



Sediment & Nutrient Reduction and Habitat Restoration USEPA-Great Lakes Restoration Initiative Project



Grant Number: GLRI 00E01450
Semi-Annual Report #10
October 2019 – March 2020
April 30, 2020



<http://www.newwater.us/projects/silver-creek-project/>

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Grant Number: # 00E01450
**Project Title: Silver Creek Sediment & Nutrient Reduction
and Habitat Restoration**

Budget & Project Periods: \$569,175 (final installment), Year 5
Reporting Period Covered: October 1, 2019 – March 31, 2020
Principal Investigator: Erin Houghton, NEW Water (GBMSD) Watershed Programs Manager
Project Goals:

- Reduce agricultural nonpoint runoff by installing permanent conservation measures
- Restore biological habitat of Silver Creek
- Achieve sediment and nutrient goals consistent with state water quality standards
 - ✓ Total Phosphorus (TP): 0.075 mg/L for tributary streams
 - ✓ Total Suspended Solids (TSS): TMDL target of 18 mg/L

88.64%	Project completion-to-date
100.62%	Recipient and Other In-kind March
656.10 acres	Contracted during current reporting period (combined operational BMPs)

1. Project Summary

The Silver Creek sub-watershed was selected by NEW Water, the brand of the Green Bay Metropolitan Sewerage District (GBMSD), for a five-year demonstration area to evaluate an Adaptive Management (AM) Strategy consistent with Wisconsin Administrative Code NR 217.18, that allows point sources such as NEW Water to pursue alternative permit compliance options for reducing total phosphorus (TP) and total suspended solids (TSS) from its discharge. In addition to its own funding, NEW Water is utilizing a five-year GLRI grant to supplement the many Silver Creek components including sub-awards for research projects, best management practice (BMP) implementation, and contractual/consulting efforts. Water and soil chemistry, conservation and nutrient plan information, and field data are continually being updated and input into models and GIS. Private Agronomists and staffs from Jacobs, Brown and Outagamie Counties continue working with landowners and growers throughout this 4,800-acre sub-watershed to improve agricultural practices and construct BMPs. The Oneida Nation is a large landowner in the sub-watershed owning 68% of the cropped fields and is a major partner in the project.

Fifteen-mile Silver Creek is located in the Duck Creek Watershed which flows into lower Green Bay of the Lower Fox River Basin in northeastern Wisconsin. The Lower Fox River and the Basin are Great Lakes Restoration Initiative (GLRI) Priorities and deemed Areas of Concern (AOC) by the International Joint Commission due to the persistence of pollutants and the degradation of habitat. Because of these pollution concerns, the Lower Fox River has an EPA approved Total Maximum Daily Load (TMDL) Plan which requires reduction of TP and TSS in the Fox River to comply with State water quality criteria. To aid in meeting the Fox River TMDL, the goal for Duck Creek (one of 16 watersheds in the Lower Fox River) is a 76% reduction of TP from agricultural sources. NEW Water is piloting AM using conservation measures and BMPs on agricultural properties surrounding Silver Creek to see if this is a feasible compliance option for reducing TP and TSS in a sub-watershed that feeds into Duck Creek.

The results of this AM pilot project are now being utilized to create a framework to address full scale water quality improvements in two adjacent sub-watersheds within the Lower Fox River basin.

2. GLRI Work Plan updates

2019 (Year 5) Overview

While 2019 experienced heavy rainfall, agricultural disruptions, and water quality impacts, many accomplishments and successes can be still lauded in Silver Creek. Partly due to the wet conditions, but also because of increased education about water quality concerns, 82% of cropland was not tilled. 88% of the cropland was covered either in alfalfa, cover crops, winter wheat, forage, pasture or grass. This is a marked increase in cover since the beginning of the pilot project in 2015 when only 30% of fields were covered. Furthermore, Conservation and Enhanced Nutrient Management Plans (C&NEMPs) were completed for 1,645 agricultural acres and aerial seeding of cover crops was performed on 235 acres. No new structural practices were installed. Water quality sampling continued at seven locations along Silver Creek.

The final Landowner/Grower and Stakeholder meetings were held in December 2019. Although the Pilot project has ended, NEW Water is committed to continue working toward water quality improvements in Silver Creek. Several of the landowners and growers own and operate fields in the adjacent Ashwaubenon Creek and Dutchman Creek (ACDC) watersheds and will continue to partner with NEW Water in the full scale, 20-year AM Program. The three Subaward activities ended during this reporting period. Soil and nutrient samples were collected from 74 agricultural fields, a sixth year of biological invertebrate data was collected, and the managed grazing project was extended until March 2021.

A. Reporting Tables

As noted previously, the GLRI grant activities are part of a larger AM Pilot Project that includes other funders and other water quality improvement activities. Data for the Reporting Tables were generated from April 2020 queries of the Silver Creek GIS database and are the most accurate numbers available at this time.

Table 1: EAGL reporting (page 6)

The EAGL table shows yearly structural and operational BMPs implemented in Silver Creek, in acres, counted on a one-time basis. When a field is first impacted by an operational practice (e.g., cover crop (CC) or residue/tillage management (R/T)) that field acreage is counted once at that time and not counted again in this reporting table. Yellow highlights indicate updates since the last reporting period.

