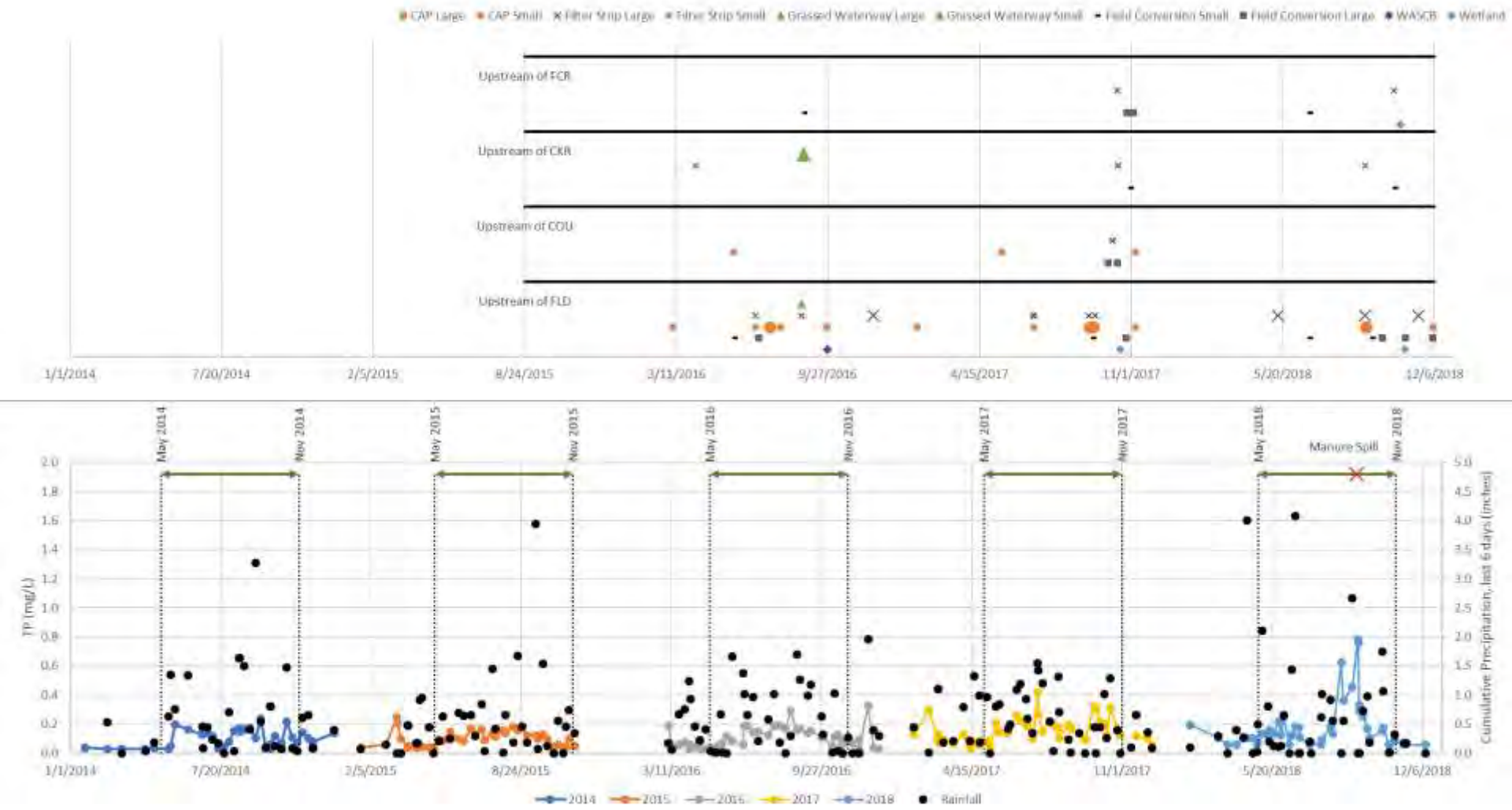

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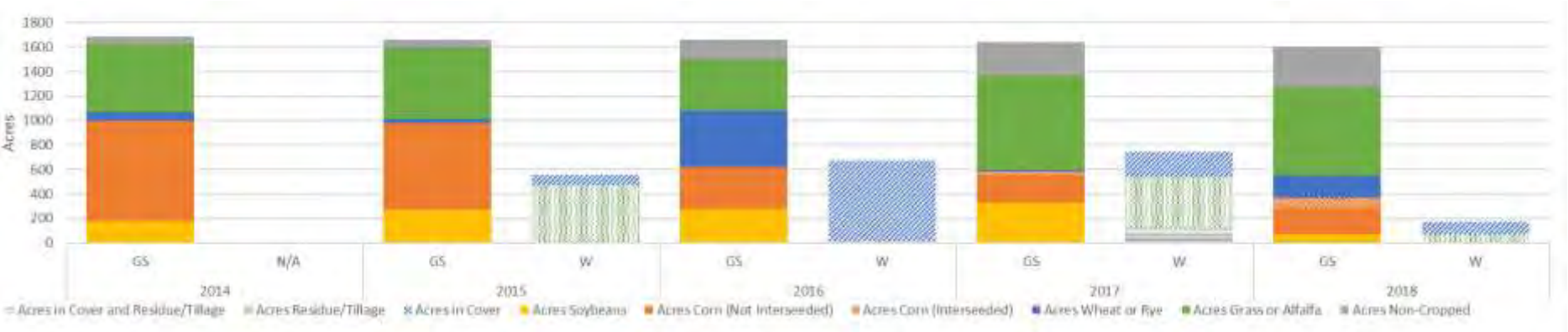

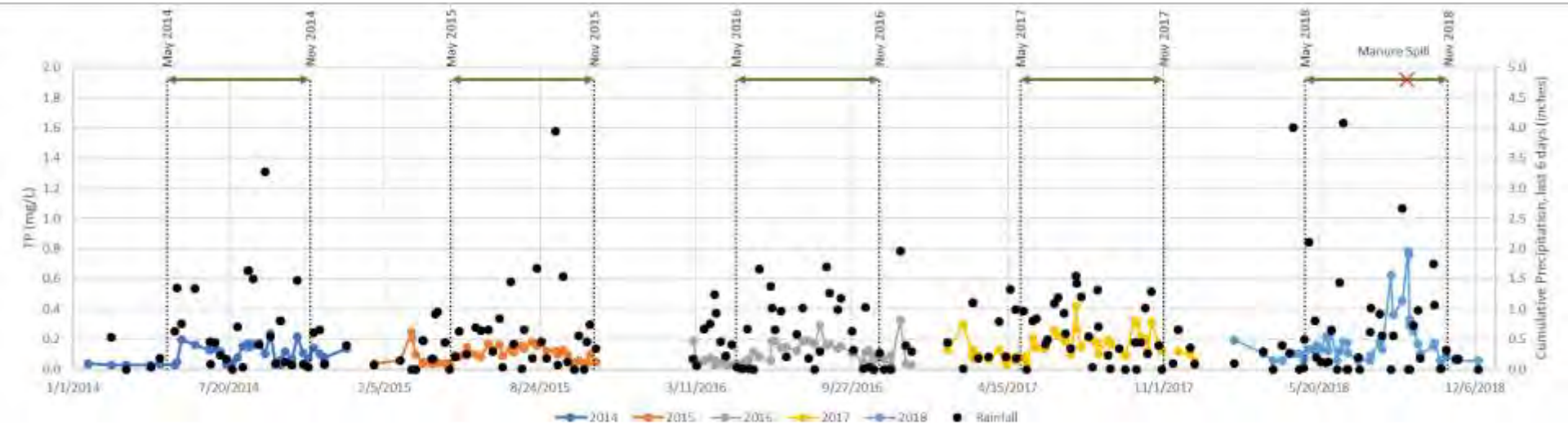

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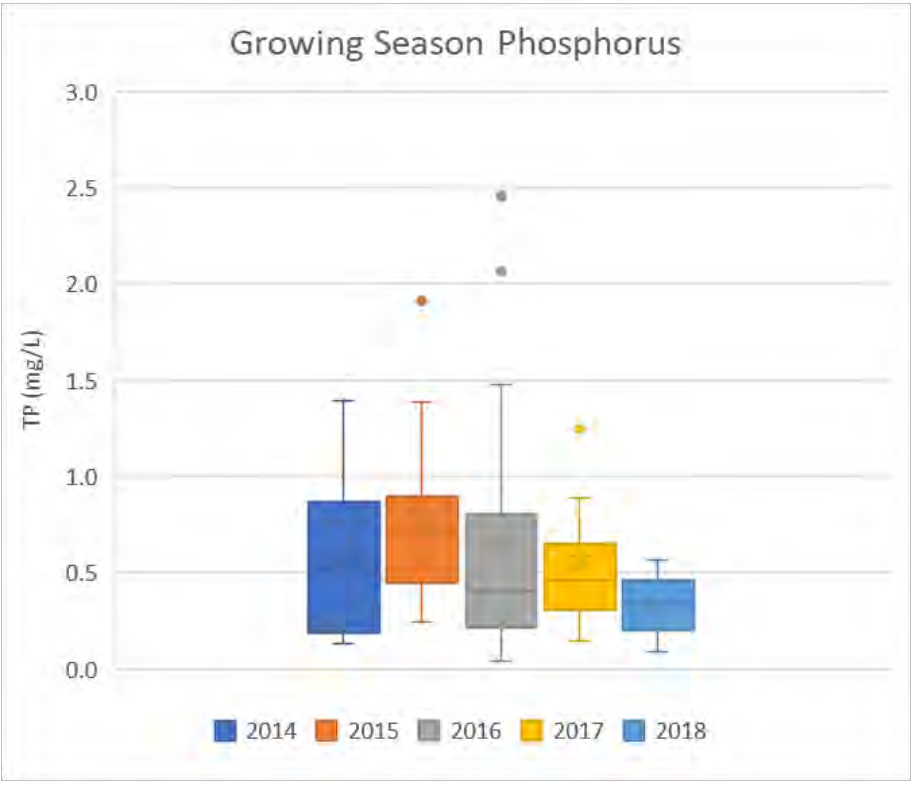

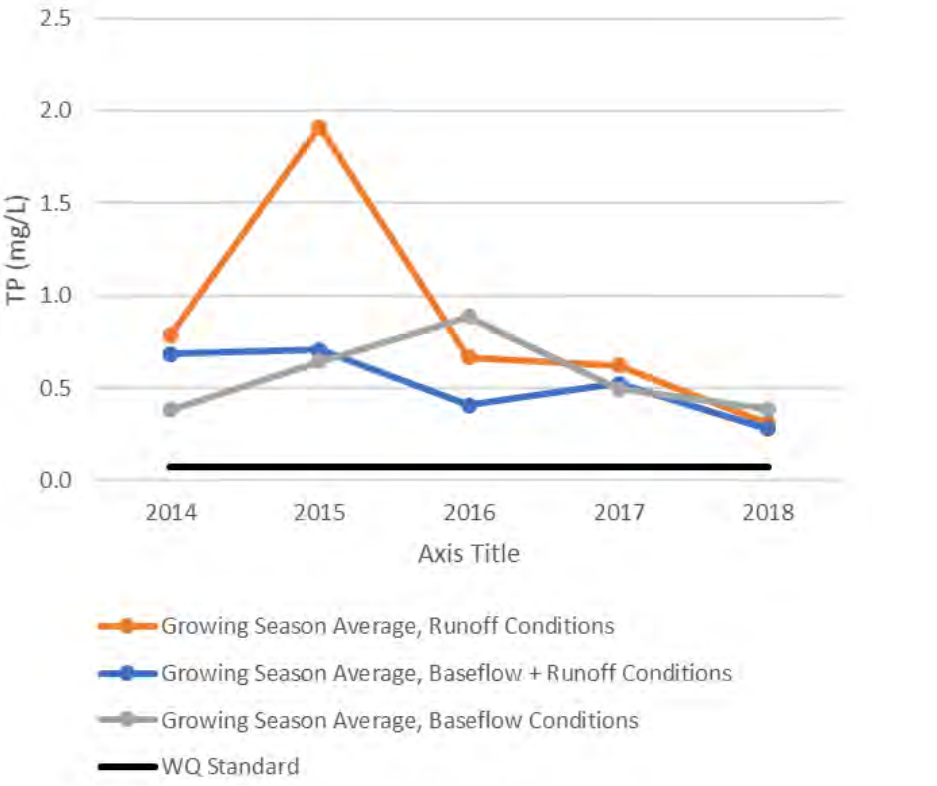

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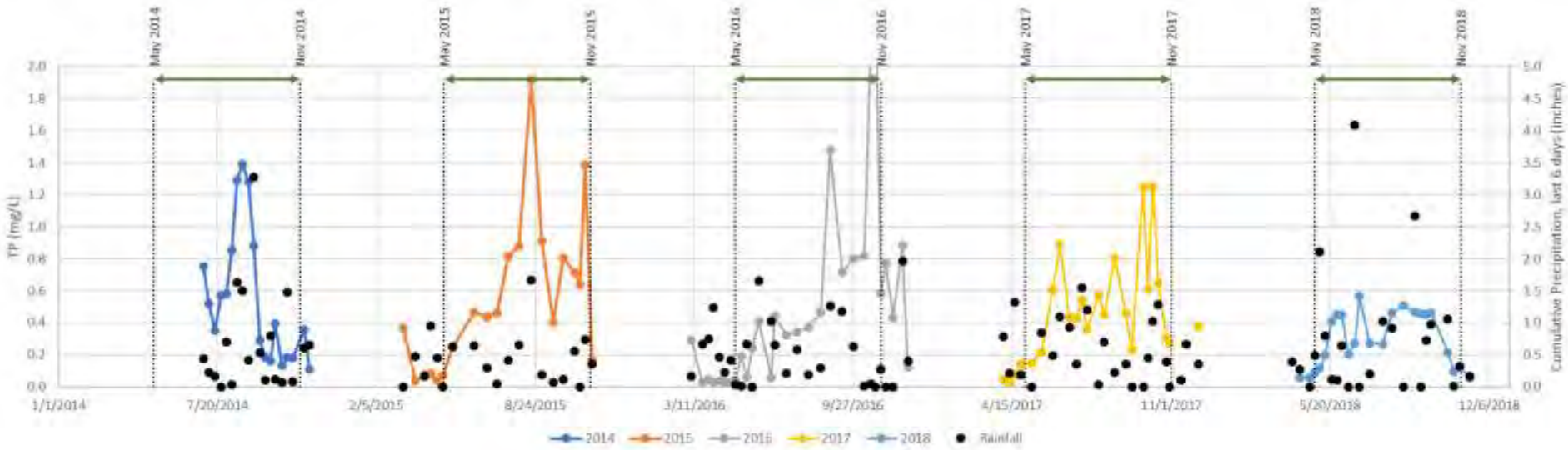

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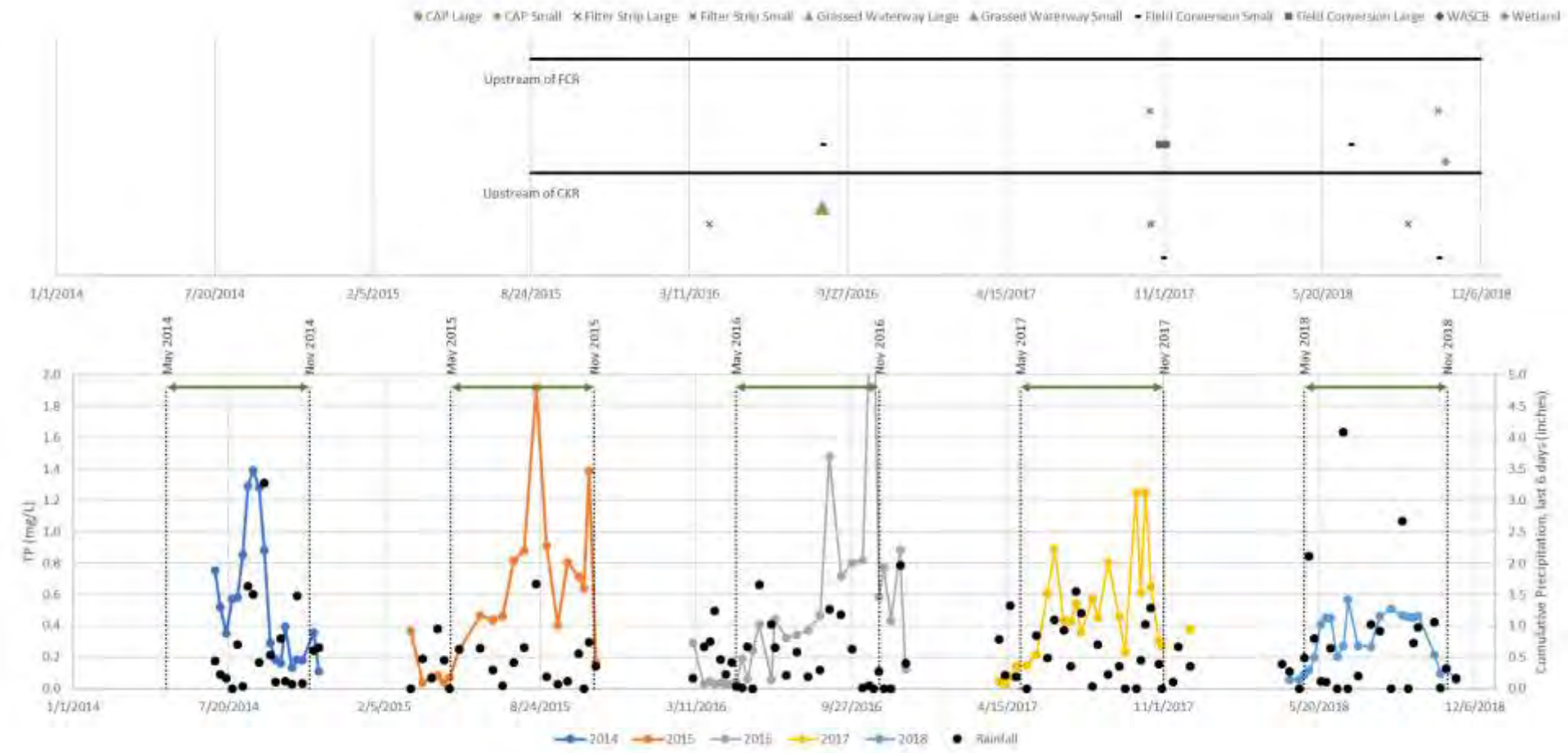

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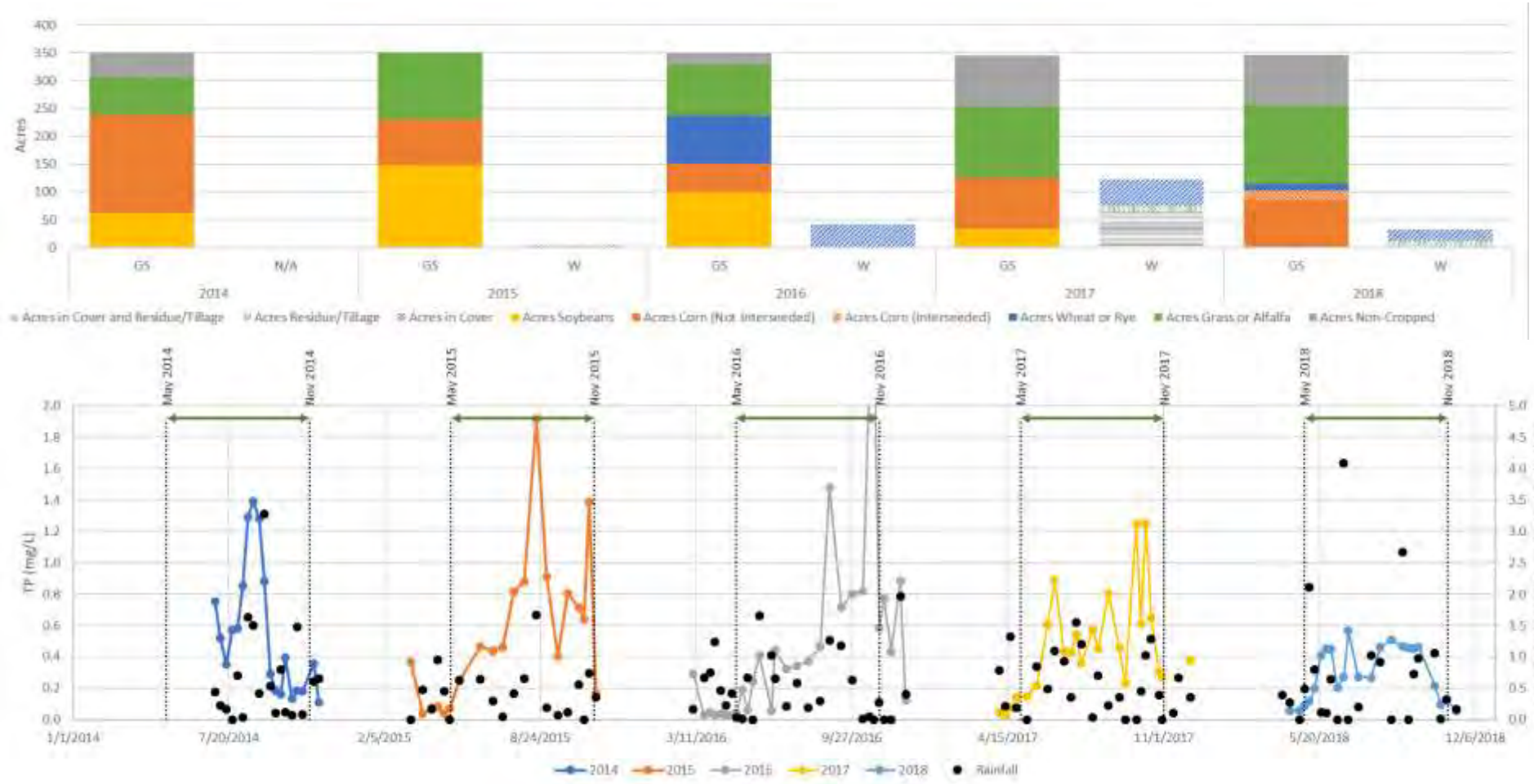


Biological Monitoring of Silver Creek

Pre-Restoration Project
Post BMP implementation

December, 2019
Stakeholder's Meeting Update
~Jim Snitgen, Oneida Nation

Oneida Nation
Water Resources Program
Aquatic Invertebrate Data Sheet

Date of sample collection: 6/14/19
Sample location: 50 @ [illegible] Dr
Sample collected by: JL Snitgen
Sieve mesh size: 500µm
Collection method: Qualitative
Date sorted: ______ Sorted by: LSRI
Date identified: 10/9/19 Identified by: JL Snitgen

Taxon	No.	Taxon	No.
Diptera		**Diptera - Other**	
Chironomidae			
		Antocha sp.	1
		Simulium sp. ([illegible])	2
Brillia flavifrons	1		
		Trichoptera	
Cardiocladius sp.	8	(4) Hydropsyche alhedra	6
Eukiefferiella sp.	2	(5) Hydropsyche bronta	3
Orthocladiinae	3	(4) Hydropsyche sparna	1
Orthocladius sp.	1	Hydropsychidae	4
Microtendipes pedellus gr.	4		
Polypedilum aviceps	9	**Ephemeroptera**	
Polypedilum sp.	10	Baetis flavistriga	1
Polypedilum tritum	1		
Paratanytarsus sp.	2	Maccaffertium vicarium	2
Parametriocnemus sp.	1		
Stictochironomus sp.	13		
Micropsectra sp.	1	**Plecoptera**	
Thienemanniella xena	1	Perlesta decipiens	3
		Coleoptera	
		Dubiraphia sp.	5
		Optioservus sp.	7
		Odonata	

Oneida Nation
Water Resources Program
Aquatic Invertebrate Data Sheet
(Continued)

Taxon	No.	Taxon	No.
Hemiptera		**Oligochaeta**	
Amphipoda			
Gammarus pseudolimnaeus	179		
Isopoda		**Others**	
Caecidotea sp.	52		
Pelecypoda		[illegible]	1
Gastropoda			
Lymnaea sp.	1		
Physidae	27		

Date data entered: 16/9/19 Data entered by: JS
Total taxa: 27 Total no. organisms: 369
HBI taxa: 24 HBI total no. organisms: 324

Seasonality adjusted HBI total no. organisms: 5.25

EPT = 6

Table 1. Water quality ratings for HBI values (from Hilsenhoff 1987)

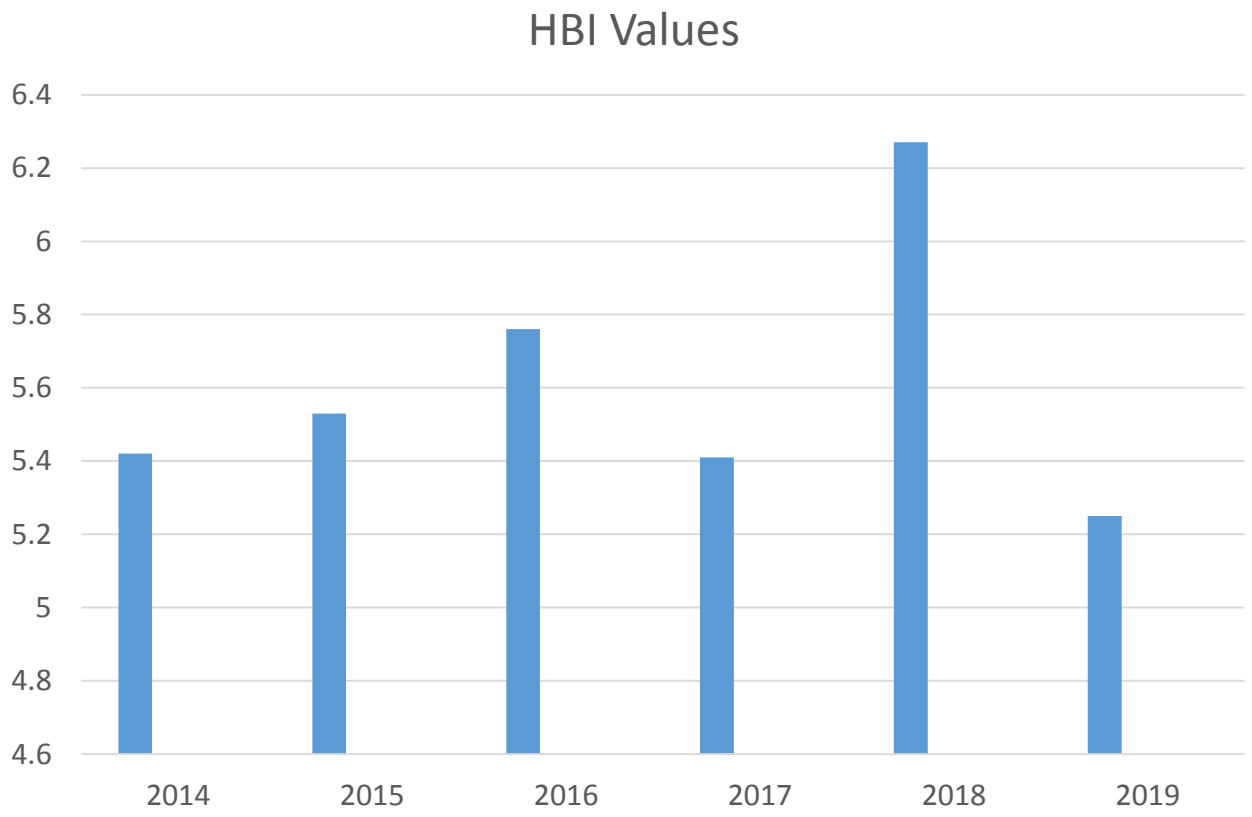
HBI Value	Water Quality Rating	Degree of Organic Pollution
≤ 3.50	Excellent	None Apparent
3.51-4.50	Very Good	Possible Slight
4.51-5.50	Good	Some
5.51-6.50	Fair	Fairly Significant
6.51-7.50	Fairly Poor	Significant
7.51-8.50	Poor	Very Significant
8.51-10.00	Very Poor	Severe

2019

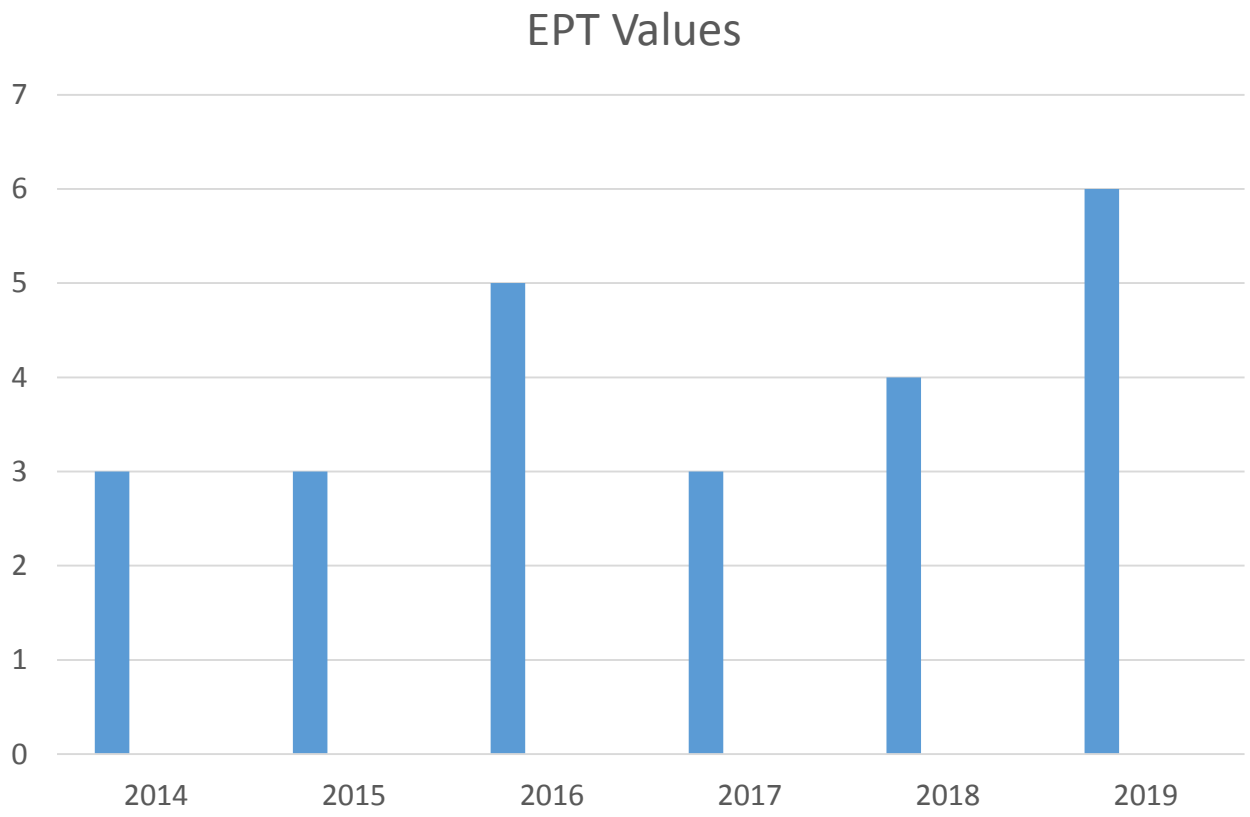
HBI = 5.25

EPT = 6

Total taxa = 27



2019 HBI “best” score yet



The Ephemeroptera (Mayflies), Plecoptera (Stoneflies) and Trichoptera (Caddisflies) Index (EPT) had best score in 2019.

Questions?

Wetland Projects Review

Gary Van Vreede
U.S. Fish & Wildlife Service


eida
Freedom Rd
S County Line Rd
Freedom Rd
Freedom Rd
E
E
Fernando Dr
Fernando Dr
S County Line Rd
County Rd Ee
County Rd Ee
County Rd E

Fund for Lake Michigan

Oneida Nation 1822

Outagamie County

NEW Water
The brand of the Green Bay Metropolitan Sewerage District

The Nature Conservancy

W. Adams Drive Project

Project Goals

1. Improve surface **water quality**
2. Restore **habitat for wildlife** and native plants
3. **Educate** stakeholders and garner support

Oct 2017 – Wetland Basins

Fall 2017-18 Planting

By the Numbers

- 80 acres of row crops converted to perennial forage cover
- 3.5 acres of treatment wetland/detention basins installed
- 20 acres of native prairie and wetland species planted
- Approximately 17 acres of invasive plants treated
- Number and kinds of birds increased

Water Quality Monitoring

Outreach

FOX 11 NEWS | NEWS | WEATHER | SPORTS | TRAFFIC | CHIME IN | WATCH

Wetlands construction underway in Hobart

by Eric Peterson, FOX 11 News | Tuesday, October 3rd 2017

Wetlands construction at Silver Creek Pilot Project, October 3, 2017 (WLUK/Eric Peterson)

HOBART (WLUK) -- A project to help keep farm runoff out of the waters of Green Bay is underway.

The plan is two-fold, by improving the wildlife habitat as well.

At the Silver Creek Pilot Watershed Project west of Green Bay, an excavator cleared the way Tuesday morning for a future 80-acre wetlands site.

Lessons

- Permitting
- Partnerships
- Time

Vegetated Treatment Systems

Dr. Mathew Dornbush
Dustin Nelson
Isabelle George
University of Wisconsin-Green Bay

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GREEN BAY

2019 Annual Silver Creek Stakeholder Meeting
(Dec. 11th)

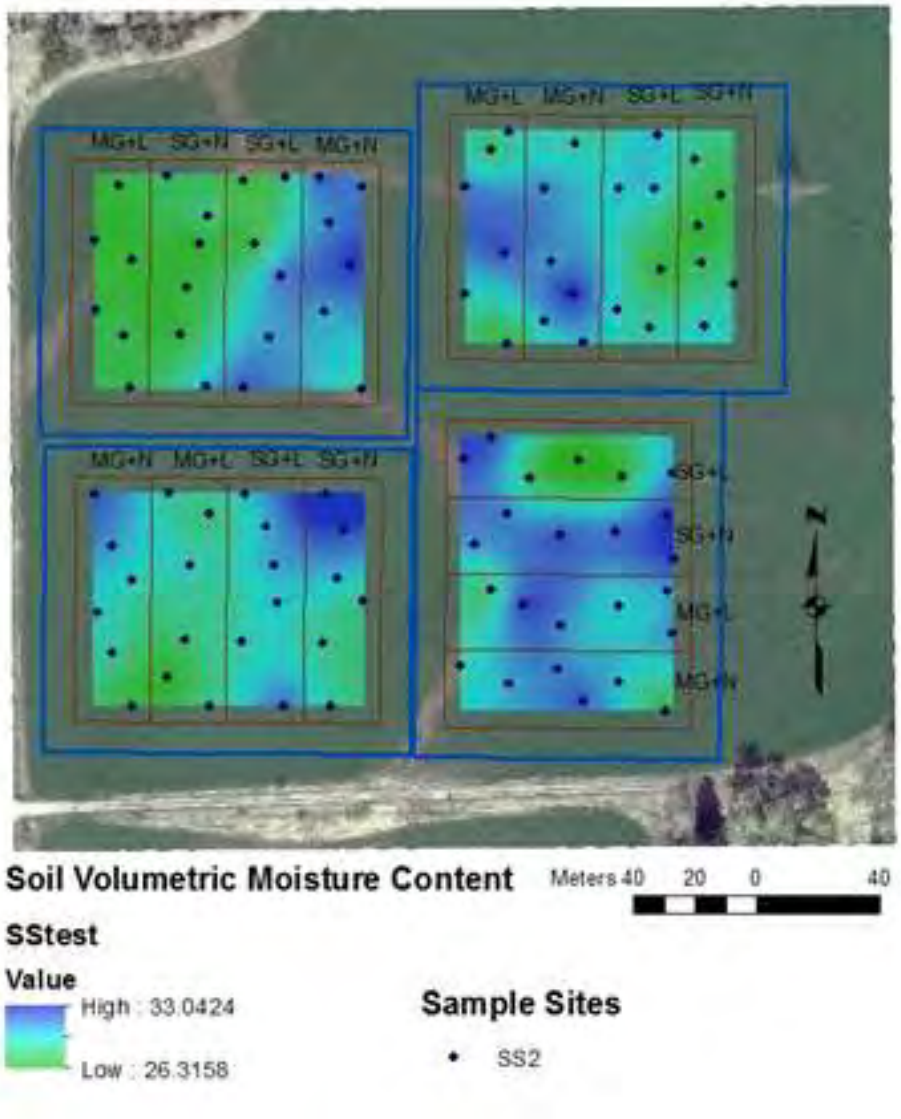
Goal 1: to evaluate the potential for warm-season grasslands to sequester and remove P in plant biomass.

- Compare:
  - Switchgrass verses mixed grass plantings
  - N-fertilizer verses legume inter-seeding
    - Ammonium sulfate fertilizer (200 lbs/ac)
  - Single mid-summer cut verses double cut

Biofuels Grasslands

- Established in 2012
- 16 plots, at approximately 0.5 ac each

- Data Collection:
  - Aboveground biomass
  - Belowground biomass
  - Tissue P (%)
  - Soil properties (‘12, ‘18)



Legacy soil P within **Fields**

- Influences are long-lasting

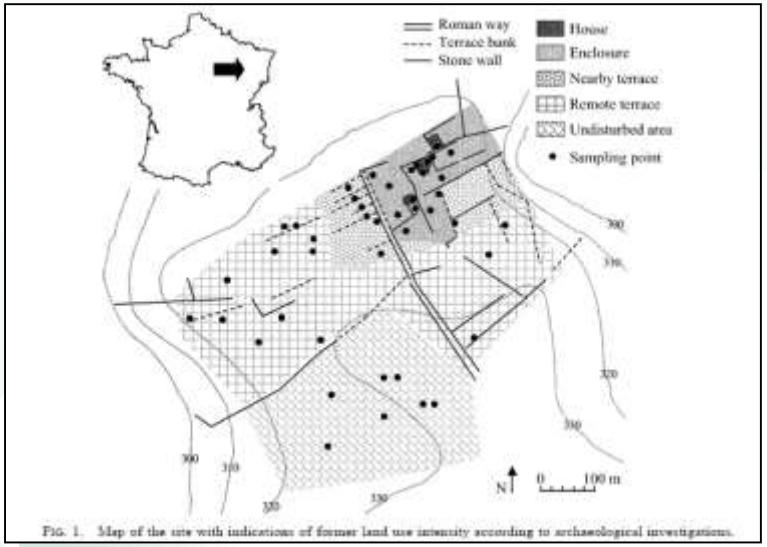
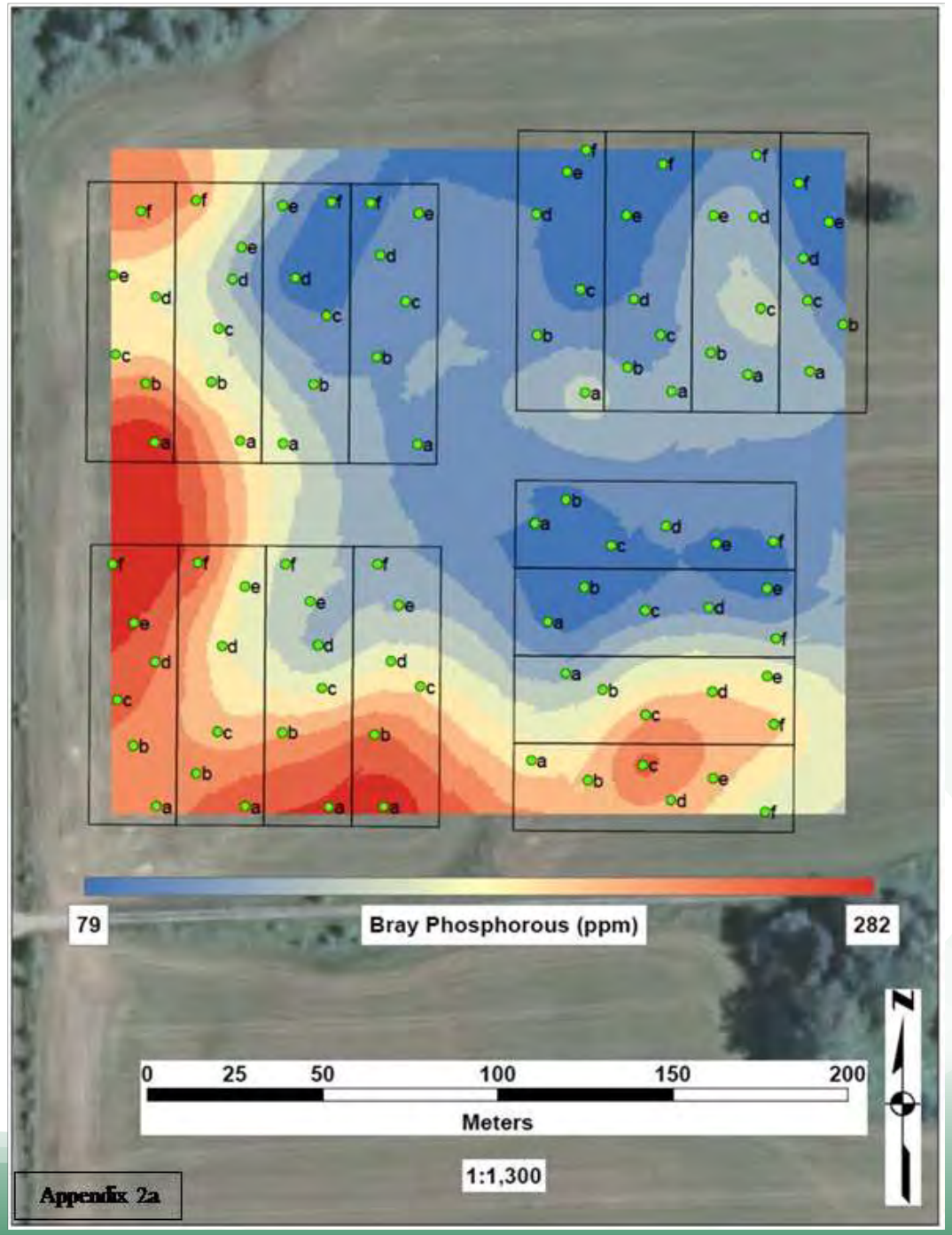


FIG. 1. Map of the site with indications of former land use intensity according to archaeological investigations.