As a result of an October 2019 conference call with the US EPA Project Officer and others, the EAGL table was modified to meet a reporting requirement such that the total EAGL acres cannot exceed the baseline acreage (2054 acres) of the project watershed. The Silver Creek GIS database tracks each operational practice as a unique BMP activity. However, most often a CC is followed by an R/T practice on the same field. Tracking one operational BMP following another operational BMP results in double counting from an EAGL perspective. Therefore, CC fields immediately followed by R/T BMPs are now only counted once and reported as combined “operational practices.” Unique operational BMPs continue to be tracked in the GIS database and the cumulative acre totals are presented in Table 2.

Table 2: Project Milestones (page 7)

This table lists the total number of acres that have been contracted and impacted/treated with one-time structural BMPs or yearly (operational) BMPs to date, March 2020. This table shows both GLRI funded and “other funded” BMPs. Interseeding is a relatively new method of planting CCs and is identified separately because it is an innovative method of adding cover to planted fields. This table also lists the percent acres achieved as per the approved Work Plan budget. Yellow highlights indicate updates since the last reporting period.

Table 3: Acres Contracted during this Reporting Period (page 8)

This table lists new cost share agreements (CSAs) contracted during Semi-Reporting Period #9. These new CSAs incorporate the “pay-for-performance strategy.” This table shows only GLRI funded BMPs. In the latter years of the project, the vast majority of funded BMPs are operational practices.

TABLE 1: EAGL REPORTING SEMI #10
October 2019 - March 2020
NEW Water (GBMSD) SILVER CREEK GLRI # 00E01450
field acres and practices only counted once (first time implemented)

Best Management Practices (BMP) IMPLEMENTED		Grant year 1 March 2015 to March 2016	Grant year 2 April 2016 to March 2017	Grant year 3 April 2017 to March 2018	Grant year 4 April 2018 to March 2019	Midyear 2020 Oct 2019 to April 2020	Grant year 5 April 2019 to March 2020	Midyear 2021 April 2020 to Sep 2021	Grant year 6 April 2020 to March 2021	Acres to date March 2021
		field season 2015	field season 2016	field season 2017	field season 2018		field season 2019		field season 2020	
approved acres 2014 WP budget	BMP (NRCS code)									
		41	grassed waterway (412)							
27	critical area planting (342)		1.6	1.5						3.1
41	filter strip/buffer (393)			6.3	2.1					8.4
	stream restoration (395)		1.0	0.8						1.8
	diversion (362)				0.3					0.3
20	wetland restoration (657) ¹⁾			25.8	1.5					27.3
	field conversion, new seeding (pollinator habitat)			46.9	13.5					60.4
	VWTS ²⁾			22.0						22.0
	heavy use area (561) ⁶⁾			0.3						0.3
	CRP			19.2						19.2
50	rotational grazing (528)		97.0							97.0
	stream crossing (578)		0.01							0.01
	cover crops (340) ⁴⁾		198.6	202.5	2.4		122.0			-
	interseeded cover crops (340) ⁸⁾		56.6	24.0	17.8					-
	residue/tillage management or NO-TILL (329) ⁹⁾		45.3	292.9	133.6	124.0				-
	TOTAL COMBINED OPERATIONAL ACRES (cover crops interseeding, and residue/tillage management)⁹⁾		163.7	125.7	12.5		136.9			438.8
GLRI funded acres (EAGL)										678.6
	41	grassed waterway (412)		3.9						3.9
	27	critical area planting (342)		3.6	3.5	5.6	10.8			23.5
	41	filter strip/buffer (393)		12.7	10.6	14.0	1.3			38.6
		waste storage facility (313) ⁶⁾		0.7						0.7
		vegetated treatment area (635) ⁶⁾			0.3					0.3
		waste facility closure (360)		3.4						3.4
		water & sediment control basin WASCB (638)		73.0						73.0
		TNC wetland restoration (657) ⁷⁾			21.0					21.0
		field conversion (cereal/harvestable storage, food plot, biomass, pollinator habitat)		76.1	21.0	55.5				152.6
		CRP (land taken out of production)			1.8	12.8				14.6
		cover crops (340) ⁴⁾	487	238.8	30.3					-
		interseeded cover crops (340) ⁸⁾		195.0	-					-
		residue/tillage management or NO-TILL (329)	562	-						-
		TOTAL COMBINED OPERATIONAL ACRES (cover crops, interseeding, and residue/tillage management)⁹⁾	749	105.3	30.3	0.0	0.0			884.7
		other funded acres	749.0	597.3	88.5	87.9	12.1			1216.3
TOTAL GLRI and "OTHER FUNDED" PRACTICES										1895

NOTES: acres may have changed from previous reporting periods as these acres represent actual IMPLEMENTED BMPs per GIS database
1) Sites #1, #2 and #7: 27 acre water impoundment + ~117 acre surrounding area converted from agriculture to wildlife and pollinator habitat
2) Two impoundment basins: east (2 acres) and (3.5 acres) west with embankment planting + 16.5 acres surrounding vegetative buffer
3) N/A
4) Acres of cover crops (CC) on unique acres, only counted first time cover crops were planted
5) Acres of residue/tillage mgmt on unique acres, only counted first time residue/tillage mgmt was used
6) Part of fields converted to rotational grazing (corrected between semi #8 and semi #9 - waste storage facility-EQIP funded, heavy use area-NEW W GLRI funded
7) The Nature Conservancy - Adam Drive: 3.5 acre water impoundment + 16.5 acre surrounding area converted from agriculture to wildlife and pollinator habitat
8) Interseeded CC acres are noted as they are an emerging practice. CC fields are counted only once regardless of CC or Interseeded CC
9) to meet US EPA 11/7/19 EAGL reporting requirement to not exceed baseline acreage of 2,054 acres, for counting purposes, the first time implementation of any operational practice (e.g., cover crops, interseeding, and residue/tillage management) are now reported as TOTAL COMBINED OPERATIONAL ACRES as these practices were usually sequentially performed on the same fields.

Table 1 EAGL Reporting

Table #2: PROJECT MILESTONES (ACRES)					
NEW Water (GBMSD) SILVER CREEK GLRI #00E01450					
March 2015 to March 2020					
BEST MANAGEMENT PRACTICE (NRCS CODE)	Approved Acres 2014 WP Budget	GLRI FUNDED ACRES	"OTHER" FUNDED ACRES ³⁾	SILVER CREEK TOTAL ACRES	% Approved Acres Achieved
grassed waterway (412)	41		3.9	3.9	10%
critical area planting (342)	27	3.1	23.5	26.6	99%
filter strip/buffer (393)	41	8.4	38.6	47.0	115%
managed grazing (528)	50	97.0		97.0	194%
wetland restoration (657)	20	27.3	21.0	48.3	242%
diversion (362)		0.3		0.3	
stream crossing (578)		0.01		0.01	
field conversion/new seeding		60.4	152.6	213.0	
heavy use area (561) ¹⁾		0.3		0.3	
outlet stabilization/stream restoration (395)		1.8		1.8	
vegetated treatment area (635)			0.3	0.3	
VWTS		22.0		22.0	
waste storage facility ¹⁾			0.7	0.7	
waste facility closure (360)		3.4		3.4	
CRP		19.2	14.6	33.8	
water & sediment control basin (638)			73.0	73.0	
cover crops (340)*		1166.3	400.1	1566.4	
interseeded cover crops (340)*		178.1	61.9	240.0	
residue/tillage management, e.g. NO-TILL (329)*		1224.3	925.5	2149.8	
enhanced nutrient management plans (590)* ²⁾	300	8736.3		8736.3	630%

Note: highlighted cells updated since Report #9, data from Oct 2019-Mar 2020 added.

1) Heavy use area and waste storage facility were transposed in Report #8

2) first year ENMP acres impacted: 1891 acres

3) Technical assistance provided

*yearly impacted acres are added cumulatively. these numbers are higher than EAGL numbers, as many fields are REPEATEDLY cover cropped and residue and no-till managed

Table 2 Project Milestones

Table #3: GLRI CONTRACTED ACRES - Semi-Annual Reporting Period #10

NEW Water (GBMSD) Silver Creek GLRI # 00E01450
October 2019 to March 2020

Field UID #	CC Acres Implement Fall 2020	RT Acres Implement Spring 2021	CSA
201000506	24.71	24.71	SCNS1038
201000505	9.78	9.78	
201000517	4.25	4.25	
201000507	38.10	38.10	
201000473	27.80	27.80	
201000563	8.00	8.00	SCNS1039
201000626	2.53	2.53	
201000472	18.24	18.24	
201000478	12.48	12.48	
201000530	10.07	10.07	
201001004	18.43	18.43	SCNS1040
201001005	21.23	21.23	
201000622	28.24	28.24	
201000576	38.69	38.69	
201000577	36.83	36.83	
201000616	11.79	11.79	
201000554	12.72	12.72	SCNS1041
201000556	16.76	16.76	
201000557	13.18	13.18	
201000618	3.32	3.32	
201000551	16.74	16.74	
201000552	15.78	15.78	
201000553	17.77	17.77	
201000534	3.08	3.08	SCNS1042
201000535	12.74	12.74	
201000573	26.29	26.29	SCNS1043
201000574	63.19	63.19	
201000568	84.60	84.60	
201000499	29.66	29.66	SCNS1044
201000497	9.50	9.50	
201000498	9.09	9.09	
201000561	10.51	10.51	
TOTALS:	656.10	656.10	7 CSAs
RT: residue/tillage management CSA: cost share agreement UID: unique identification			

Table 3 Contracted Acres during Reporting Period

B. Partner and Committee Involvement

Most partners are very active members on all committees described in the work plan. While some committee meetings are highly planned and orchestrated such as the Landowner/Grower and Stakeholder annual meetings, oftentimes committee meetings are impromptu conference calls or “in-the-field” gatherings in response to time critical events or needed decisions. Most committee members are now proceeding with the transition from the Silver Creek pilot project to a full scale AM program in the ACDC watersheds.

NEW Water is continuing to work on renewing its Wisconsin Pollution Elimination Discharge System (WPDES) permit. NEW Water’s current WPDES permit expired in June 2019 and is anticipated to be renewed in conjunction with approval of the Alternative Compliance and Adaptive Management Plans.

The **Modeling Committee** (JACOBS, University of Wisconsin Green Bay [UWGB], and NEW Water) did not formally meet during this reporting period. NEW Water has worked casually with both JACOBS and Outagamie staff to evaluate modelling strategies used in Silver Creek and how they may be used in the AM program. The **Monitoring Committee** (UWGB, U.S. Geological Survey [USGS], NEW Water, and JACOBS) met on January 14, 2020 to coordinate monitoring both in Silver Creek and ACDC. The **Outreach Committee** continues to meet as needed to begin full scale AM efforts. The **Wetlands Committee** (NEW Water, US Fish Wildlife Service, Ducks Unlimited, Natural Conservancy, and NRCS) did not formally meet during this reporting period but continues to verify the function of the constructed wetlands with committee members and addressing any issues as needed.