Dupouey et al. 2002



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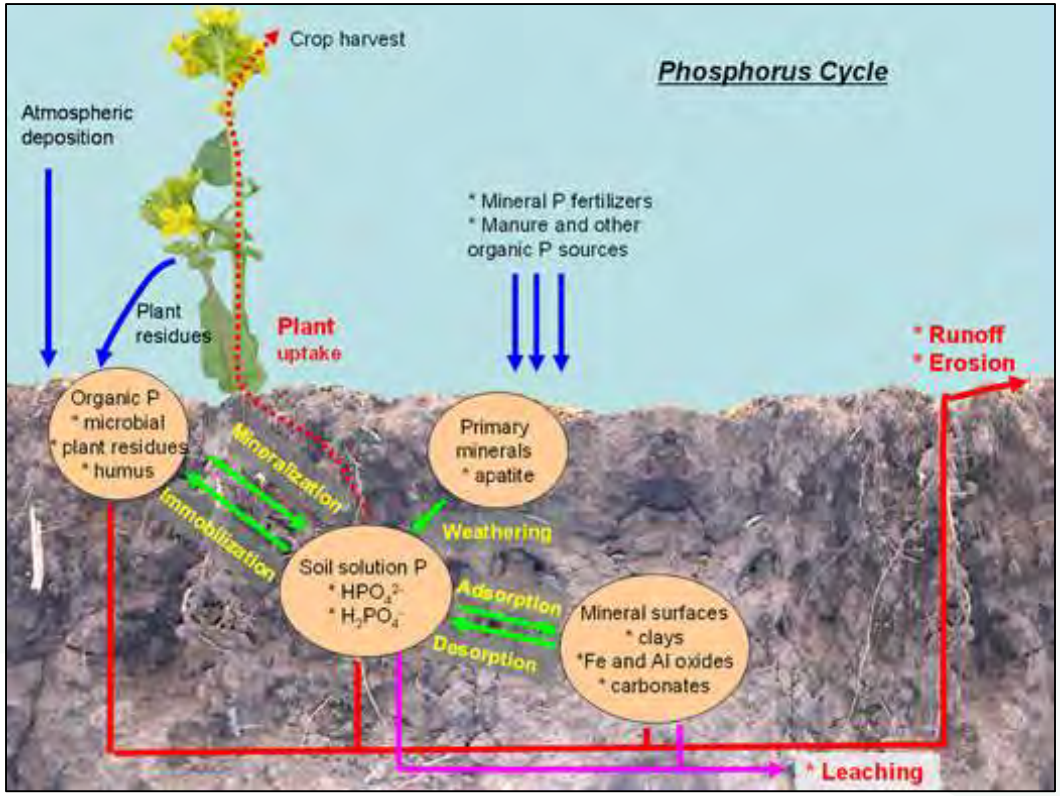
Legacy P

- Consider 3 factors:
  - **Pool**:
    - Soils and aquatic sediments
    - Plants and algae
  - **Form**:
    - Organic
    - Inorganic
      - Available
      - Unavailable
  - **Location**:
    - Depth
    - Landscape position



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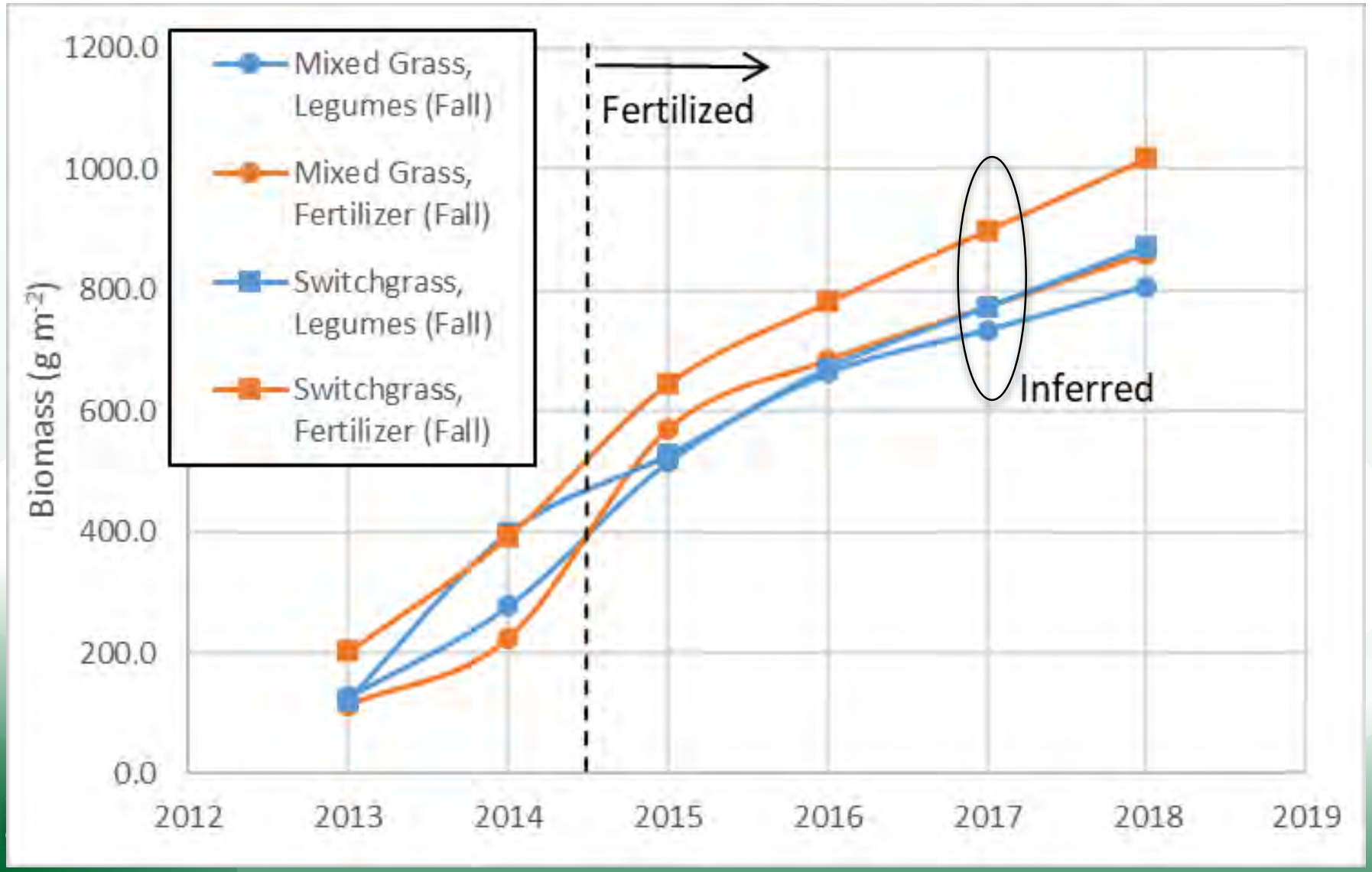
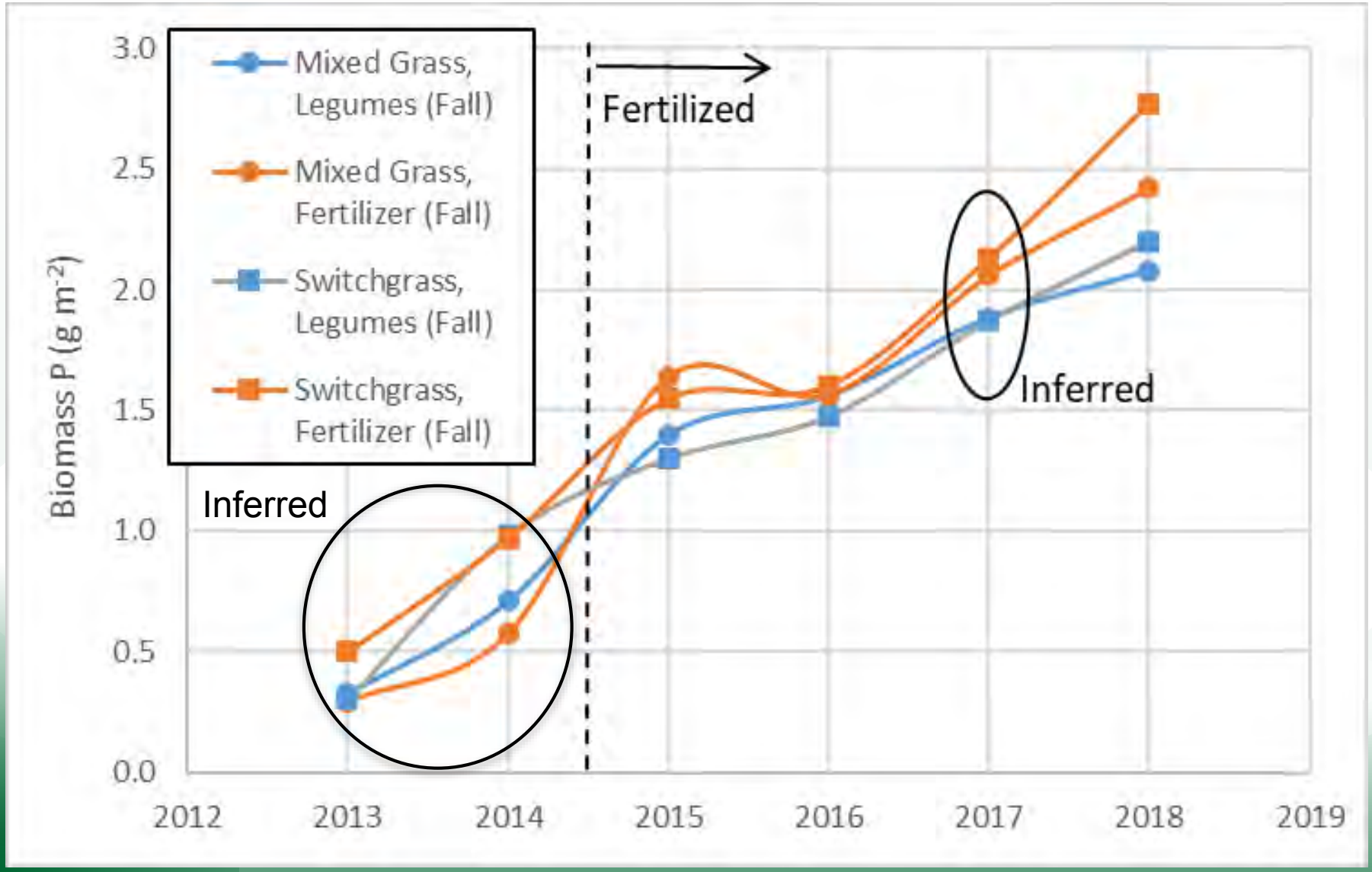
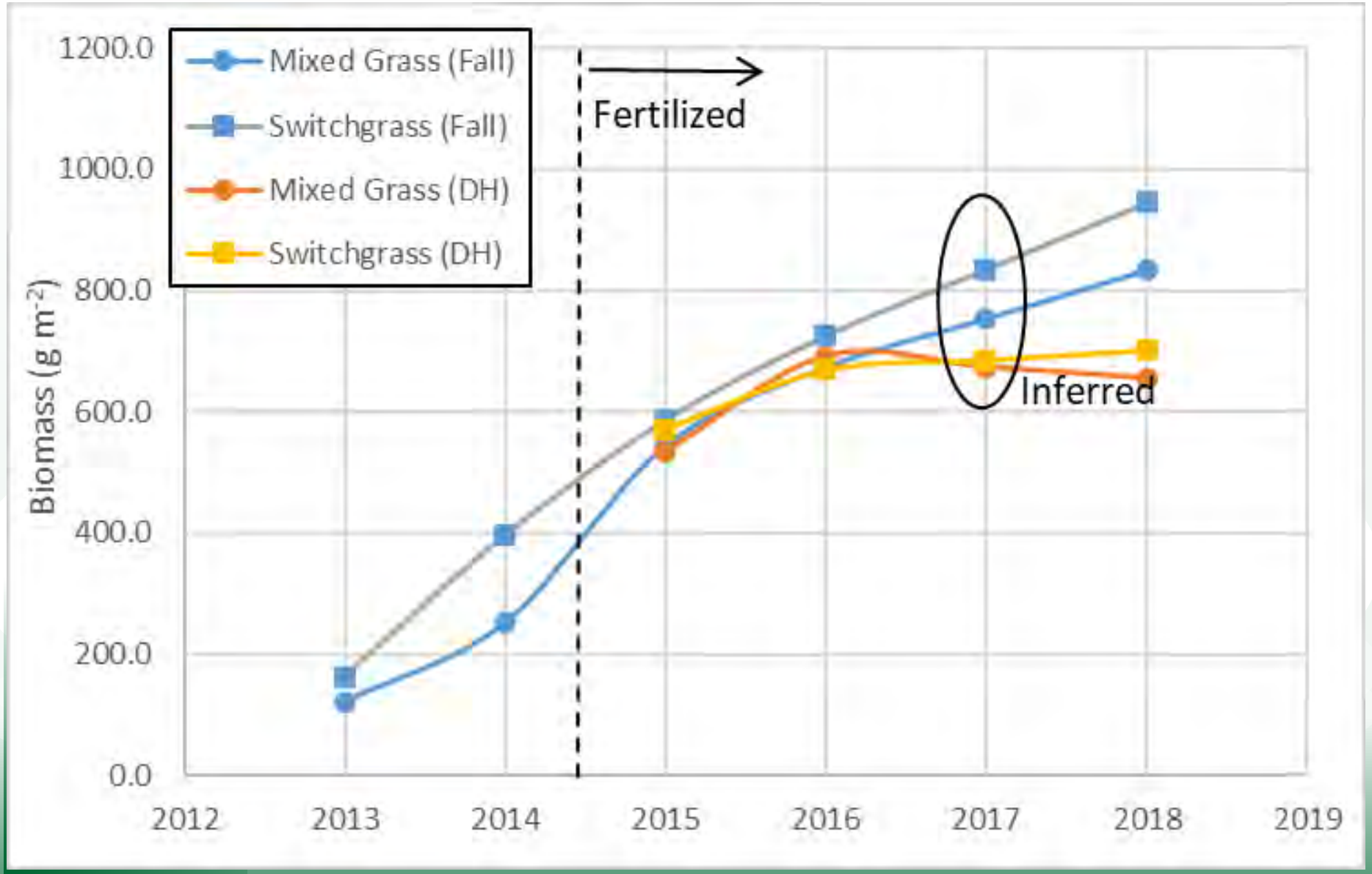
Highest yields from fertilized switchgrass cut in fall



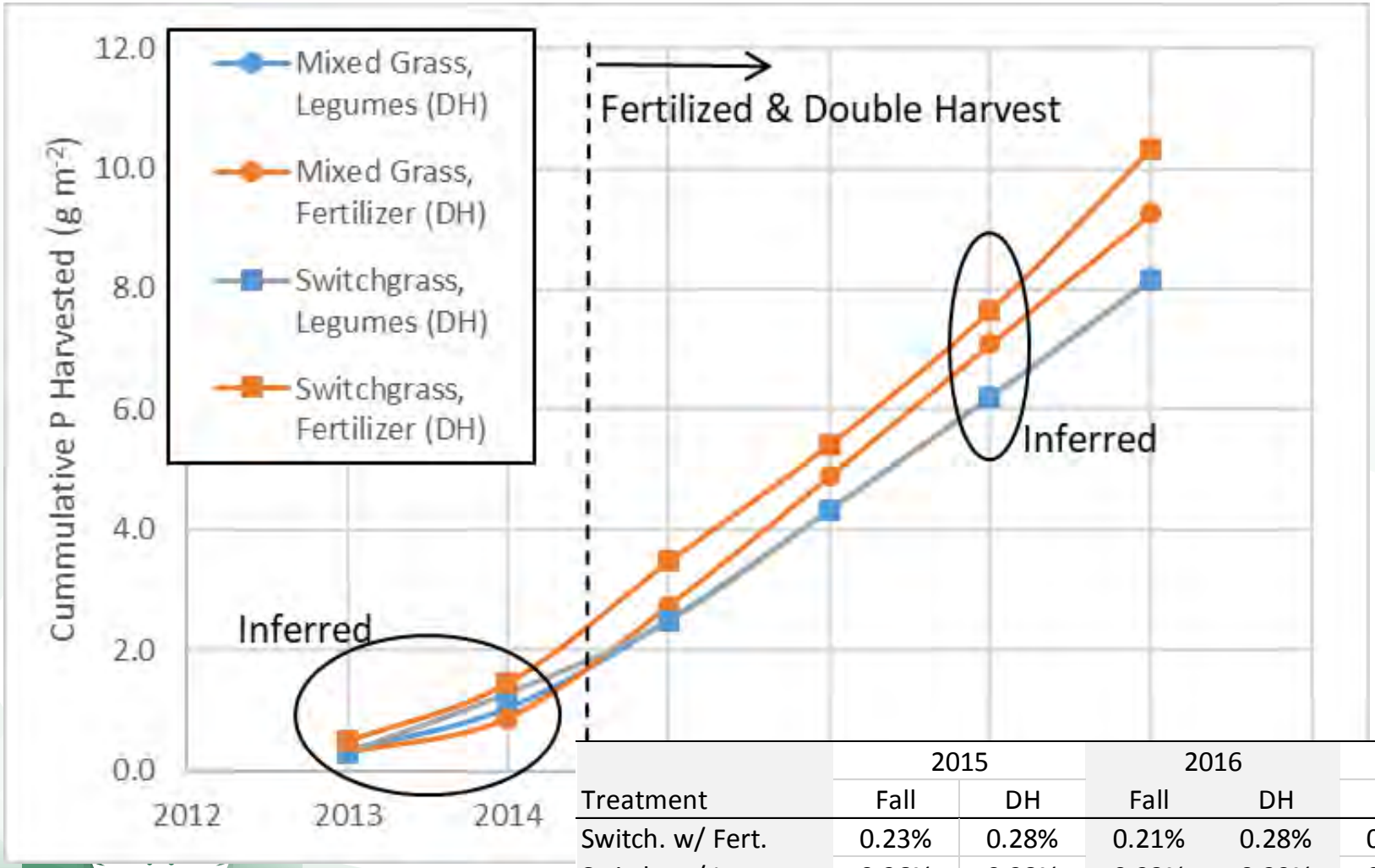
But, N-fertilization also notably increased plant-P content



DH didn't improve yield, but significantly increased tissue P (%)

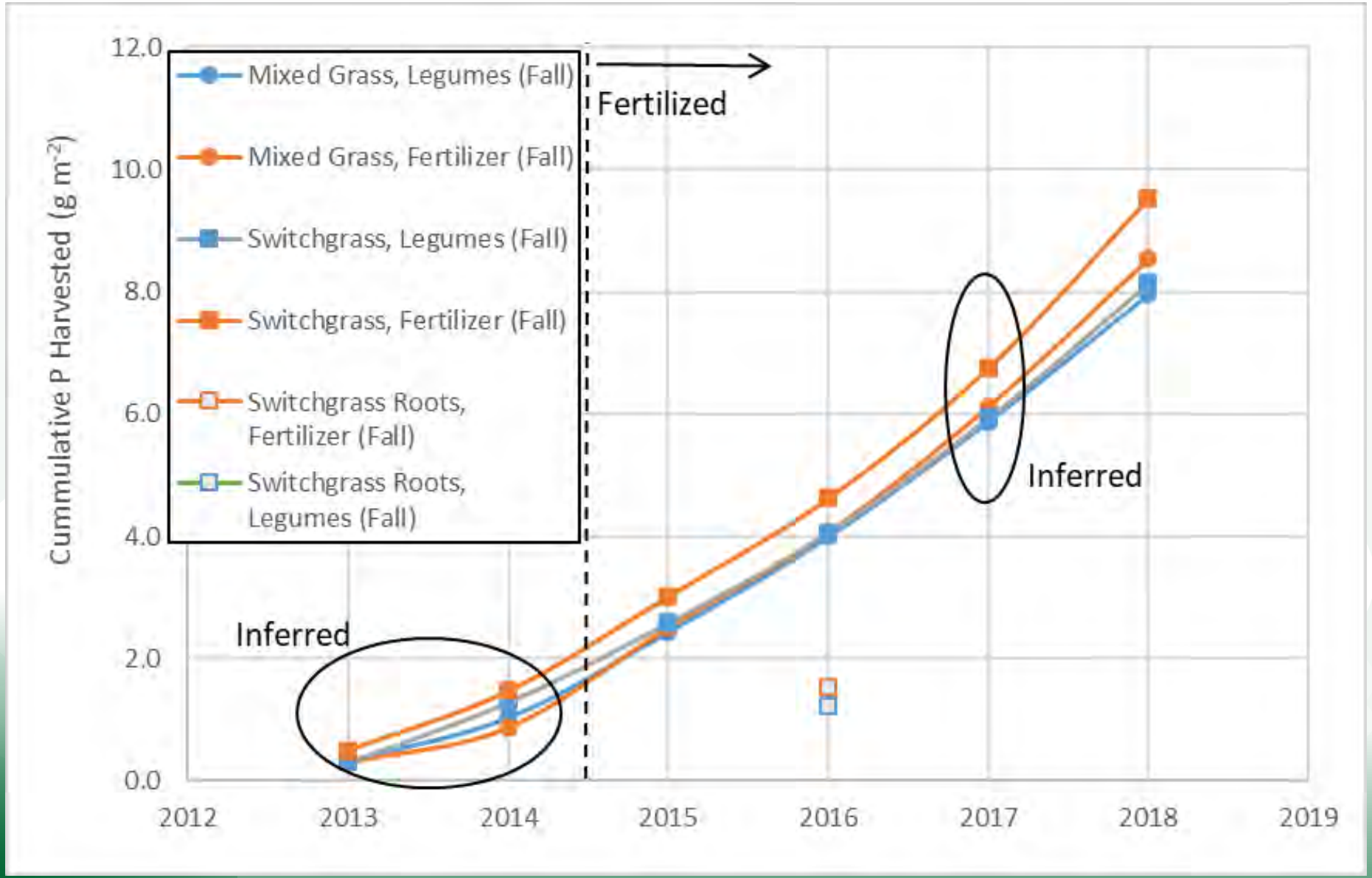


But, harvestable P was highest in fertilized double harvest treatments



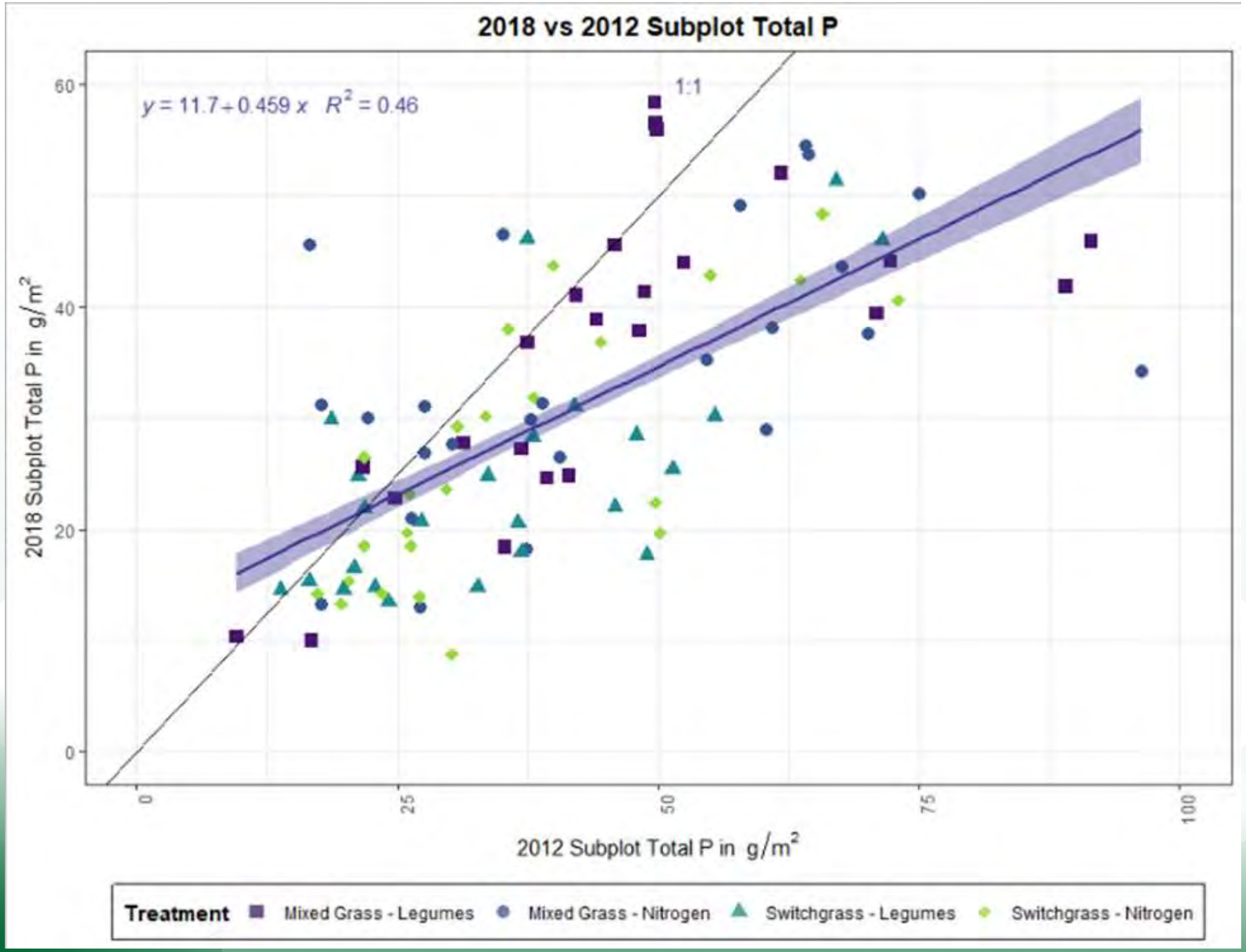
	2015		2016		2018	
Treatment	Fall	DH	Fall	DH	Fall	DH
Switch. w/ Fert.	0.23%	0.28%	0.21%	0.28%	0.27%	0.35%
Switch. w/ Leg.	0.26%	0.28%	0.23%	0.29%	0.25%	0.30%
Mix-Grass w/ Fert.	0.29%	0.34%	0.23%	0.31%	0.28%	0.33%
Mix-Grass w/ Leg.	0.28%	0.28%	0.23%	0.27%	0.26%	0.30%
	0.27%	**0.30%**	0.23%	**0.29%**	0.27%	**0.32%**