The **Implementation Planning Committee** developed the overall “full-extent” and direction of the project during the early years of the project. This committee is now known as the Stakeholder Group and met annually in December of every year.

Final Stakeholder Meeting

The final Silver Creek stakeholder meeting was held on December 11, 2019 and was attended by over 30 participants. Participants included staffs from Oneida Nation, The Nature Conservancy, Fox Wolf Watershed Alliance, University of Wisconsin Green Bay, UW-Extension, Fund for Lake Michigan, Alliance for the Great Lakes, Outagamie County, Brown County, US Fish & Wildlife Service, Tilth Agronomy, NEW Water, and Jacobs Consulting. All the presentation materials can be viewed on NEW Water’s Silver Creek website at <http://newwater.us/media/209492/2019-Final-Silver-Creek-Stakeholder-Meeting-Lowres.pdf>

C. Landowner Contacts and Communication

One-on-one grower and landowner contacts continue routinely with conservation planners, agronomists and county staff. As in previous years select fields were re-walked to confirm conservation and nutrient management opportunities. Implemented operational and structural practices were verified and monitored for performance. C&ENMPs were updated for 1,645 agricultural acres in fall 2020. Several of the growers and landowners in Silver Creek also have fields and operations in the ACDC watersheds and discussions are starting to transition to the AM Program.

The fifth annual *Grower and Landowner Appreciation Luncheon* was held December 3, 2019. The goals of the Luncheon included:

1. Silver Creek 2019 Review
2. Successes, challenges, adaptive options
3. Receive feedback on the project
4. The good, the bad, the interesting
5. Share water quality monitoring results
6. ACDC future plans
7. Continued collaborations
8. Open discussion about successes and challenges of the project

D. Water Quality Monitoring and Soil Sampling

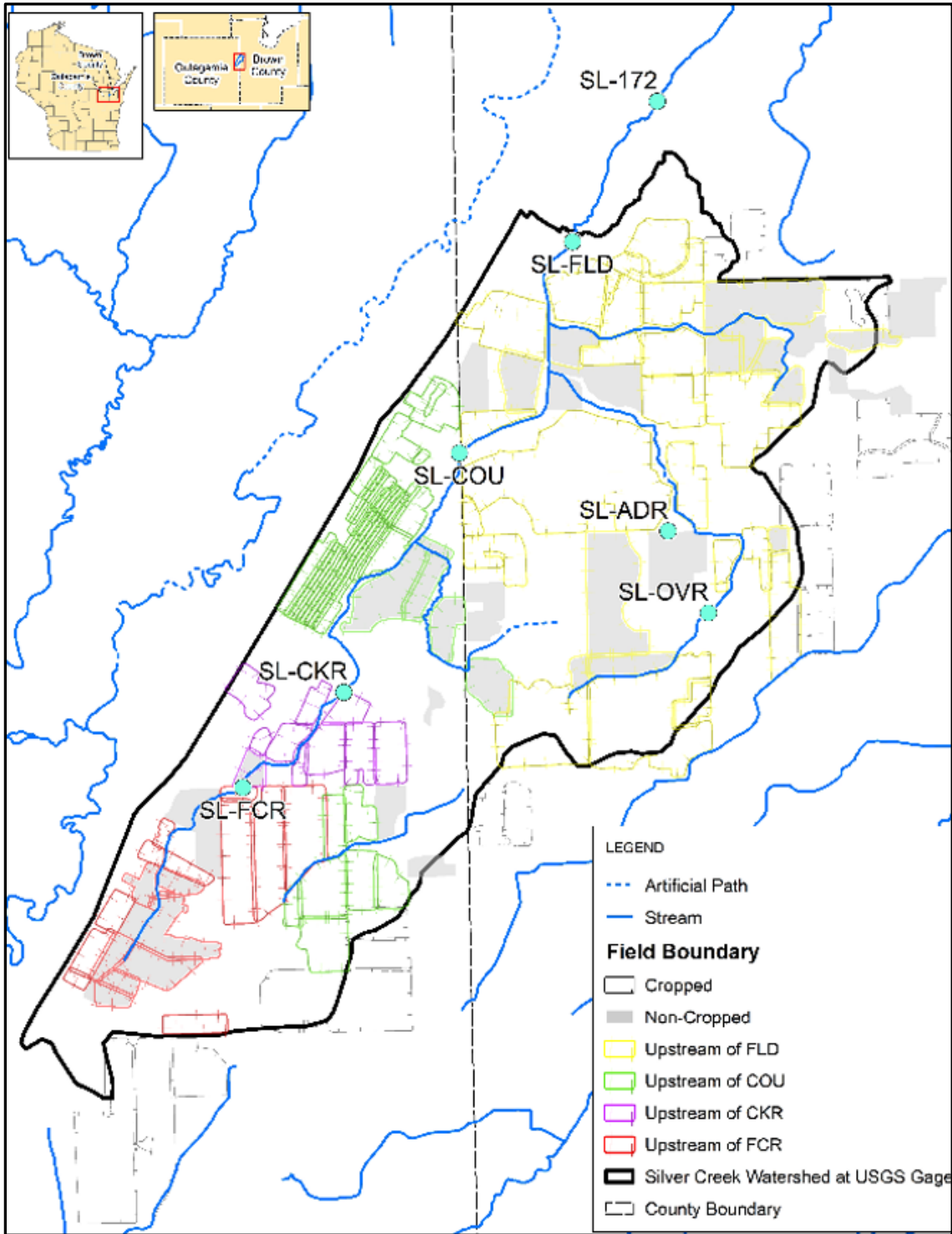


Figure 1 Water quality sampling locations along Silver Creek

Water Quality Monitoring

With 48.63 inches of precipitation, 2019 was the wettest year on record, breaking the previous record set in 2018 (39.21 inches). The long term average of annual rainfall in Green Bay is 30.1 inches. With heavy rains and prolonged saturated soil, it was difficult to see how well implemented BMPs actually worked in regard to water quality improvements. Due to the increased rainfall, 149 event samples were analyzed at Florist Drive (SL-EVT) in 2019, considerably more than any other year.

During this reporting period, 23 grab samples were collected by NEW Water staff. 7 grab samples and 32 event samples were collected by USGS and UWGB. A total of 62 samples, accounting for 222 analytes, were analyzed at NEW Water's certified laboratory according to analytical procedures outlined in the approved QAPP. Table 4 below lists the number of water quality samples collected at Silver Creek since the beginning of the project. Note the substantial increase in event samples collected in 2018 and 2019. This increase is directly attributed to the record setting amounts of precipitation that fell in the area these last two years. Figure 1 on Page 10 illustrates the sample locations along the northerly flowing Silver Creek. The SL-EVT samples are collected at the USGS gaging station near SL-FLD on Florist Drive. A photograph showing the gage station during an "event" can be viewed on the cover sheet of this report.

Table 4 Numbers of samples collected at main stem sites of Silver Creek

Silver Creek							
Site	2013-2014	2015	2016	2017	2018	2019	Total
SL-FCR	12	19	29	26	24	17	127
SL-CKR	19	25	29	26	24	20	143
SL-COU	21	25	29	26	26	24	151
SL-EVT	109	56	84	75	107	149	580
SL-FLD grab	44	47	47	48	46	45	277
SL-172	20	25	29	26	26	24	150

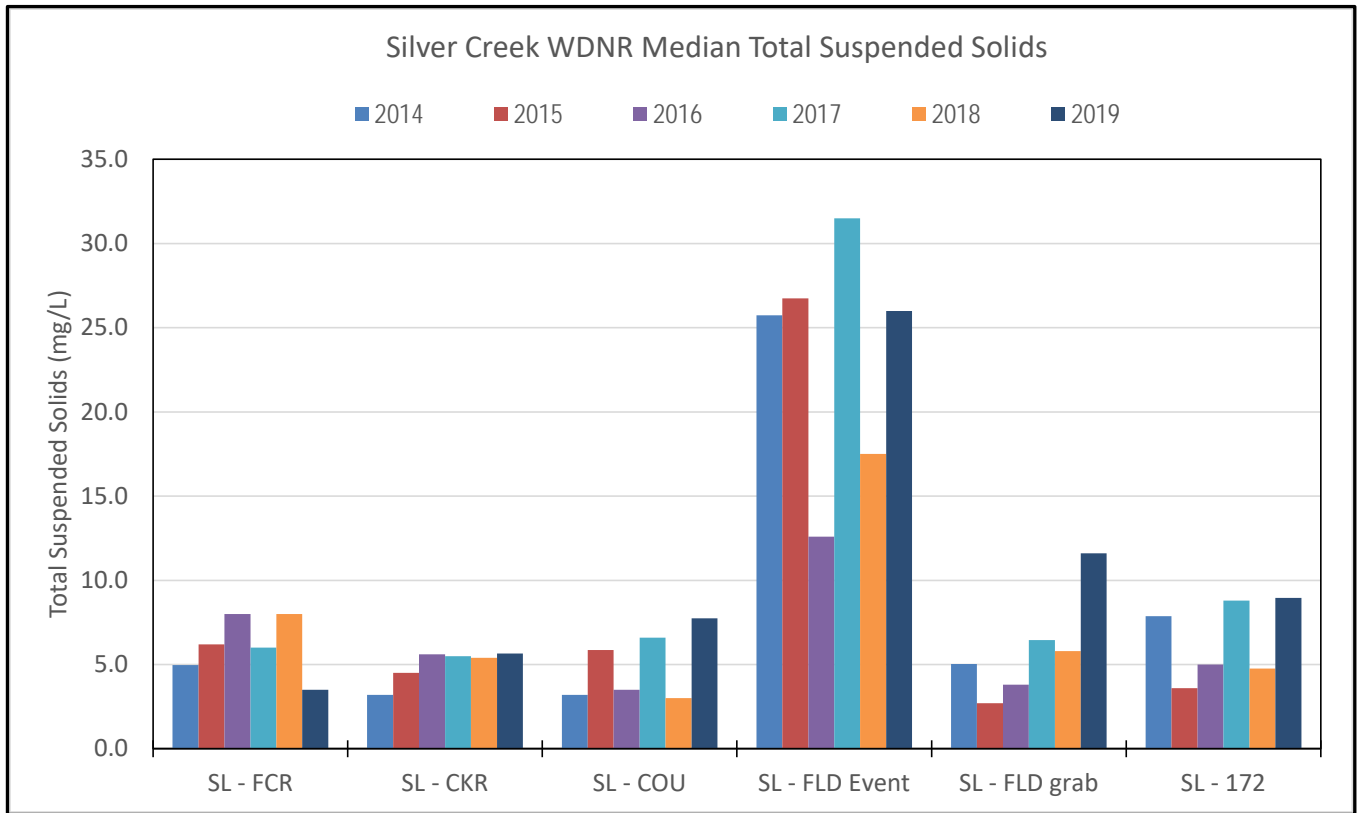


Figure 2 Graph of 2014-2019 TSS concentrations

Total Suspended Solids

TSS concentrations in Silver Creek have varied throughout the watershed over the course of five years of water quality monitoring as seen in a downstream trend on the graph in Figure 3. TSS concentrations have increased recently at each water quality monitoring site, as a result of historically high rainfall precipitation in 2018 and 2019. However, in-stream TSS concentrations are all below the TSS water quality recommendation for the mouth of the Fox River set forth by the TMDL (18 mg/L), with the exception of event samples at SL-FLD.