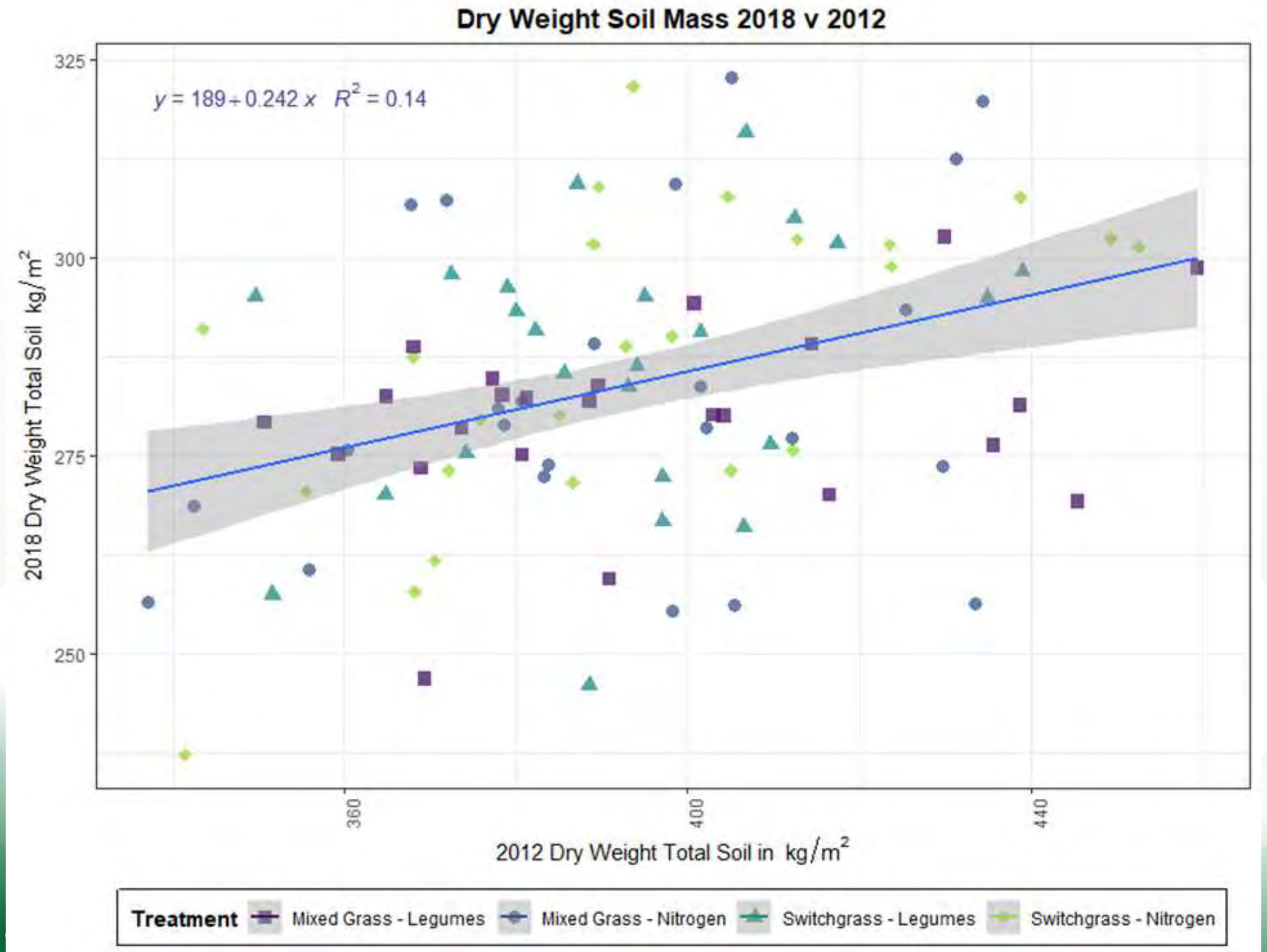
Roots are also an important part of the story



What can be harvested?

Species	DH (kg P ha^{-1})	SH (kg P ha^{-1})	Perennial Roots (kg P to 30 cm (*total*) ha^{-1})	Source
Switchgrass w/ Fertilizer (’18, ‘16)	26.9	27.7	12.2 (*15.3*)	Nelson, George, & Dornbush (unpublished)
Switchgrass w/ Legumes (’18, ‘16)	19.6	22.0	9.8 (*12.3*)	Nelson, George, & Dornbush (unpublished)
Corn Silage	--	8.3 to 29.7	0.0	Von Haden and Dornbush (2017)
Wheat grain & straw	--	21.7 (included wet areas)	0.0	Von Haden and Dornbush (2017)
Various buffers		8.8 (5.1 to 16.5)	?	George and Dornbush (unpublished)


2018 vs 2012 Subplot Total P
y = 11.7 + 0.459 x R² = 0.46
1:1
2018 Subplot Total P in g/m²
2012 Subplot Total P in g/m²
0
20
40
60
0
25
50
75
100
Treatment
Mixed Grass - Legumes
Mixed Grass - Nitrogen
Switchgrass - Legumes
Switchgrass - Nitrogen


Dry Weight Soil Mass 2018 v 2012
y = 189 + 0.242 x R² = 0.14
2018 Dry Weight Total Soil kg/m²
325
300
275
250
360
400
440
2012 Dry Weight Total Soil in kg/m²
Treatment
Mixed Grass - Legumes
Mixed Grass - Nitrogen
Switchgrass - Legumes
Switchgrass - Nitrogen

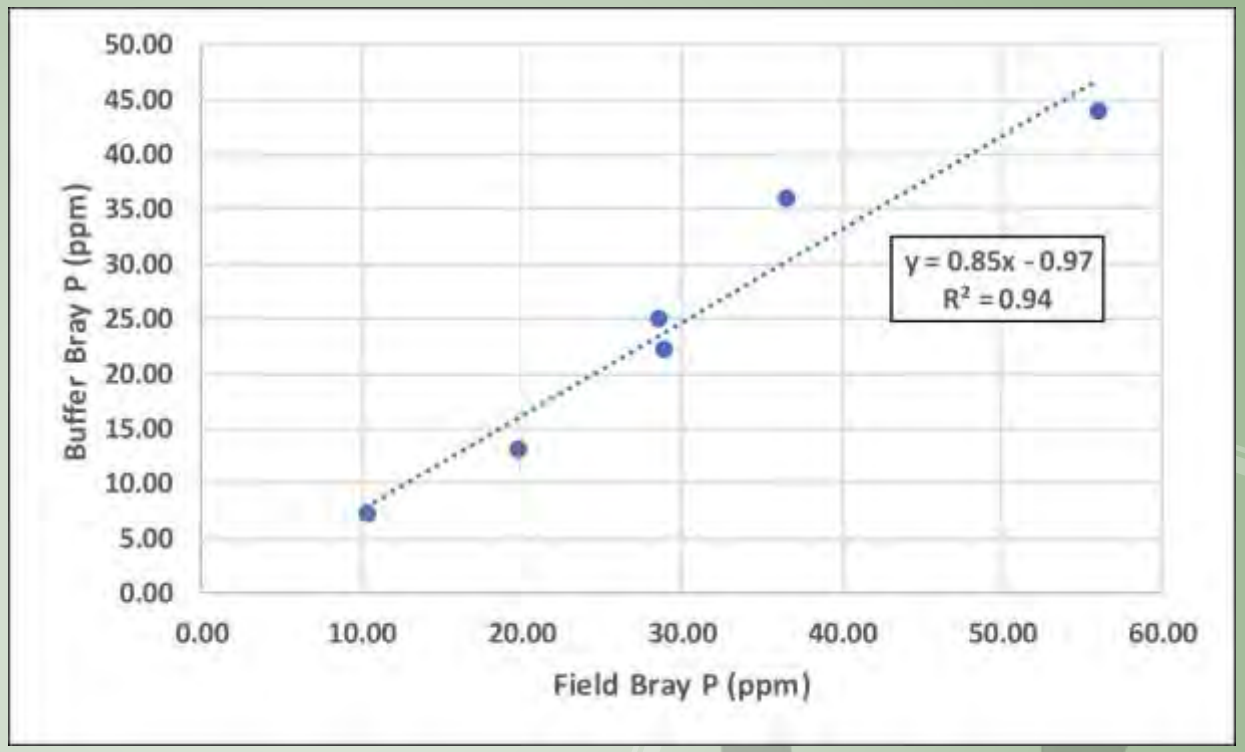
Preliminary Conclusions

- We have some mass balance work to do.
- If the goal is to maximize P harvest, while minimizing P losses, fertilizing perennial switchgrass with multiple cuttings does maximize harvestable P
  - Broader ecological questions associated with this approach (GH emissions, etc)
- Perennial grasses significantly reduced soil mass in the top 30 cm, thus changing P location and vulnerability
  - erosion vs. leaching?

Goal 2: To more expansively identify the P content of existing grass-based BMPs at the watershed scale

We sampled existing riparian grass buffers of varying ages within the Silver Creek watershed in 2016.

Paired Field and Buffer samples



- Harvestable plant P ranged from 5.1 kg ha^{-1} to 16.5 kg ha^{-1} among buffers, but was unrelated in a simple, linear way to either buffer age or soil P concentrations.
- However, both soil P concentrations in active fields and adjacent buffers were positively and significantly correlated.

Example Site: FCS-7

- Samples were take 15 m inside the buffers, and 10 m out into the field.
- Various soil and plant biomass samples.

Goal 3: Construct and evaluate the effectiveness of BMP Sediment Basins

- In August 2017, two Vegetated Water Filter Strips (2.0 and 3.5 ac) were established adjacent to Silver Creek.
- In September 2017, five 40 m transects were identified along the main surface water flow paths entering into VWTS basins from the adjacent agricultural fields.

Methods

- Five 40 m transects were identified along the main surface water flow paths entering into VWTS basins from the adjacent agricultural fields.
- In 2017 and 2019 composite soil samples were collected at 0, 7.5, 15, 30, and 45 m from the field edge, with an additional bulk density core taken at each point.
- In early September 2018 and late August 2019 we collected aboveground plant biomass from each point.
- Soil samples were analyzed for Bray P, for soil organic matter with loss on ignition, and bulk density, and biomass was recorded and analyzed for tissue P.

Findings - pending

Distance (m)	Bulk Density (g cm^{-3})	LOI (%)	Bray P (ppm)	P (kg P ha^{-1})
		2017		
0	1.2 (0.1)	3.5 (0.6)	78.0 (33.8)	99.3 (47.5)
7.5	1.2 (0.0)	3.4 (0.6)	76.8 (31.1)	93.0 (37.8)
15	1.2 (0.1)	3.8 (0.5)	68.0 (29.5)	89.5 (43.8)
30	1.3 (0.0)	3.8 (0.3)	73.6 (25.9)	96.6 (35.6)
45	1.3 (0.0)	3.6 (0.4)	97.6 (40.2)	123.8 (49.9)
		2019		
0	*In Prog.*	*In Prog.*	*In Prog.*	*In Prog.*
7.5	*In Prog.*	*In Prog.*	*In Prog.*	*In Prog.*
15	*In Prog.*	*In Prog.*	*In Prog.*	*In Prog.*
30	*In Prog.*	*In Prog.*	*In Prog.*	*In Prog.*
45	*In Prog.*	*In Prog.*	*In Prog.*	*In Prog.*

UW-Green Bay: PAIRED Grazing Study

Primary objectives

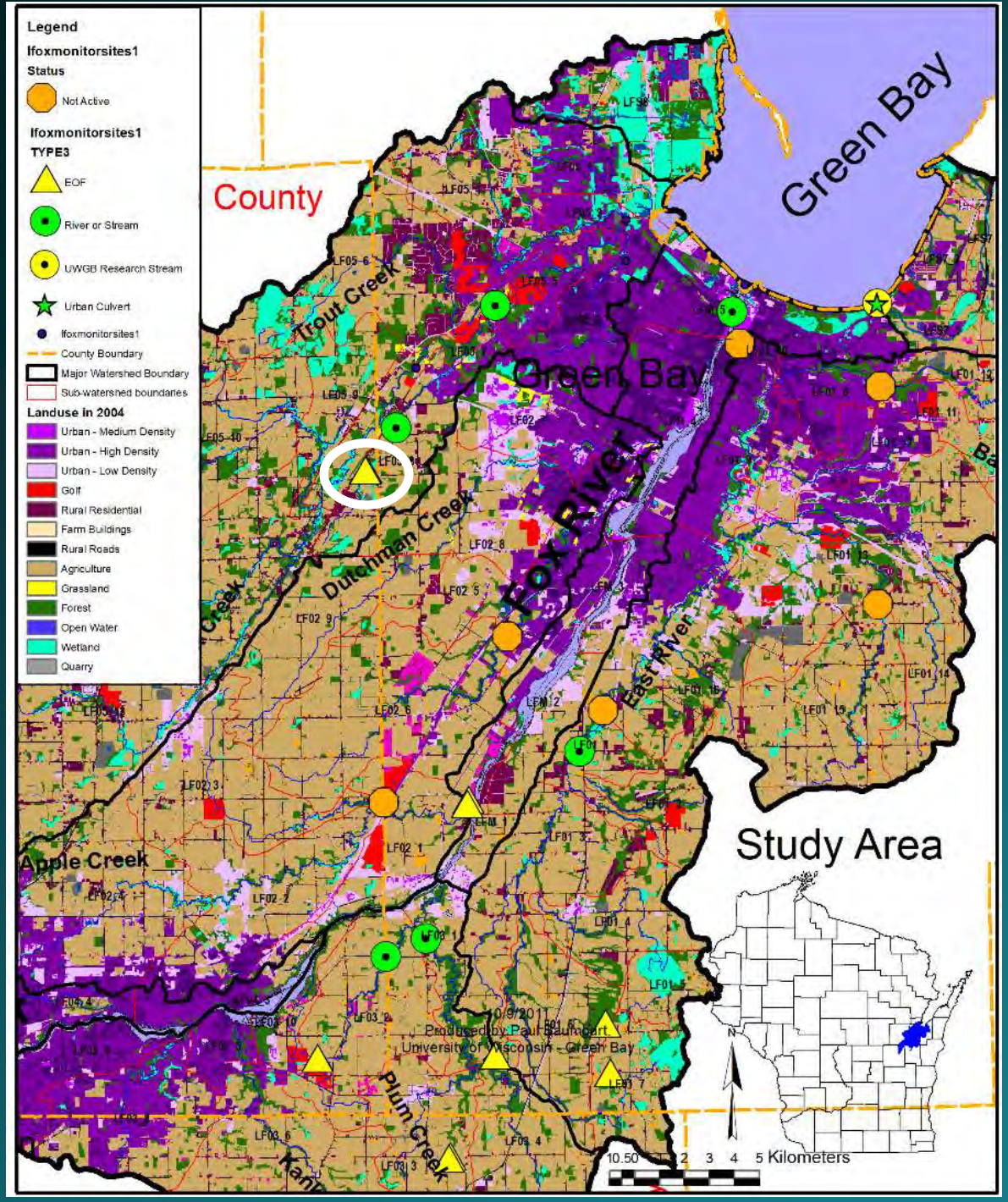
- Evaluate Effectiveness of Ag Treatments:
  - Silver Creek watershed --- Managed grazing compared to conventional dairy farm practice
- Metrics:
  - TSS, TP, dP (Event Mean Concentration, Total Event Mass)
  - Event Flow Volume
  - Turbidity, plus used as surrogate for other constituents (and Backup)

Paul Baumgart and Kevin Fermanich

University of Wisconsin – Green Bay

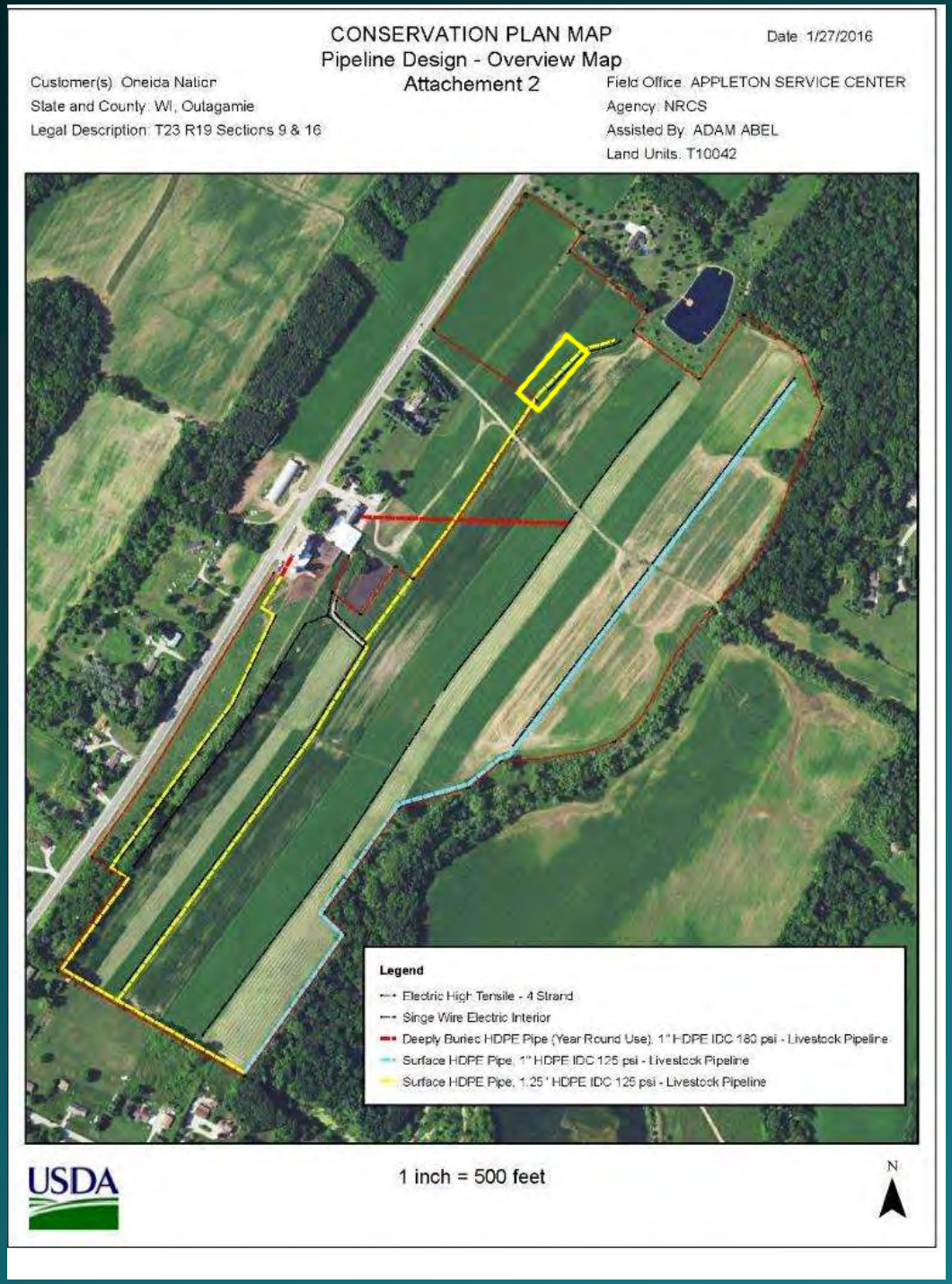
Silver Creek near Oneida: Grazing Study

- Similar equipment as USGS EOF stations
- PAIRED Study --- two EOFS
- About 0.6 acre per site
- Continuous Silage Corn (cooperative farmer)
- Very limited residue
- Treatment: Managed Grazing when pretreatment data are sufficient