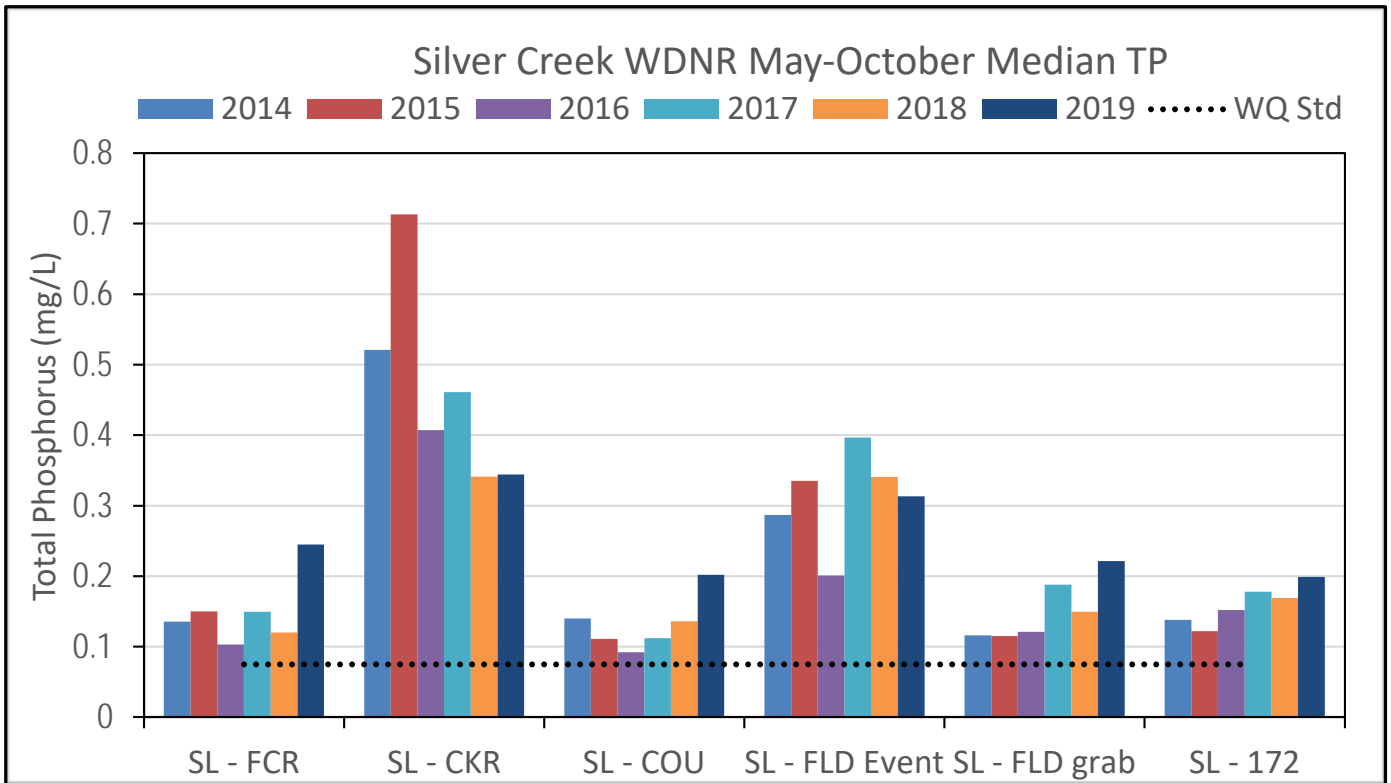


Figure 3 Graph of 2014-2019 TP concentrations

Phosphorus

In-stream total phosphorus (TP) concentrations vary both over space and time, similar to TSS. Upstream reaches of the watershed, especially at the SL-CKR sample location, have historically had high in-stream TP values. However, even with historical rainfall in 2018 and 2019, TP concentrations further upstream in the watershed are declining or starting to at least level off. The same can be said about event samples at SL-FLD, as TP concentrations are actually declining even with increased rainfall and associated flows. These results upstream and during event samples are promising in that in-stream water quality is starting to positively respond to various BMP installations. While these results are promising, it is important to understand the lag time associated in water quality response to BMP implementation often exceeds 10+ years, so more time is needed to fully understand this relationship.

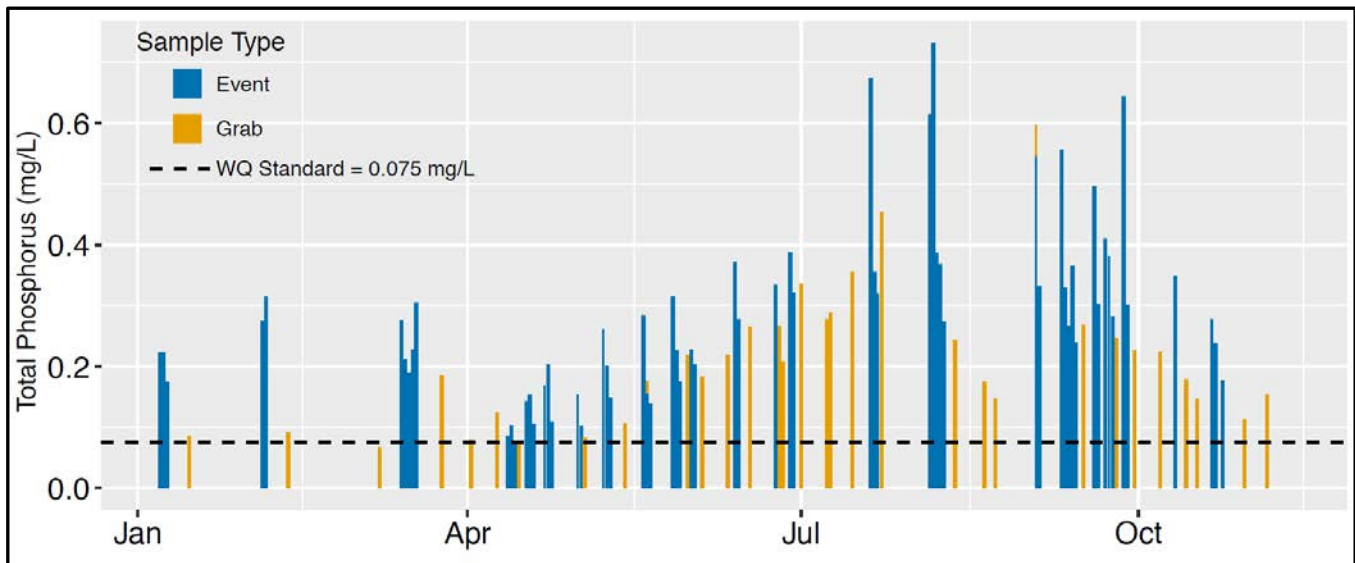


Figure 4 Grab sample TP vs Event sample TP

Comparison of grab samples versus event samples

As stated earlier, 2018 was once the wettest year on record. However, 2019 exceeded 2018 rainfall values by over 9 inches and was over 18 inches above the long term average, and thus 2019 is now considered the wettest year on record. Increased rainfall obviously has an effect on TP concentration data at SL-FLD. In-stream TP concentrations at SL-FLD are slightly elevated above the water quality standard set forth by the TMDL (0.075 mg/L) for fixed interval grab samples, but are further elevated above the water quality standard during increased flow events. However, concentration data doesn't always tell the entire water quality story, this is why annual sediment and nutrient loads are calculated. Loads are an expression of both concentration data and flow, so loads somewhat normalize data to flow, and allows concentration data to be analyzed over changing flow regimes in response to increased precipitation over the years. Figure 5 compares event versus grab sample TP concentrations during the wettest year on record. It clearly illustrates that event TP concentrations are elevated above grab TP concentrations.