UWGB
Silver Creek – near Oneida
Paired EOF catchments

GLRI Grants
NEW Water



Dairy Farm Transitioning to More Managed Grazing

Study Site Paired Catchments

Silver Creek near Oneida: paired EOF catchments

Silver Creek near Oneida: paired EOF catchments

North Station

South Station

South Station

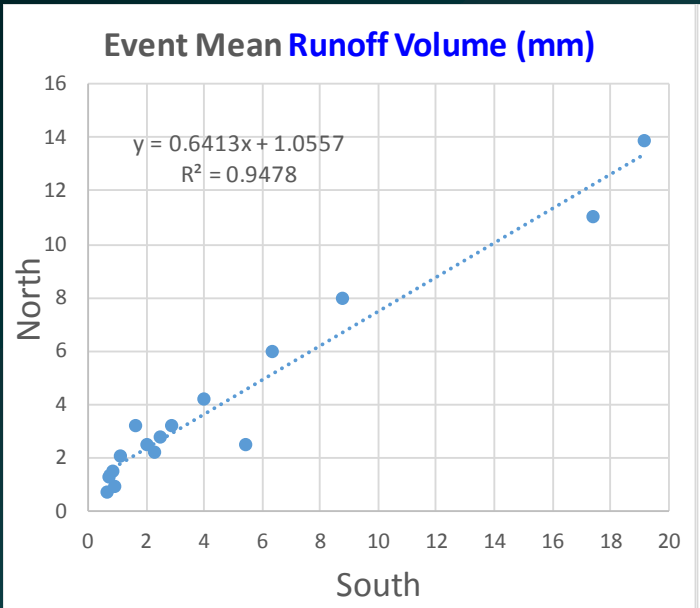
narrow 1’ HS flume

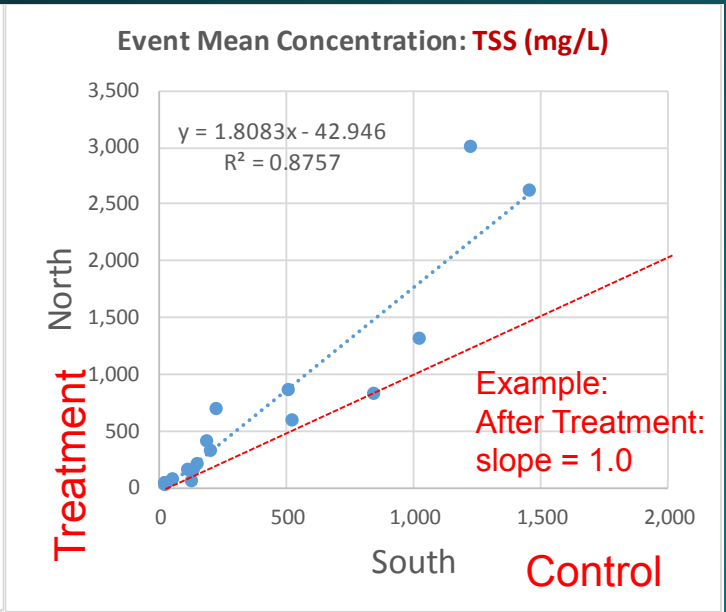
hence: 2”x3” mesh screen for “trash”

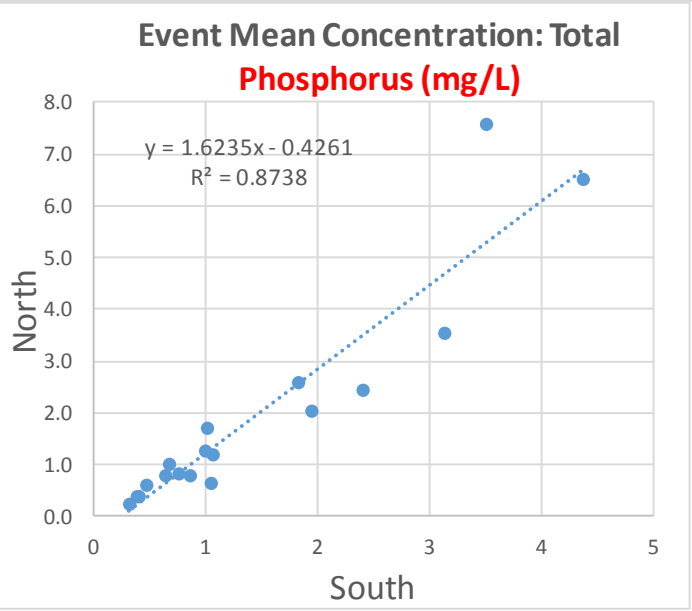
Silver Creek/Oneida Paired EOFs

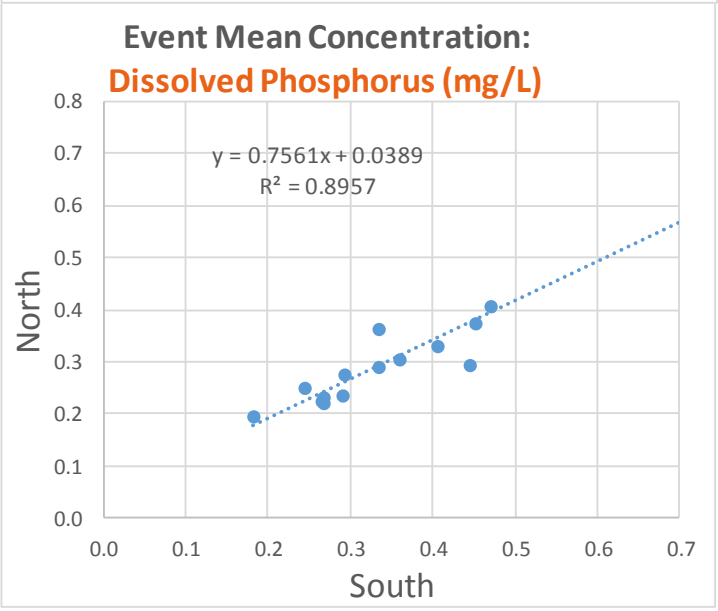
landscape: plane with slight tilt

RESULTS









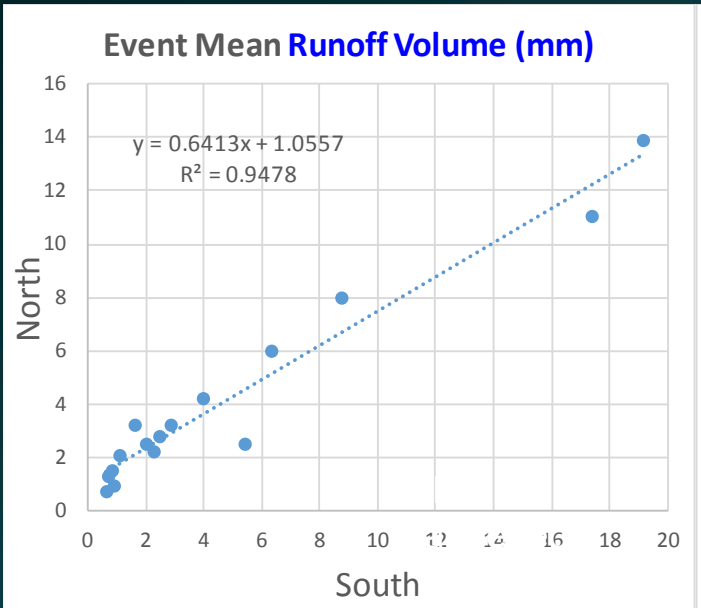
Silver Creek - Oneida Paired Managed Grazing Study

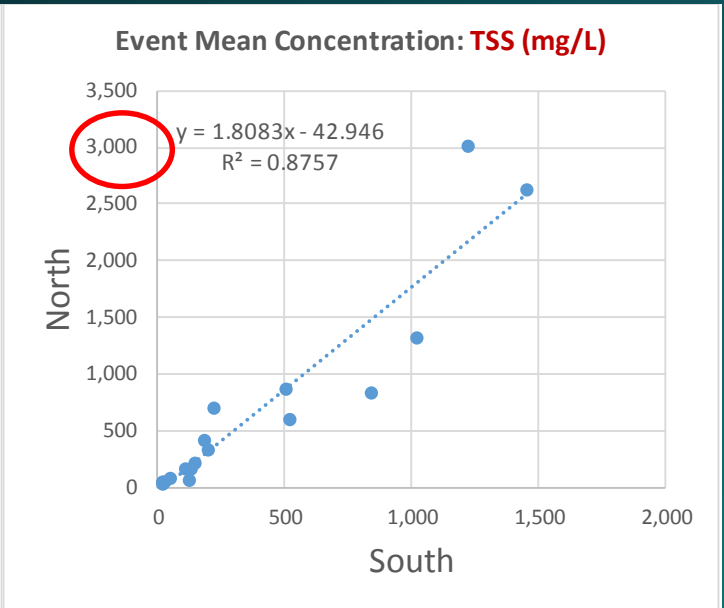
So far, relationships are satisfactory

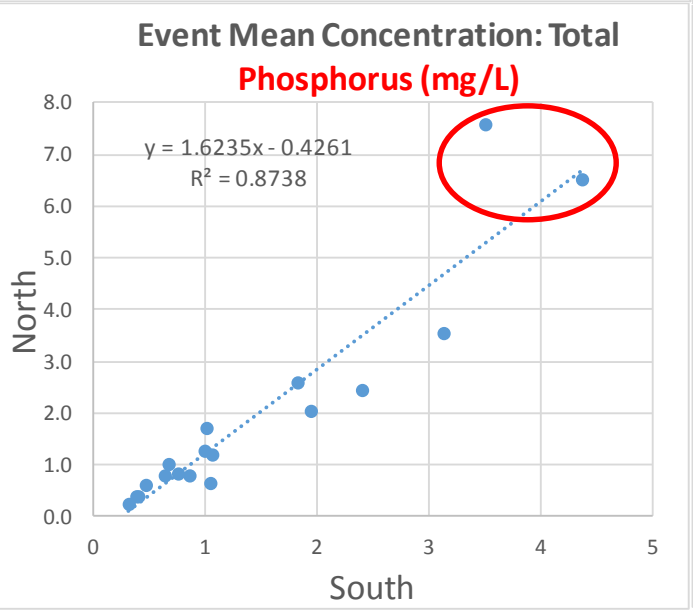
with runoff adjusted for 2 2017 events

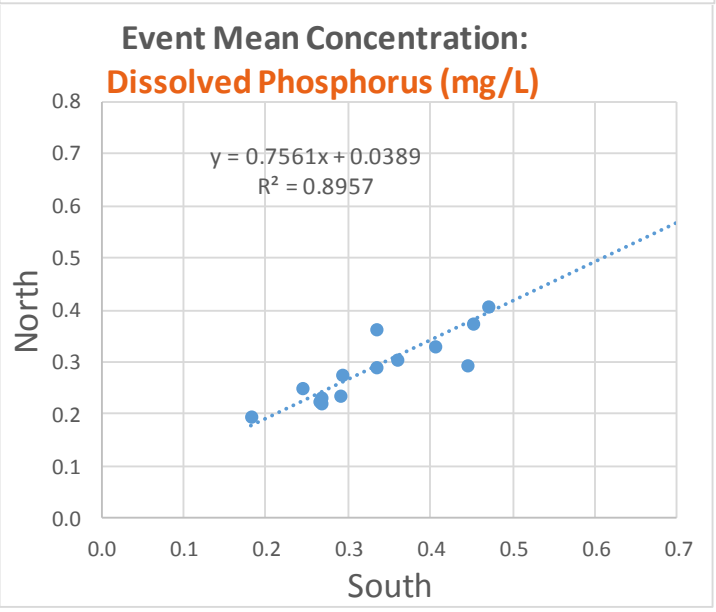
Runoff: n<18 (some estimates)

TSS, TP, DP n=18









Silver Creek - Oneida Paired Managed Grazing Study

So far, relationships are satisfactory

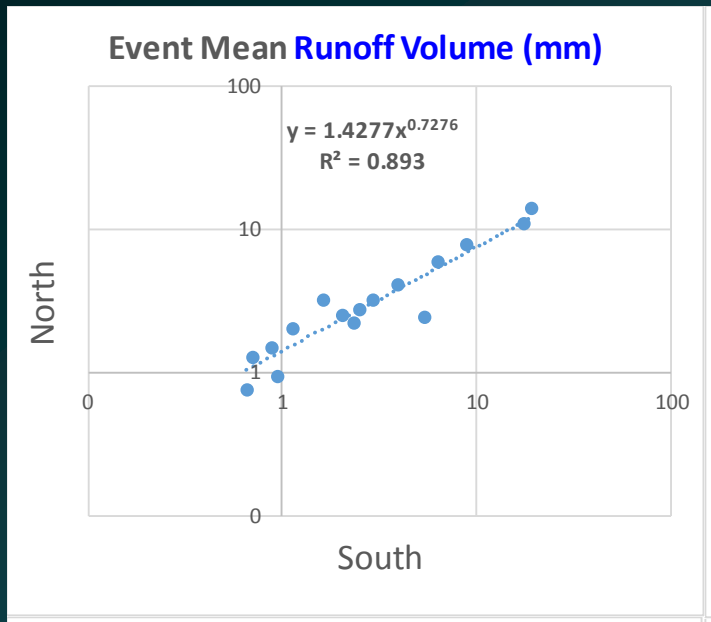
with runoff adjusted for 2 2018 events

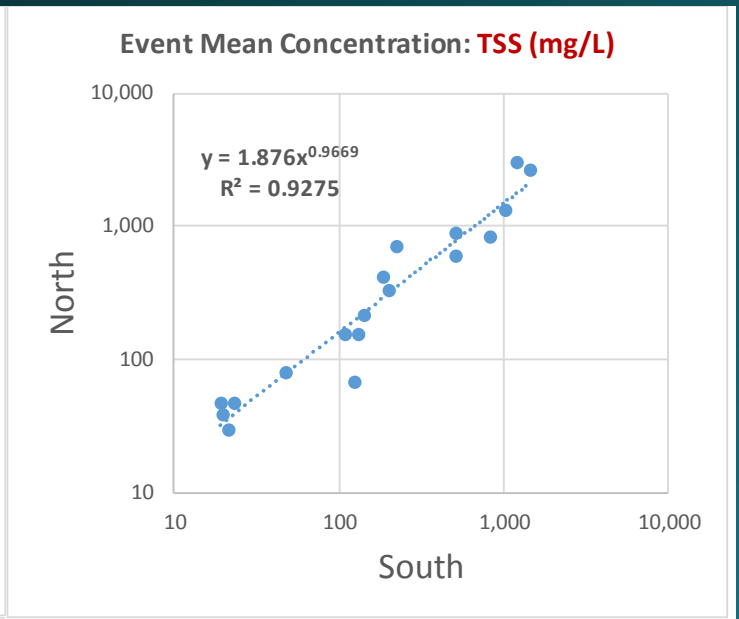
Runoff: n<18 (some estimates)

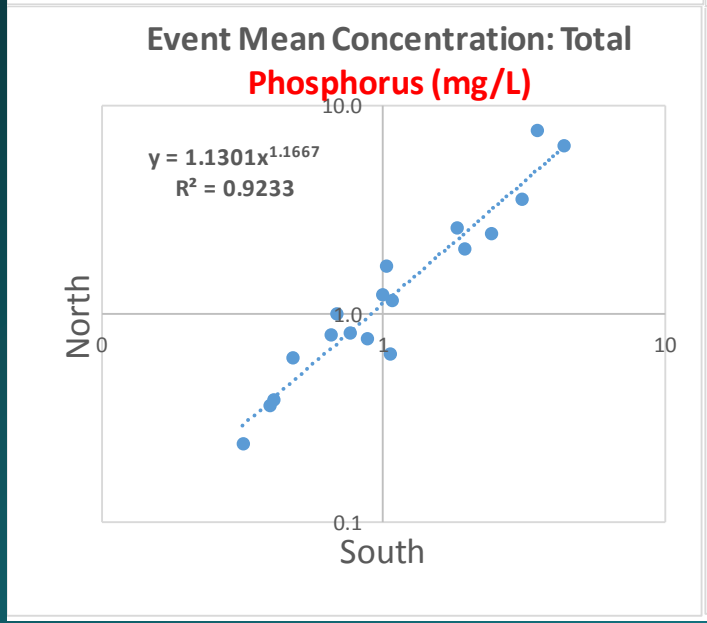
TSS, TP, DP n=18

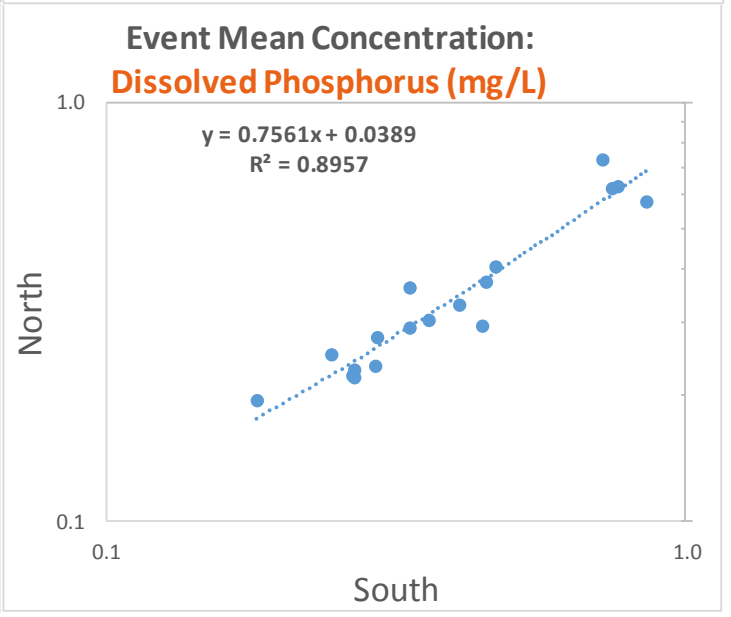
dP Mass: 25%

median dP conc.: 37%









Silver Creek - Oneida Paired Managed Grazing Study

LOG-Space

Runoff: n<18 (some estimates) TSS, TP, DP n=18

Ruts from late Fall 2018 Harvest

Fall 2018 (gets worse later, after final harvest)

SW Plot: 3/19/19

3/19/19

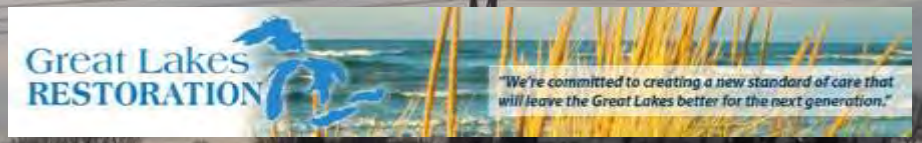
SW plot: 11/20/2019

Next Steps

- Fall 2018: Planned to have pasture planted (too Wet), plus →
- Many deep ruts from late fall 2018 harvest --- Issues with runoff direction and volume variability
  - So sampling discontinued ---- runoff characteristics not representative
- Spring 2019: Planned to plant pasture after tilling to level ruts; plus till and plant corn silage in control plot
  - But, operational change to Owner/Oneida Nation
  - Plus Wet conditions
- RESULT: control and treatment same
  - Deep ruts still present, but less so in NE Treatment plot
  - Control Not Tilled; and No planting in treatment
  - Both were grazed after volunteer grasses, etc took off (not planted)
  - No samples for study since Fall 2018
  - Tillage won't occur in Treatment plot until spring
  - Group B soils, so sufficient runoff for sampling not likely until next fall (i.e., no results for most of 2020
- SO, what Now ------ Extension Granted, but ISSUES ---
  - New Plan, with water quality monitoring not likely until fall 2020, unless fairly wet conditions after control plot is planted
  - Discuss with EPA?

Questions

THANKS!



NEW Water
The brand of the Green Bay Metropolitan Sewerage District

NRCS

FOX-WOLF
WATERSHED ALLIANCE

UW Extension
University of Wisconsin Extension

LOWER FOX
Demonstration Farms Network

*** Phil Robertson ***

* Crop Consultants

The Nature Conservancy

* Outagamie and Brown County Land Conservation Departments

* Forrest Kalk, Josh Jarosz, Zach Ashauer, Gillian Ivanoff, Noel Craig
UWGB students

University of Wisconsin
GREEN BAY

Dec. 18, 2018 Oneida EOFs

Interseeding, Aerial Seeding, and Tillage Practices

Bill Schaumberg
Tilth Agronomy

Aerial Seeded Sept 11th

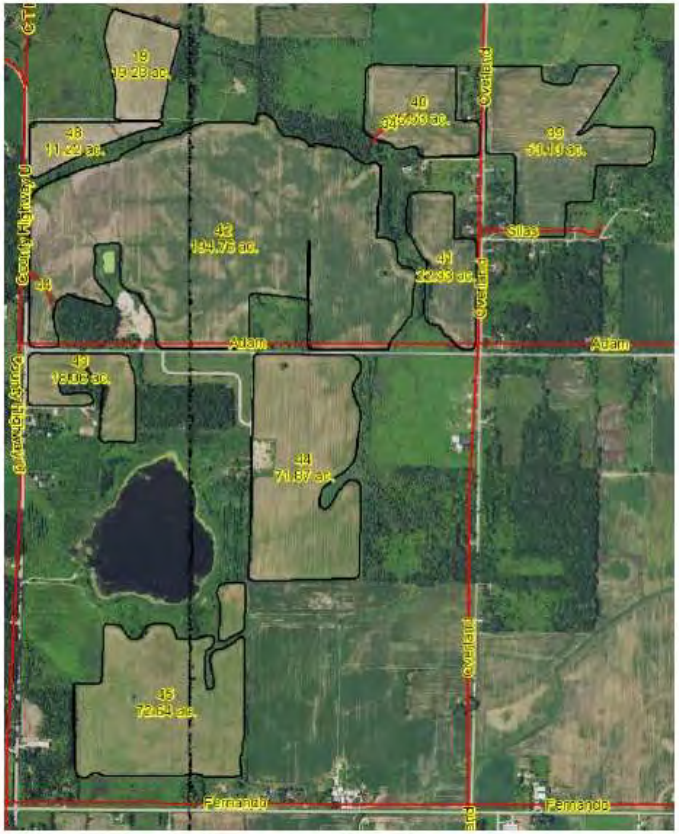
Aerial Seeded- Pictures Week After Planting

Aerial Seeded- Two Weeks After Planting

Aerial Seeded- Three Weeks After Planting

Aerial Seeded- After Harvest

Poor Man's CAP



Poor Man's CAP

Interseeding Red Clover

Interseeding Red Clover

No Till Vs. Chisel Plow

No Till Vs. Chisel Plow

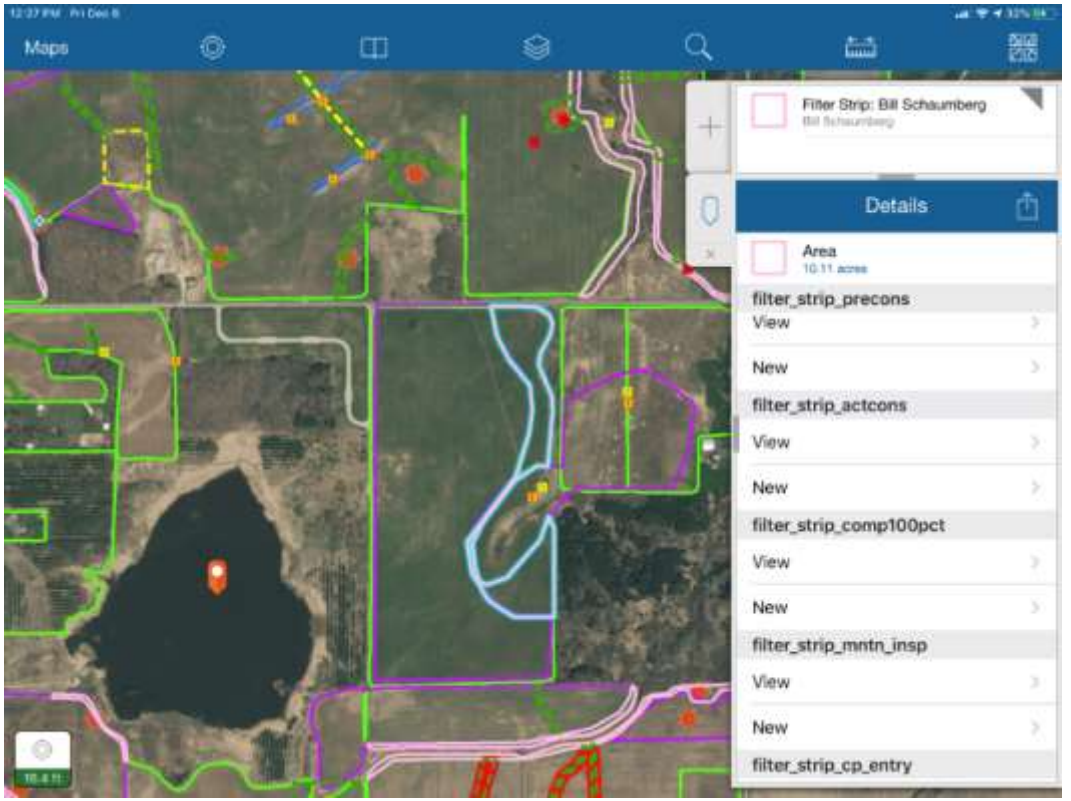
No Till Vs. Chisel Plow

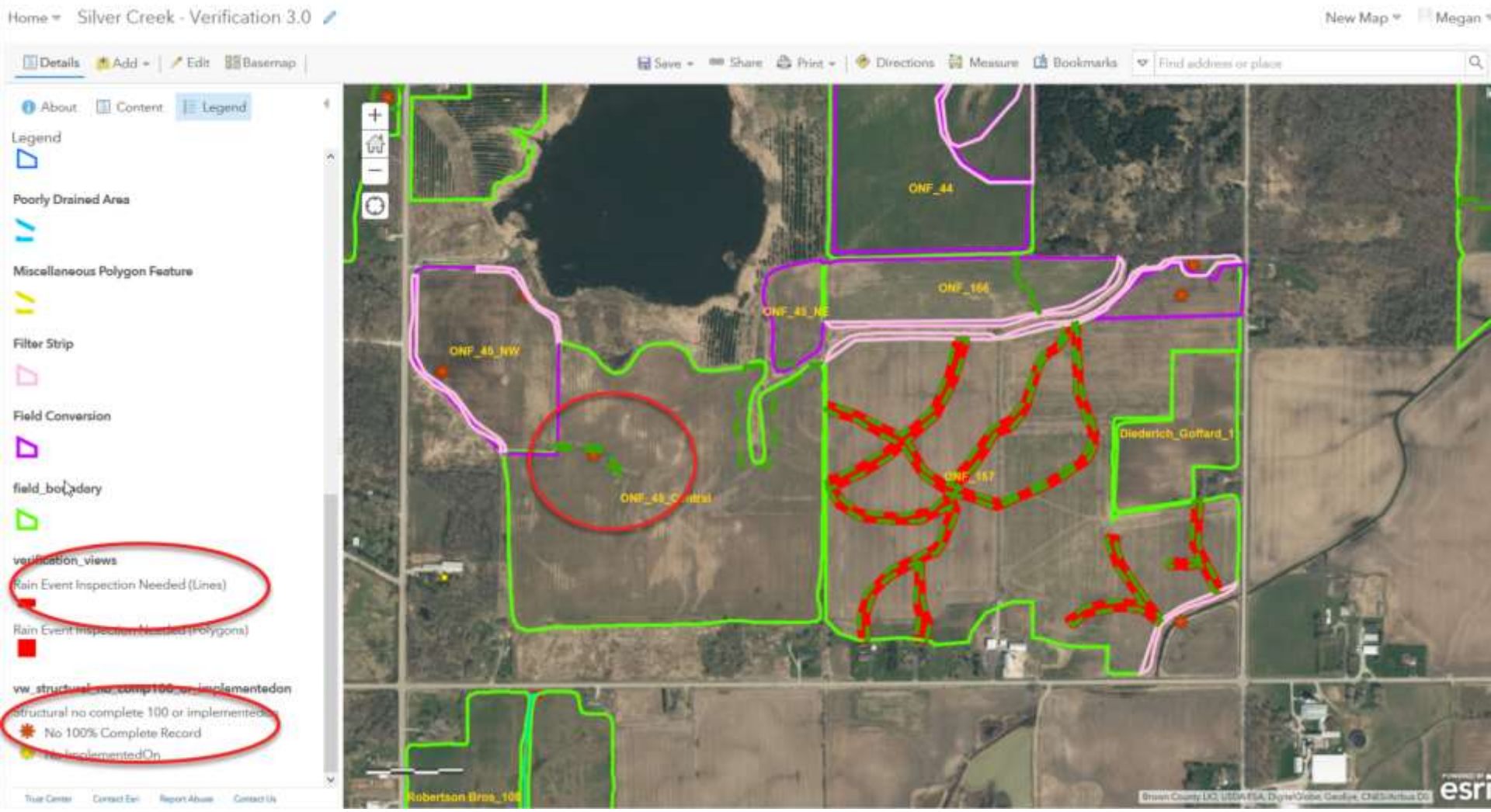
GIS and Innovative Tools

Megan Bender
Jacobs Engineering

Verification App

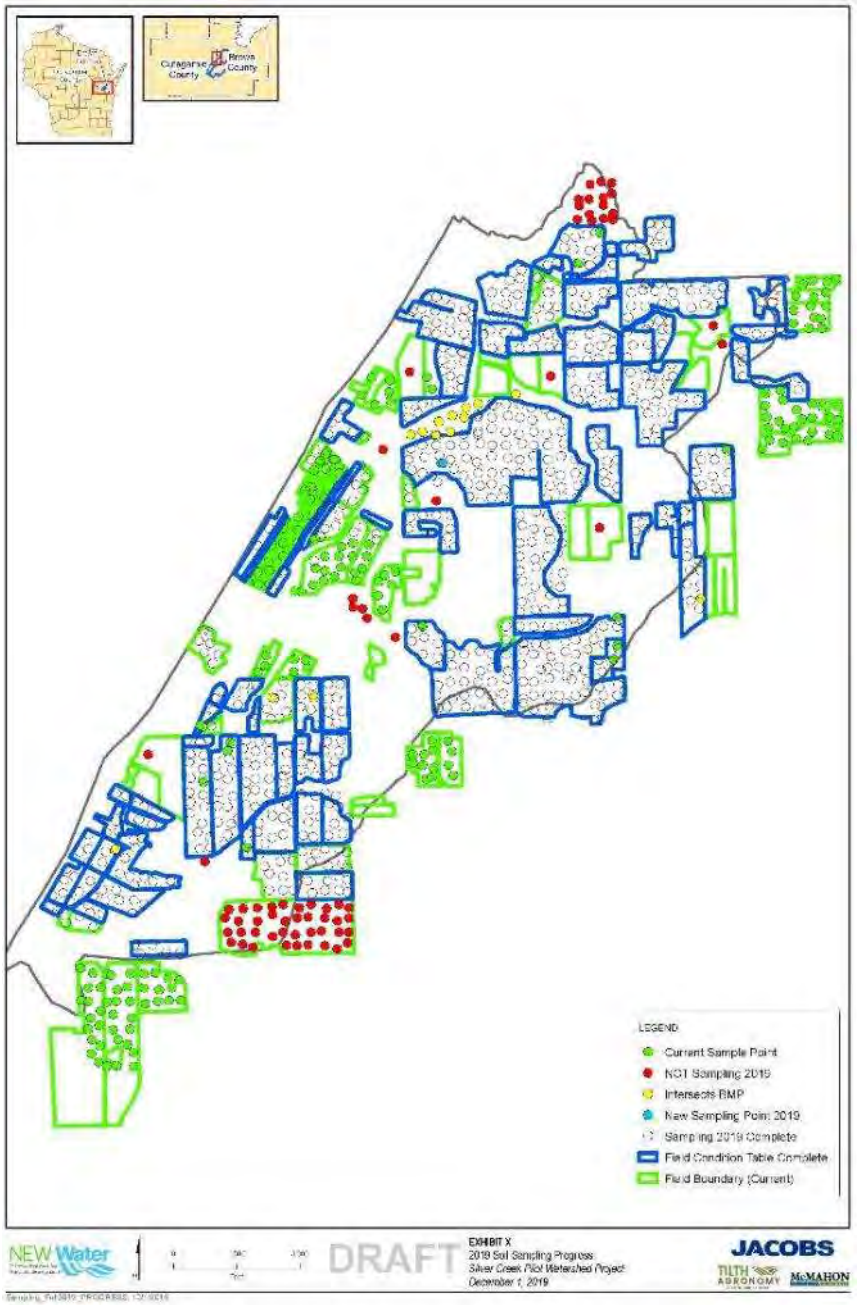
- Evolution from the Field Walk app
- Allows for inspections and planning for all structural and operational BMPs
- Add new, edit existing BMPs
- Tracked through Unique ID numbers
- Database views incorporated
  - No 100% complete inspection
  - Needs a post >1” rainfall inspection

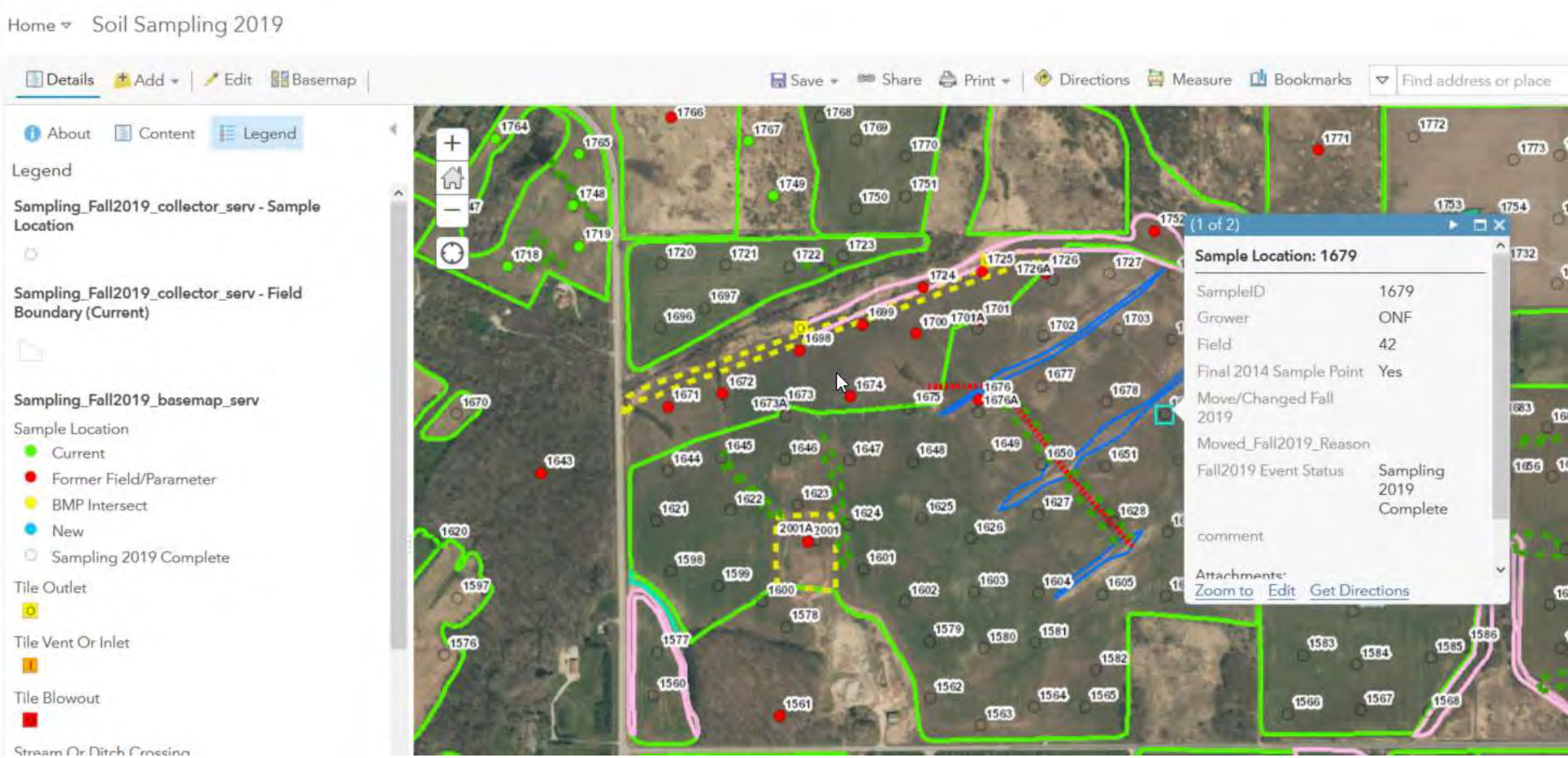



Home
Silver Creek - Verification 3.0
New Map
Megan
Details
Add
Edit
Basemap
Save
Share
Print
Directions
Measure
Bookmarks
Find address or place
About
Content
Legend
Legend
Poorly Drained Area
Miscellaneous Polygon Feature
Filter Strip
Field Conversion
field_boundary
verification_views
Rain Event Inspection Needed (Lines)
Rain Event Inspection Needed (Polygons)
vw_structural_no_comp100_or_implementedon
structural no complete 100 or implemented
No 100% Complete Record
ONF_44
ONF_166
ONF_45_NE
ONF_45_NW
ONF_167
Diederich_Goffard_1
Robertson Bros_100
esri

Soil Sampling App 2019

- Guide field teams to the correct sampling points
- Shows progress
- Allows for capture of field conditions
- Automated report generated weekly



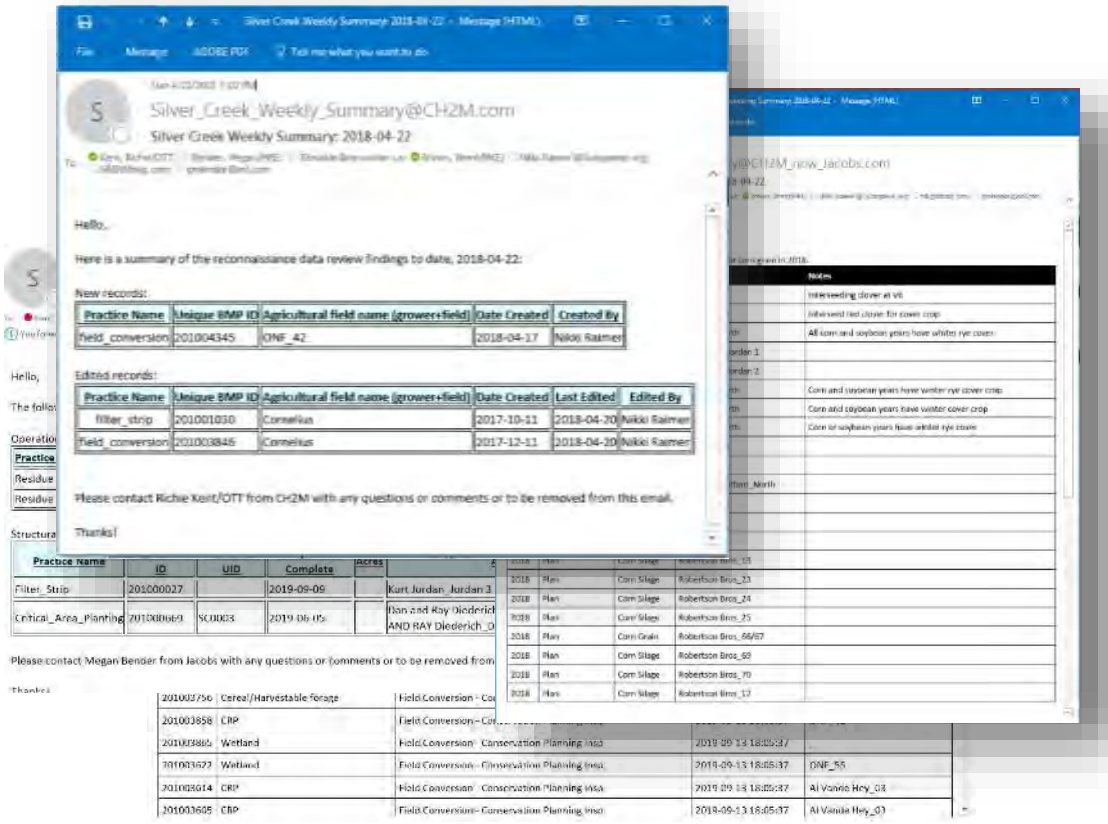

Home
Soil Sampling 2019
Details
Add
Edit
Basemap
Save
Share
Print
Directions
Measure
Bookmarks
Find address or place
About
Content
Legend
Legend
Sampling_Fall2019_collector_serv - Sample Location
Sampling_Fall2019_collector_serv - Field Boundary (Current)
Sampling_Fall2019_basemap_serv
Sample Location
Current
Former Field/Parameter
BMP Intersect
New
Sampling 2019 Complete
Tile Outlet
Tile Vent Or Inlet
Tile Blowout
Stream Or Ditch Crossing
(1 of 2)
Sample Location: 1679
SampleID 1679
Grower ONF
Field 42
Final 2014 Sample Point Yes
Move/Changed Fall 2019
Moved_Fall2019_Reason
Fall2019 Event Status Sampling 2019 Complete
comment
Attachments
Zoom to
Edit
Get Directions

Conservation Planning App

- Enter ENMPs and conservation plan details
- Access C&ENMPs

Automated Email Reports

- Rainfall generated inspection report
- BMPs fully implemented and ready for payment approval
- Interseeder Scheduling
- Added/edited records of the previous week
- 6-month maintenance inspections needed

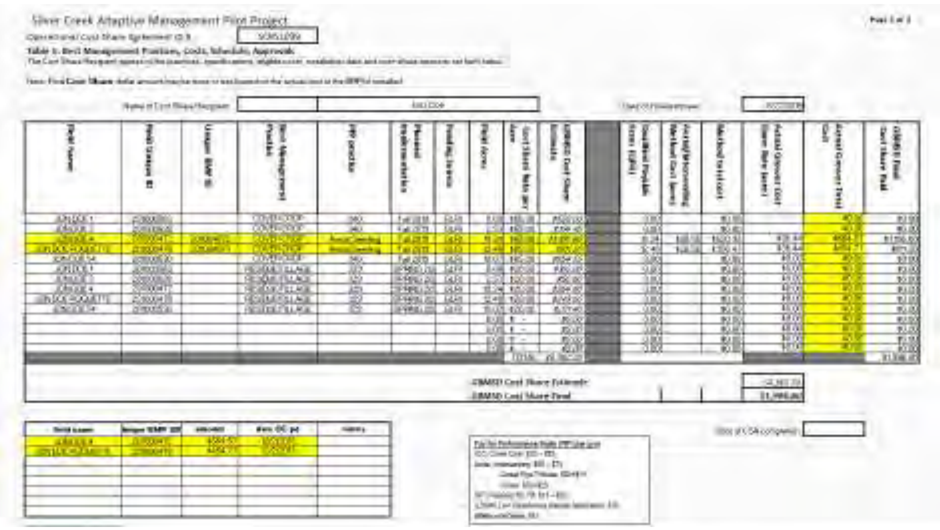


Cost Share Agreements
Conservation & Enhanced Nutrient Management Plans
Best Management Practices

Nikki Raimer
Jacobs Engineering

Cost Share Agreements

Operational



Silver Creek Adaptive Management Pilot Project

Structural

Section D BMP Plan: Practices, Costs, Installation, and Approvals

Silver Creek Cost Share Agreement: SC0099

Name of Cost Share Recipient: **Jon Doe**

Initial Estimate: Nov 2016

Unique ID (shown on map)	NRCS Code	BMP	Estimated Quantity	Units	Install Date	Initial Cost ($)	FINAL QUANTITY	Final Cost ($)	Source of Funds	GBMSD Final Approval (date)
201000151	345	CAP	[illegible]	ac	spring 17	[illegible]	0.20	$60.00	NEW GLRI	7/28/2017
201000067	[illegible]	filter strip	0.70	ac	spring 17	$210.00	1.50	$450.00	NEW GLRI	7/28/2017
201000775	[illegible]	filter strip	0.70	ac	spring 17	$220.00	1.00	$300.00	NEW GLRI	7/28/2017
201000067	[illegible]	buffer incentive	0.70	ac	spring 17	$2,450.00	1.50	$5,250.00	NEW GLRI	7/28/2017
201000775	[illegible]	buffer incentive	0.70	ac	spring 17	$2,450.00	1.00	$3,500.00	NEW GLRI	7/28/2017
					TOTAL	$5,410.00		$9,560.00		

invoice #	vendor	Date	service	cost	Date NEW approved	Date OC pd	GBMSD payment	[illegible]
55888	Jon Doe	8/1/2017	CAP, Buffer Incentive and seeding	$9,560.00	7/28/2017	8/2/2017	[illegible]	[illegible]
			TOTAL	$9,560.00				

CONSERVATION & ENHANCED NUTRIENT MANAGEMENT PLAN

CONSERVATION & ENHANCED NUTRIENT MANAGEMENT PLAN

Crop Year: 2019

Diederich 12 2019 12 01

2015: Field is owned by Al Robert and Dary Jacobs. Robertson farm [illegible] in 2016. [illegible] Operational BMPs [illegible] structural BMPs [illegible]. Grower interested in manure injector from Outagamie County potential coordination with Phil Robertson for use on both farms.
2016: Field 12 will be run as corn in 2017.
2017: Both fields will be run as corn silage and receive manure. [illegible] All CAPs except [illegible] required. [illegible] for implementation on Diederich 12 [illegible] boundary for field 12 [illegible] into rye cover.
2018: Will go into corn again. Will be no till [illegible] manure [illegible] rye cover crop after harvest. Corn silage planned [illegible] of rye planted after harvest. Will likely surface apply manure on this field this fall.
2019: [illegible] manure [illegible] in the spring. Corn silage will be the [illegible] in 2019.

RECOMMENDED STRUCTURAL OR "HARD" PRACTICES

Hard Practice Feature Class				Conservation Plan Table				100% Complete Table	Maintenance Inspection Table
BMP Unique ID	BMP	Accepted? (Grower, Owner, Both)	Why Not Accepted?	Planning Year	Priority (High, Low, NR)	Comments	Implementation Planned (month/year)	Implementation Actual (Month/year)	Is there a Maintenance Inspection (How Many)?
[illegible]	Filter Strip	Neither	None	2015	NR	This portion of the field was removed from cropping, this takes care of the need for the filter strip. No longer recommended.		-	
[illegible]	Critical Area Planting	Neither	[illegible]	2015	low	[illegible] waterway is installed and maintained. Outside of [illegible] Creek watershed			
				2016	NR	Waterway changed to CAP [illegible]			
[illegible]	Critical Area Planting	[illegible] Owner	None	2017	high	Was originally shown as a critical area planting but grower felt it should be a waterway. Was changed to high priority with [illegible]. Install at the same time as [illegible]. Would be ideal to coordinate with [illegible] waterway but that is not critical		-	
				2018	high	not installed in 2018	01/2017		
				2017	high	installed [illegible] CAP [illegible]	01/2017	01/2017	No
				2018	[illegible]	Installed January of 2017.	01/2017	-	[illegible]

OPERATIONAL OR "SOFT" PRACTICES

BMP Soft Practice Table						Operational Inspection Table
No.	BMP	Planning Year	Grower Accepted?	Description of Accepted Practice or Reluctance to Implement Accepted?	Implementation Planned (month/year)	Implementation Actual (Month/year)
1	Cover Crop Or Interseeding	2015	N/A	N/A	N/A	N/A
		2016	Yes	annual	09/2016	
		2017	Yes	Will implement a winter rye cover crop after corn harvest	09/2017	10/2017
		2018	Yes	No change	09/2018	
		2019	N/A	N/A	N/A	N/A
2	Alfalfa With Grass	2015	N/A	N/A	N/A	N/A
		2016	N/A	N/A	N/A	N/A
		2017	N/A	N/A	N/A	N/A
		2018	N/A	N/A	N/A	N/A
		2019	N/A	N/A	N/A	N/A
3	Alfalfa With Nurse Crop	2015	N/A	N/A	N/A	N/A
		2016	N/A	N/A	N/A	N/A
		2017	N/A	N/A	N/A	N/A
		2018	N/A	N/A	N/A	N/A
		2019	N/A	N/A	N/A	N/A
4	Nutrient Placement Techniques	2015	N/A	N/A	N/A	N/A
		2016	N/A	N/A	N/A	N/A
		2017	Yes	Manure was applied and incorporated in 2016. Outagamie County injector not used. Will inject manure using injector purchased by Waste Control Services in 2017.	04/2017	05/2017
		2018	Yes	No change	05/2018	
		2019	N/A	N/A	N/A	N/A
5	Tillage Practice Change	2015	N/A	N/A	N/A	N/A
		2016	N/A	N/A	N/A	N/A
		2017	Yes	Not implemented previously because manure injector wasn't used. Will [illegible] in 2017	04/2017	05/2017
		2018	N/A	N/A	N/A	N/A
		2019	N/A	N/A	N/A	N/A
6	Soil Amendments	2015	N/A	N/A	N/A	N/A
		2016	N/A	N/A	N/A	N/A
		2017	N/A	N/A	N/A	N/A
		2018	N/A	N/A	N/A	N/A
		2019	N/A	N/A	N/A	N/A
7	[illegible]	2015	N/A	N/A	N/A	N/A
		2016	N/A	N/A	N/A	N/A
		2017	Yes		03/2018	
		[illegible]	[illegible]	[illegible]	[illegible]	

Feature Class/Table BMP		Field Boundary Conservation Plan
Type	BMP Unique ID	BMP	Cost Share Restriction? (EQIP, State/County, GLRI, Private or Gov't Grant, NEW Water, Other)
Structural	201000030	Filter Strip	No
	201000119	Critical Area Planting	
	201000874	Critical Area Planting	
	201000868	Critical Area Planting	
	201000882	Critical Area Planting	
	201000881	Critical Area Planting	
	201000875	Critical Area Planting	
Operational	201000710	Cover Crop Or Interseeding	No
	201001581	Cover Crop Or Interseeding	
	201004861	Cover Crop Or Interseeding	
	201004115	Cover Crop Or Interseeding	
	201001593	Nutrient Placement Techniqu	
	201001609	Nutrient Placement Techniqu	
	201004479	Nutrient Placement Techniqu	
	201001628	Tillage Practice Change	
	201001699	Tillage Practice Change	
	201004962	Residue	
	201004216	Residue	
	201004683	Residue	
	201004855	Residue	

Field Boundary Conservation Plan
Is Grower Willing to Contribute In-kind? (time, equipment, fuel, lost crop acreage, supplies, other?)
No response recorded in conservation plan record.
Is Owner Willing to Contribute In-kind? (time, equipment, fuel, lost crop acreage, supplies, other?)
No response recorded in conservation plan record.

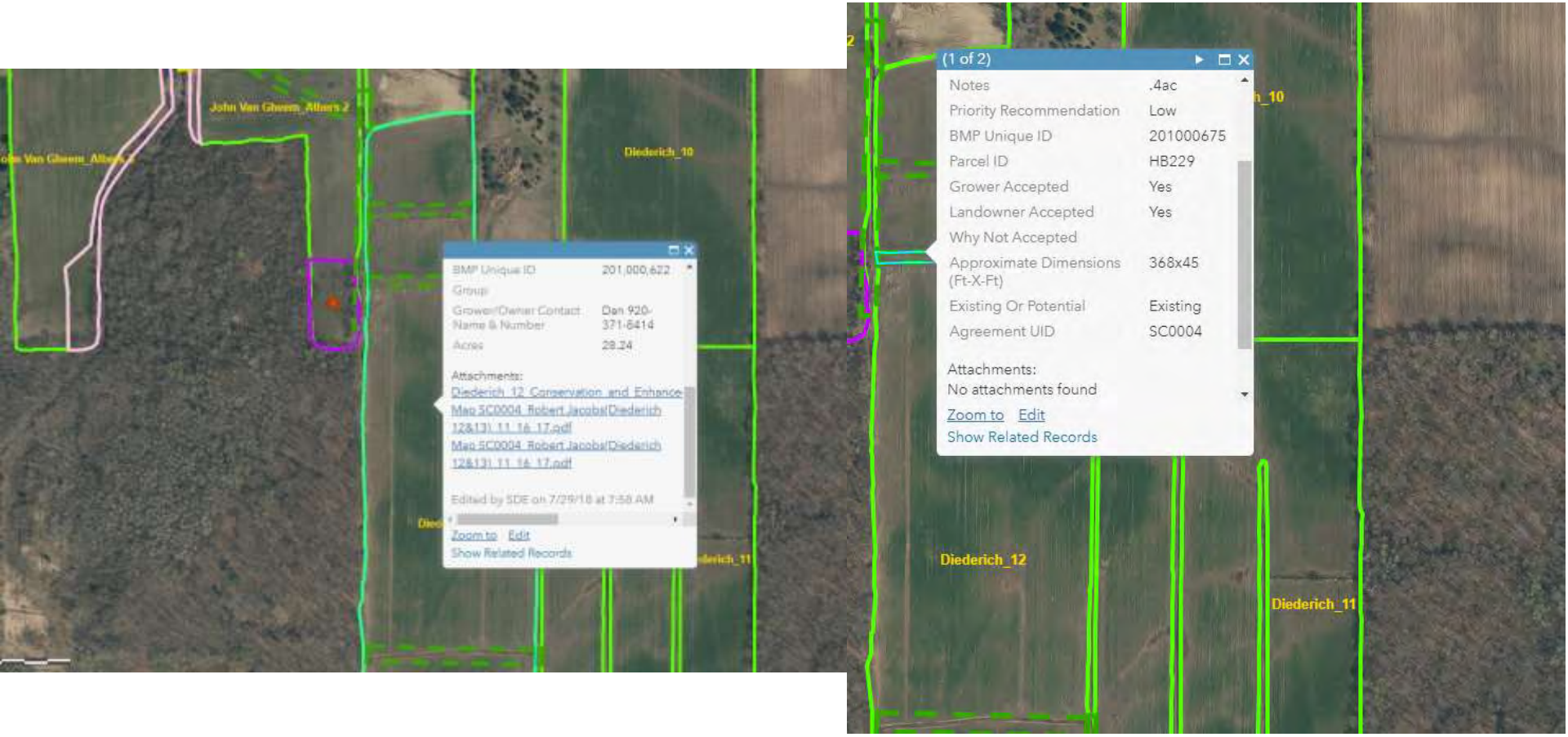
201000710	Cover Crop Or Interseeding - Operationalbmptables

201000710	Cover Crop Or Interseeding - Operationalbmptables

Enhanced Nutrient Management Plan: Diederich 12

Enhanced Nutrient Management Plan Table

Year	Plan Or Actual	Rotation	Tillage Practices During Rotations	Current Year Pi (Lb/Acre)	First Yr Pi (Lb/Acre)	Min Pi In Rot (Lb/Acre)	Max Pi In Rot (Lb/Acre)	Rot Avg Pi (Lb/Acre)	Avg Soil P (Ppm)	Min Soil Test P (Ppm)	Max Soil Test P (Ppm)	Current Year Soil Loss (Tons/Acre)	Min Soil Loss In Rot (Tons/Acre)	Max Soil Los In Rot (Tons/Acre)	Rot Avg Soil Loss (Tons/Acre)	Scr	Organic Matter (%)	Crop Yield (Bushels Or Tons/Acre)	Fertilizer Type	Fertilizer Amt (Lb/Acre)	Solid Manure (Tons)	(S) Surface Worked Or Injected	Liq Ma (Gal/
2017	Actual	CS-CS-CS-CS-CS-CS	SC-SC-NT-NT-NT-NT	2.3	3.9	2.1	8.1	4	30			1.9	1.8	4.4	2.8	0.3								1500
2018	Plan	CS-CS-CS-CS-CS-CS	SC-SC-NT-NT-NT-NT	2.1	3.9	2.1	8.1	4	30			1.8	1.8	4.4	2.8	0.3								1500
2019	Actual	CS-CS-CS-CS-CS-CS	SC-SC-NT-NT-NT-NT	1.3	2.8	1.3	6.9	3	30	38	134	1.2	0.9	4.2	2.2	0.3	3.1	13	Urea, ESN	75075	0			0
2019	Plan	CS-CS-CS-CS-CS-CS	SC-SC-NT-NT-NT-NT	2.5	3.6	1.8	7.8	4	30			1.3	1.3	4.3	2.4	0.4	3.1		None		0			1600
2018	Actual	CS-CS-CS-CS-CS-CS	SC-SC-NT-NT-NT-NT	2.1	3.9	2.1	8.1	4	30			1.8	1.8	4.4	2.8	0.3	3.1		None	0	0			1500
2015	Plan	CS-CS-Alf-Alf-Alf-Alf-CS	SCND-SCND-SCND-NT-NT-NT-		7	1	9	4	30	38	134	4	0.4	4	2.2	0.2	3.1							


John Van Gheem_Albers 2
Diederich_10
BMP Unique ID 201,000,622
Group
Grower/Owner Contact Name & Number Dan 920-371-6414
Acres 28.24
Attachments:
Diederich_12_Conservation_and_Enhance-Map SC0004_Robert Jacobs(Diederich 12&13)_11_16_17.pdf
Map SC0004_Robert Jacobs(Diederich 12&13)_11_16_17.pdf
Edited by SDE on 7/29/18 at 7:58 AM
Zoom to Edit
Show Related Records
(1 of 2)
Notes .4ac
Priority Recommendation Low
BMP Unique ID 201000675
Parcel ID HB229
Grower Accepted Yes
Landowner Accepted Yes
Why Not Accepted
Approximate Dimensions (Ft-X-Ft) 368x45
Existing Or Potential Existing
Agreement UID SC0004
Attachments:
No attachments found
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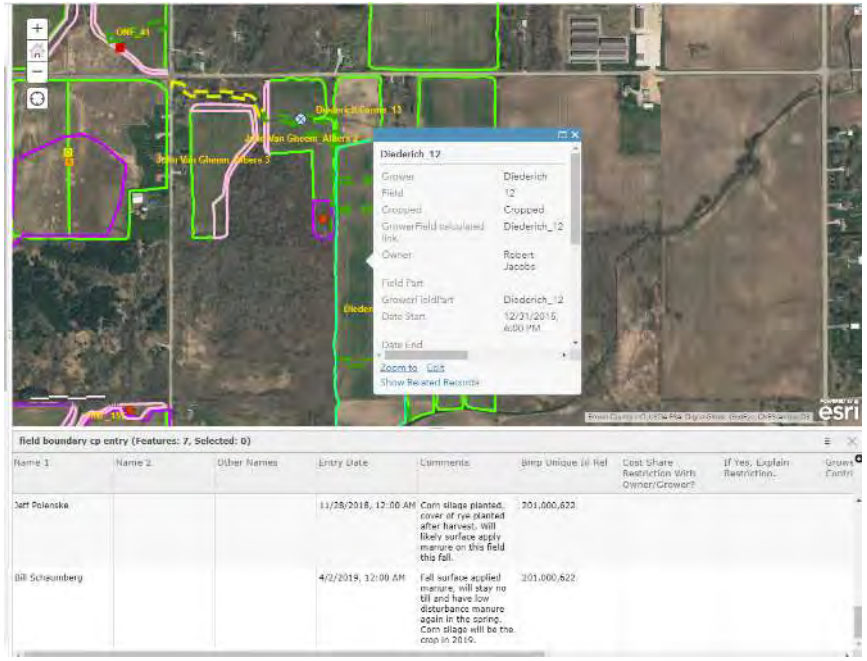
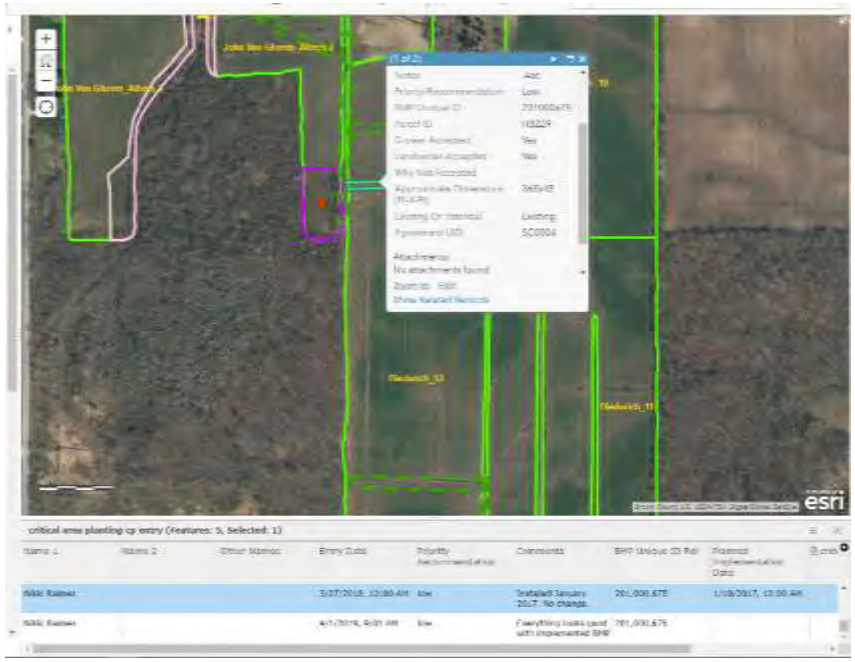
Diederich_12
Diederich_11

Conservation Plan

Field



BMP



Silver Creek BMP's

Silver Creek Pilot Project 2014- 2019	Field Acreage (includes all acres: Cropped, Wetland, Forage, CRP)	Grassed Waterway (412)	Critical Area Planting (342) aka concentrated flow channels	Filter Strip (393)	stream restoration (395)	wetland restoration (657)	Field Conversion: taken out of tillage (new seeding:pollinator, harvestable forage, biomass, etc)	existing non-cropped	stream crossing (578)	current enhanced NMP (590)	Managed Grazing (528)	Vegetated treatment area (VTA, 365) & VWTS	waste facility closure (360)	Waste Storage Facility (313)	Heavy Use Area (561)	Conservation Reserve Program (CRP) acres	WASCB (638)	Diversion (362)
Acres	2187	3.9	26.6	47.0	1.8	48.3	213.0	126.2	0.01	1645.0	97.0	22.3	3.4	0.7	0.3	33.8	73.0	0.3
Numbers of	118	3	16	21	3	9	17	9	1	81	16	2	1	1	1	5	1	1

10 min Break

12-2-2019:
- Can you spot the sediment plumes?!

Silver Creek Final Review & Report

- 2020 NEW Water and Jacobs Team
- Funding strategy, opportunities, and final cost breakdowns
- BMPs & modeled reductions
- Contracts and cost share agreements
- GIS technology development
- Education & Outreach
- Biological & Water Quality Summary

Great Lakes RESTORATION

Lower Fox River Watershed - Plum/Kankapot

Fox-Wolf Watershed Alliance

Outagamie County Est. 1851

Brown County Established 1818

University of Wisconsin Green Bay

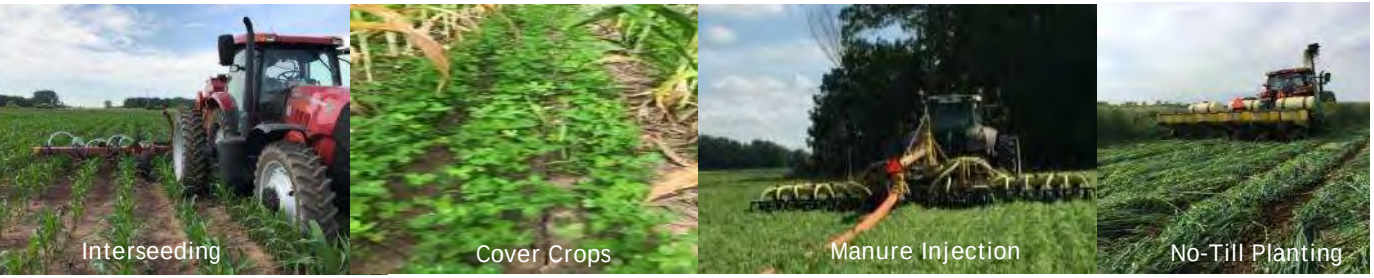
We Extend the Cap to All Mankind

The Nature Conservancy Protecting nature. Preserving life.

Great Lakes Commission des Grands Lacs

Plum & Kankapot GLRI #1

Original Timeframe: March 2015 - February 2020
Requested: 1 Year Extension



Land Conservation

BMPs	Current 9/30	Goal	Plan for Extension
Buffer Strips 35-49' 50'+	 66.18 ac 49.98 ac	 76 ac 58 ac	 Meet goal Meet goal
Streambank Protection	7308 ft	5438 ft	Add additional
Concentrated Flow Treatment	68.87 ac	128 ac	Reduce goal
Pay for Performance	3465 ac	3137 ac	Add additional
Treatment Wetland Acres	2.05 ac	3-6 ac	Meet goal

Other Wins

Monitoring:
Instream & Edge of Field
Extended thanks to support from WDNR and TNC

Equipment:
Equipment funded through GLRI has spurred additional equipment investments in the watershed

Practice Adoption without cost share:
Concentrated Flow Treatment

Plum & Kankapot GLRI #2

Project Timeframe: March 2016 - February 2020

Big Win!

Project succeeded to show value of land conservation staff!

Calumet County has budgeted to keep GLRI project staff on permenantly after grant funds expire.

Land Conservation

BMPs funded	Current 9/30	Goal	Plan for Extension
Streambank Restoration	3666 ft	2280 ft	Exceeded goals

Bigger Story to Tell – Value of GLRI

Winnebago Waterways

A Fox-Wolf Watershed Alliance program

Winnebago Waterways

FOX-WOLF

FOND DU LAC COUNTY est. 1836 WISCONSIN

WISCONSIN Calumet County

Winnebago County

WISCONSIN DEPT. OF NATURAL RESOURCES

Welcome to Waushara County For All Seasons

Intergovernmental Cooperation Agreement

Counties Commit to Work Together to Protect the Winnebago Waterways

Wednesday, October 18, 2017 was a monumental day for all interested in protecting and restoring the Winnebago System!

Lake Management Planning
Moving into Implementation 2020

Northeast Wisconsin Water Quality Pact

Outagamie County Executive Nelson

Winnebago County Executive Harris

Oneida Nation Vice-Chairman Stevens

Brown County Executive Streckenbach

Fond du Lac County Executive Buechel

- Signed March 5, 2019
- All County Executives in Fox-Wolf Basin + Oneida Nation
- Facilitated by Alliance for the Great Lakes & Fox-Wolf Watershed Alliance

Pact Overview:

Therefore, as a Pact Party signing this Pact:

- I pledge to prioritize clean water within my respective jurisdiction.
- I pledge to participate in an annual meeting with pact parties.
- I pledge that whenever possible, I will work with others, including Pact Parties and elected officials, to further the Pact.
- I pledge to communicate to my jurisdiction duly adopted water quality initiatives adopted by the Pact Parties group.
- I pledge that when possible, I will support the development of policy priorities that support the Pact.
- I pledge I will advocate for clean water in area waterways.
- I pledge to actively inform new elected officials in northeast Wisconsin of the Pact and encourage them to sign the Pact.
- I pledge that when possible, I will support the development of a sub-basin management plan to include such things as water quality goals, target dates, performance metrics, management strategies, and a governance program within my sub-basin.

Basin Leadership Council

Strategic Collaboration to Achieve Nutrient Reduction Goals in the Lower Fox Basin

ALLIANCE for the GREAT LAKES

FOX-WOLF WATERSHED ALLIANCE

BLC role is to achieve TMDL nutrient reduction goals in the Lower Fox Basin through:

- Formalizing Lower Fox Basin regional coordination and leadership
- Multi-sector participation
- Developing a strategic approach & clear metrics for success
- Increasing community capacity through collaboration and leveraging strengths
- Championing the cause – prioritize water in decision making

By 2030 we will achieve significantly cleaner water, supporting healthy communities, and resilient economies through coordinated regional collaboration in the Lower Fox River and Green Bay

Goals and Timeline

- 30% reduction in phosphorus by 2030
- 60% reduction in phosphorus by 2040

By achieving a 30% reduction in phosphorus entering the LFR we will see significant reductions in dead zones, algae outbreaks, and sediment plumes. As a result, we will see improved water clarity, aquatic habitat, and recreation, as well as less dredging and healthier soils.

Lower Fox Management Plan Components

Strategic Watershed Planning

- Agriculture
- MS4
- Wastewater

Planning Framework

1. **Funding Strategy**
2. **Synopsis of Implementation Efforts**
3. **Policy**
4. **Leadership & Coordination**
5. **Shared Measurement**
6. Communication
7. Research Strategy

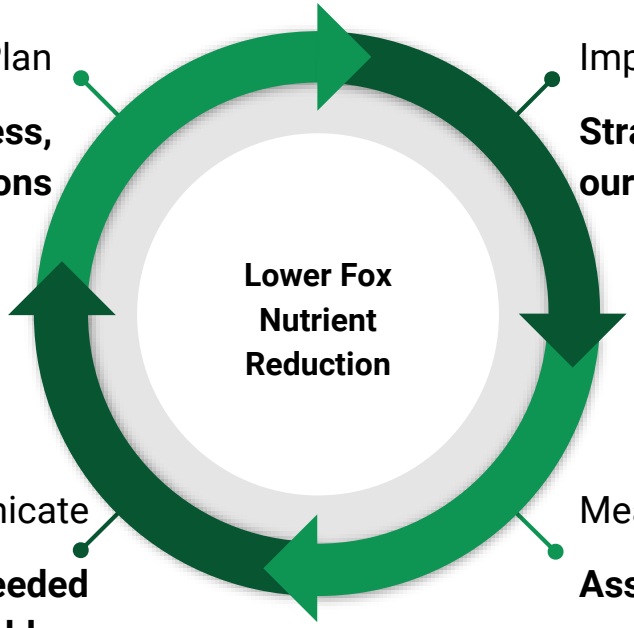
Leadership and Coordination

Short Term Strategic Plan

Establishes metrics, defines success, and implementation actions

Implementation

Strategic actions moving us closer to our nutrient reduction goals



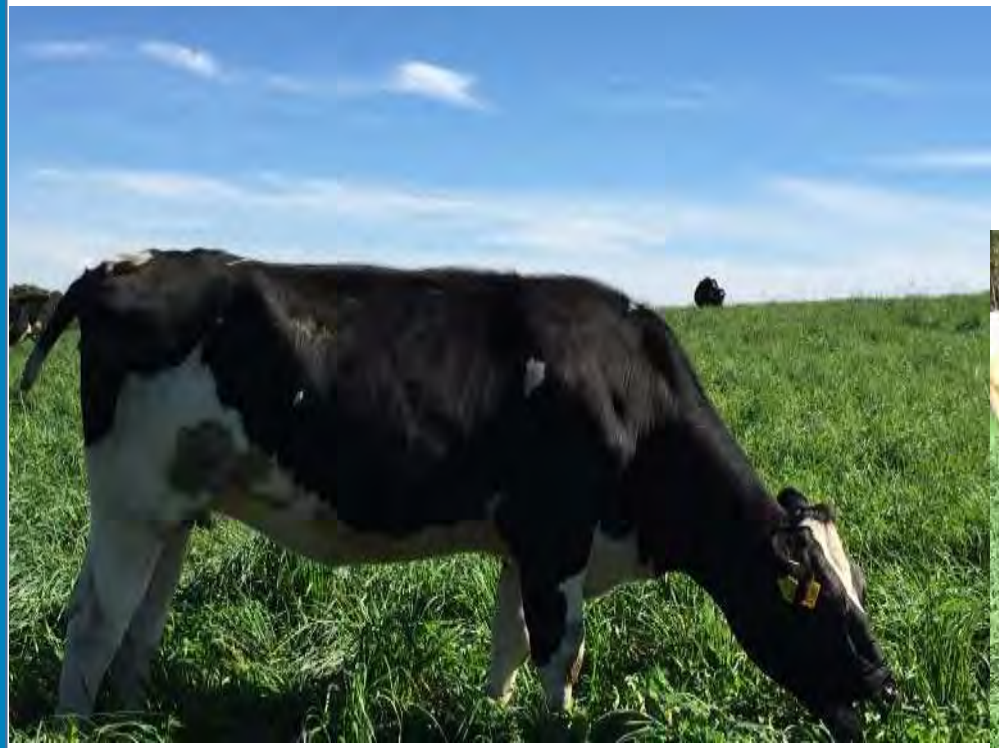
Adapt and Communicate

Adapting implementation plan as needed and communicating to stakeholders

Measure and Evaluate Progress

Assessing implementation efforts

Break – Get Lunch!



SC Partner Feedback

- What went well in your project as part of the Silver Creek Pilot?
- What should we have done differently?
- Should we have collected different baseline information such as soil health parameters?
- Were there projects or partners we missed including?

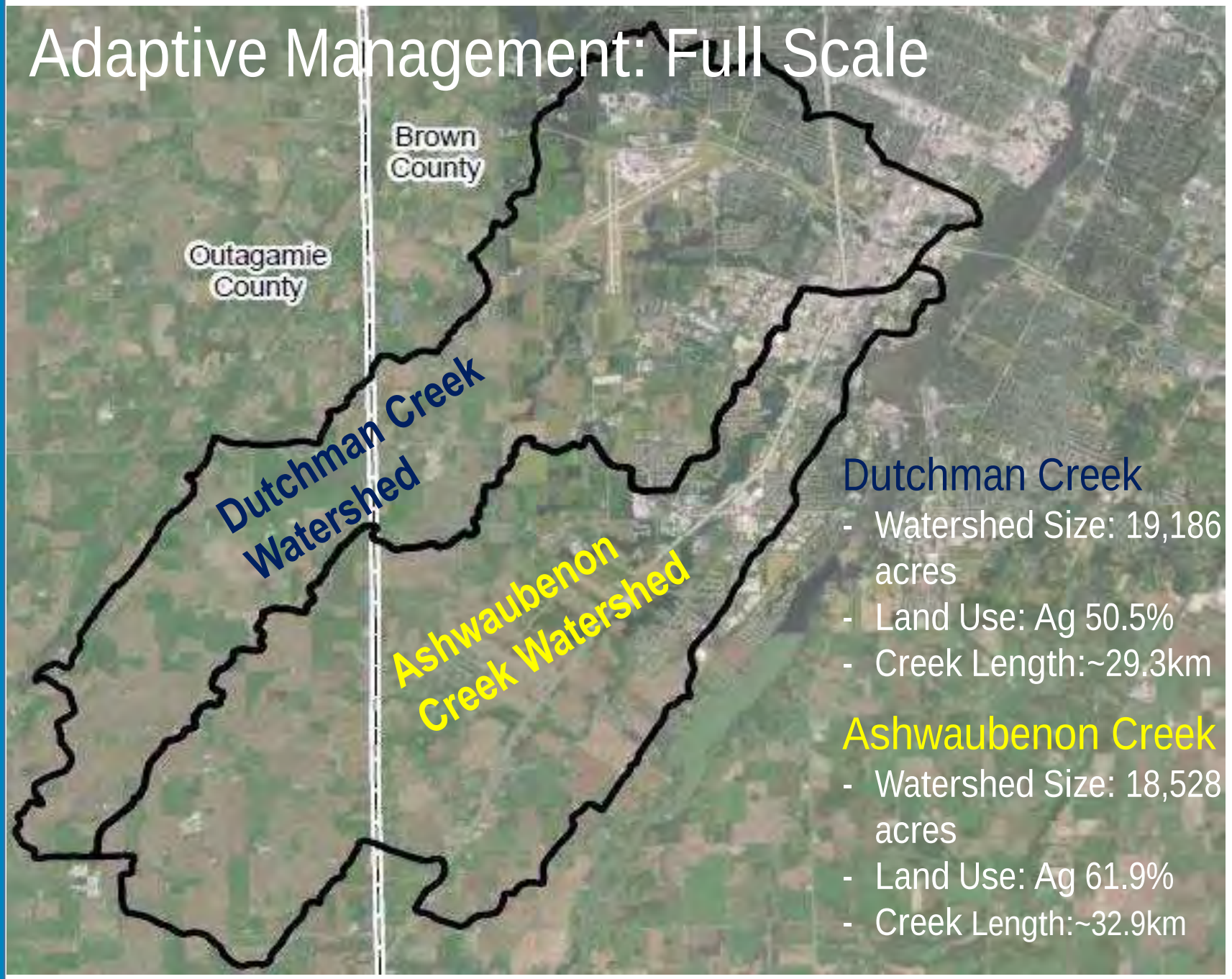
Comments and Open Discussion

Opportunities in Adjacent Watersheds

Watershed Evaluation Criteria

1. Sub-watershed Size
2. Sub-watershed Land Use and Agricultural Contribution
3. Geographic Location
4. Nine-Key Element Plan Status
5. Potential Load Partners
6. Flow and Water Quality Data
7. Ongoing Agricultural Watershed Projects
8. Severity of Perceived Issues
9. Technical Resources

Adaptive Management: Full Scale



Dutchman Creek

- Watershed Size: 19,186 acres
- Land Use: Ag 50.5%
- Creek Length:~29.3km

Ashwaubenon Creek

- Watershed Size: 18,528 acres
- Land Use: Ag 61.9%
- Creek Length:~32.9km

Full Scale Watershed Program

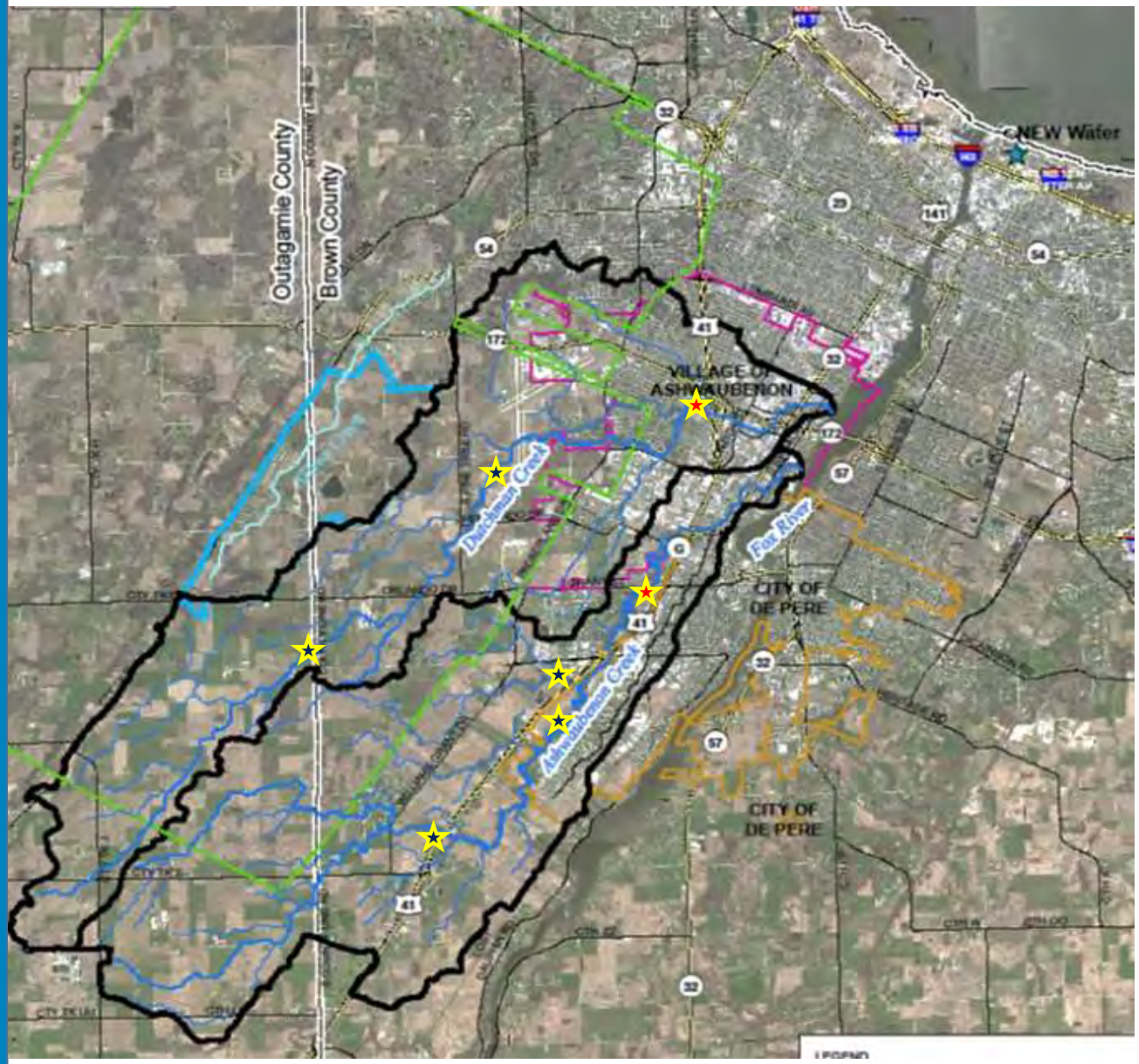
- NEW Water Commission Approved Full Scale Planning in 2018
  - Position NEW Water to advance AM as part of the phosphorus and TSS compliance strategy
- Similar starting tasks as the Pilot
  - Stream corridor inventory
  - Workgroups, partnership agreements
  - Field walks and conservation planning
- Water Quality Monitoring
- Flow Monitoring
- Biological Monitoring

ACDC Water Quality and Biological Monitoring

- Water Quality:
  - 8 water quality monitoring sites
    - TSS, TP, dissolved TP, TKN
    - Multi parameter sonde recordings
- USGS Gage Stations
  - 2 gage and event samplers
    - Installed and operational
  - 2 additional gage stations
    - Installed and operational

- Biological Monitoring
  - Contract with UWGB & Oneida to perform annual biological sampling
    - 2018 & 2019 fall sampling complete
      - 9 sites sampled: fish, inverts, habitat
      - Samples sorted and out for identification and review

ACDC Water Quality Sampling Review



Water Quality Sites:

<u>Ashwaubenon Creek</u>

- 3 main stem sites
- 1 tributary site

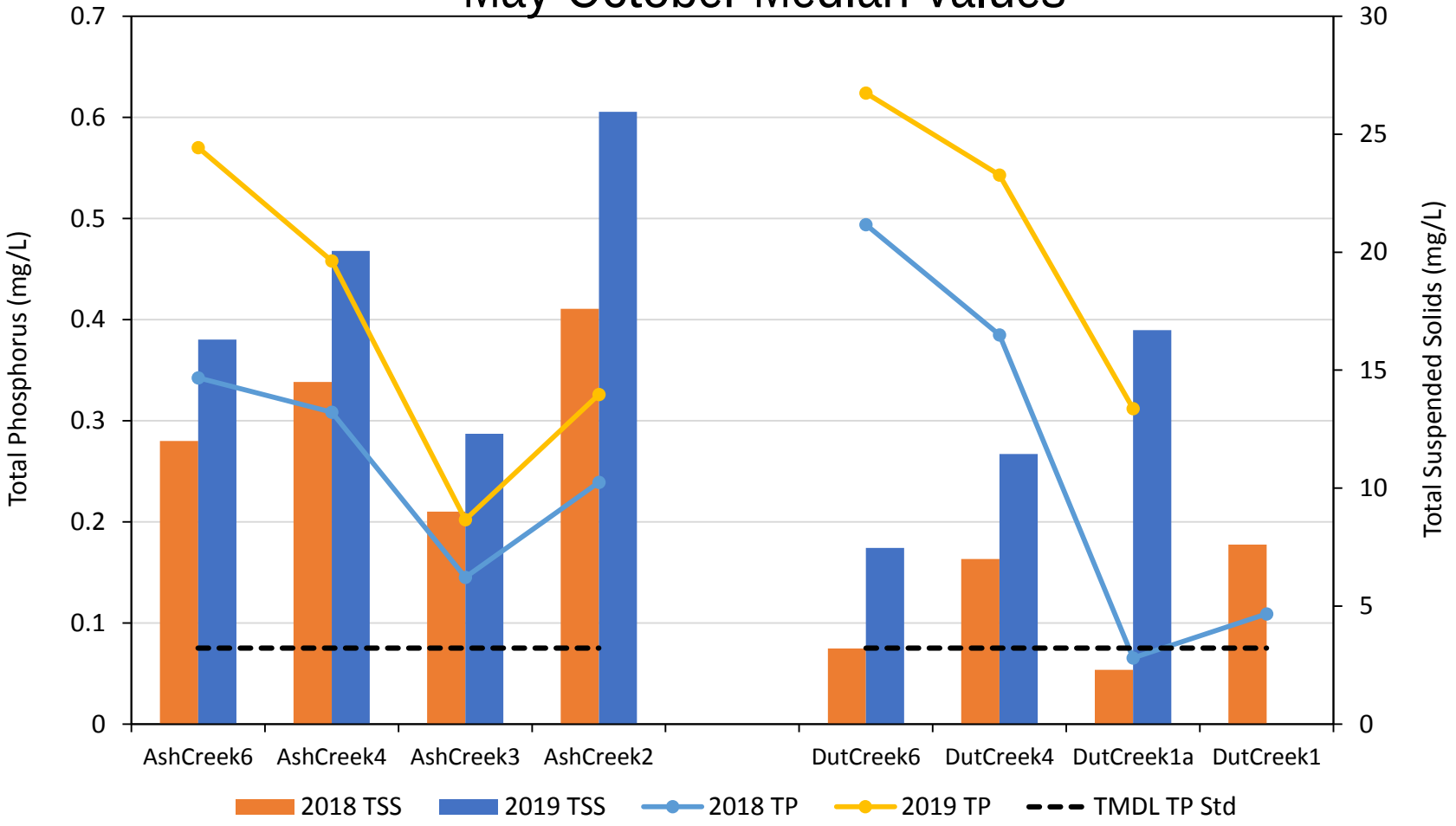
<u>Dutchman Creek</u>

- 3 main stem sites
- 1 temporary site

★ WQ, Bio & USGS

★ WQ Site & Bio

2018-2019 ACDC Preliminary WQ Results: May-October Median Values



*DutCreek 1a sampling started in Oct 2018, only 3 data points. DutCreek 1 not sampled 2019

A Full Scale Watershed Management Program

- NEW Water Commission Approved Full Scale Planning in 2018
- Similar starting tasks as the Pilot 2018 - 2019
  - Workgroups and partnership agreements
  - Stream corridor inventory
  - Field walks and conservation planning
  - Water Quality Monitoring
  - Flow Monitoring
  - Biological Monitoring

- Formal submittal of Adaptive Management Plan December 2018
  - Along with WPDES Permit Renewal request
- Continued Revisions with WDNR on AM Plan in 2019 & WPDES Permit
- NEW Water expecting an approved AM Plan and WPDES Permit in first half of 2020

Next Steps in Full Scale Watershed Program

- 2019 – a Year of Planning and Inventory
  - Water quality monitoring:
    - Grab samples, event samples, USGS gage data, biological data and habitat data
  - Desktop field evaluation
  - Develop a method of prioritization
  - Develop advisory committee
- 2020 – Begin implementation of practices
  - Kickoff of the Program
  - Finish desktop evaluation
  - Spring field walks
  - Prioritization of BMP opportunities
  - Discussions with land owners and growers of program opportunities
- 20 Years of collaborative watershed efforts!

Wrap-Up and Final Discussion

- Collectively we have learned a lot about the Lower Fox River greater watershed
- Through these efforts we have tried new watershed approaches to reduce sediment and nutrients
- Shared knowledge and lessons learned
- We look forward to continuing to work with you towards improving our impaired waterways for future generations to enjoy
- *OPEN DISCUSSION*

Photo credit: Steve Seilo (www.photodynamix.com)

Silver Creek Project
Partnering for Water Quality

Outagamie County

Oneida Nation

The Nature Conservancy

Ducks Unlimited

Jacobs

NEW Watershed Program
Partnering for Water Quality

USGS

Ag Ventures

GLRI

EPA

WDNR

Brown County

McMahon

UW – Green Bay

Tilth Agronomy

Fund for Lake Michigan

NRCS

US Fish & Wildlife Service

NEW Water
The brand of the Green Bay Metropolitan Sewerage District

Thank you!

Questions / comments?

Silver Creek Project TEAM

Erin Houghton

Watershed Programs Manager

ehoughton@newwater.us

(920) 438 - 1071

www.newwater.us

NEW Water

The brand of the Green Bay Metropolitan Sewerage District