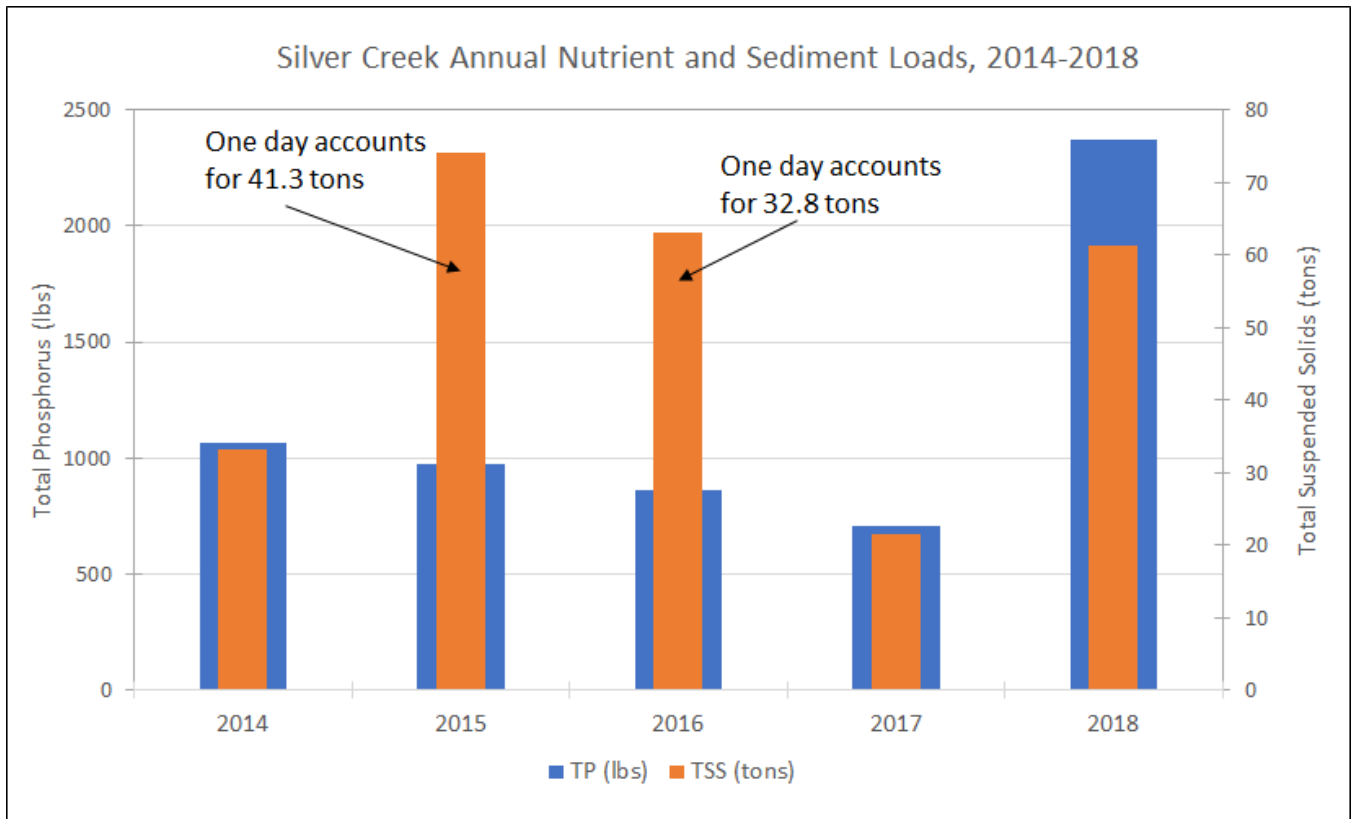


Figure 5 Annual loads at Silver Creek

The impact of extreme daily loads

While concentration data varies for TSS and TP throughout Silver Creek, TSS and TP loads have shown a historical decrease from 2014-2017, that is, until increased precipitation started in 2018. Annual TSS loads for 2015 and 2016 don't explicitly show this trend, but it is worth noting that almost, if not more than, half of the annual TSS load came from a single day in each respective year. If that single day was removed, TSS loads would be historically decreasing until 2018. These data show how a few "events" throughout the year (usually less than 10) produce the majority of the sediment or nutrient load. Historic reductions in both TSS and TP loads appear promising in the Silver Creek watershed. However, 2018 shows increased loads due to heavy rainfall events, showing the importance of building resiliency within the watershed landscape to start dealing with these increased rainfall totals and what may be considered the new normal pattern. Figure 6 shows how single day events can dramatically increase measured TSS loads.

Water Quality Summary

Given the record amounts of precipitation, 2019 was obviously not a great year to monitor for water quality. There is an increasing need to think outside the box to build resilient land to deal with increased precipitation that will come from a changing climate. For example there should be greater efforts to establish some form of annual cover on fields in the watershed to help reduce large loading(s) from small number of events. Overall it can be stated that while TP concentrations are elevated above water quality standards in Silver Creek, there are measurable TP and TSS load reductions from 2014 to 2017. The results are promising, but more time is needed to fully show in-stream water quality results due to lag time (10+ years).

Soil Sampling

Soil sampling was completed on agricultural fields in the Silver Creek watershed at the beginning of the Pilot Project in 2014 and repeated at the end of the 2019. Composite samples were collected on a 2.5-acre grid using locations marked on a GIS mapping application. As per the approved QAPP, samples were tested by Ag Source Labs in Bonduel, WI for soil nutrient parameters including pH, plant-available phosphorus (P), potassium (K), organic matter (OM), calcium (Ca), magnesium (Mg), and cation exchange capacity (CEC).

There were 88 agricultural fields sampled in 2014 and 74 agricultural fields sampled in 2019. There were less fields in 2019 because some growers did not provide permission to sample their fields again and some fields were converted to non-agricultural use, such as housing or commercial building development. Over the five years of the Project, hundreds of operational and structural BMPs were implemented and installed to reduce TP and TSS runoff, to reduce application of nutrients, and to direct application of nutrients to locations where nutrient levels are below agronomic targets. The net result of these practices was anticipated to reduce the soil phosphorus values.

Comparing soil phosphorus test values between individual sampling locations between 2014 and 2019 shows an overall lowering of soil phosphorus on most fields. Figure 7 on page 17 illustrates the difference in soil phosphorus test results between individual sampling points from 2014 and 2019 sampling, where green and yellow areas of the map had a net decrease or no change in soil phosphorus and orange and red areas of the map had a net increase in phosphorus. Figure 8 on page 18 shows that field average soil phosphorus also decreased on most fields by an average of approximately 6 parts per million. The comparison of the soil test data demonstrates an overall improvement in soil phosphorus concentrations, which will result in a decreased nutrient loss from agricultural fields. The soil data is still being analyzed to further understand cause-effect relationships between changes in agricultural field and the resulting soil test values and will be further discussed in the Final Report.

E. GIS

During this reporting period, the GIS database was updated with new implementation and verification events, as well as photographs. It is also routinely checked for quality control and refinements are made as needed.

F. Installation of Conservation Measures

Seven operational cost share agreements (CSA) were contracted (see Table 3) this reporting period. These are the last operational CSAs to be GLRI funded in Silver Creek. In 2020, NEW Water is also hoping to sign a couple of CSAs to implement conservation cover BMPs. When GLRI funding ends for Silver Creek, NEW Water will continue its partnerships with landowners and growers towards achieving improved water quality in Silver Creek. Aerial seeding was implemented in 2019 due to extreme wet field conditions and the inability to access fields for interseeding or other late fall seeding. One remaining structural practice has been planned for some time and should be installed in the summer of 2020 if the construction site can be accessed with heavy equipment. Any existing BMPs needing repair work may also be considered for GLRI funding.

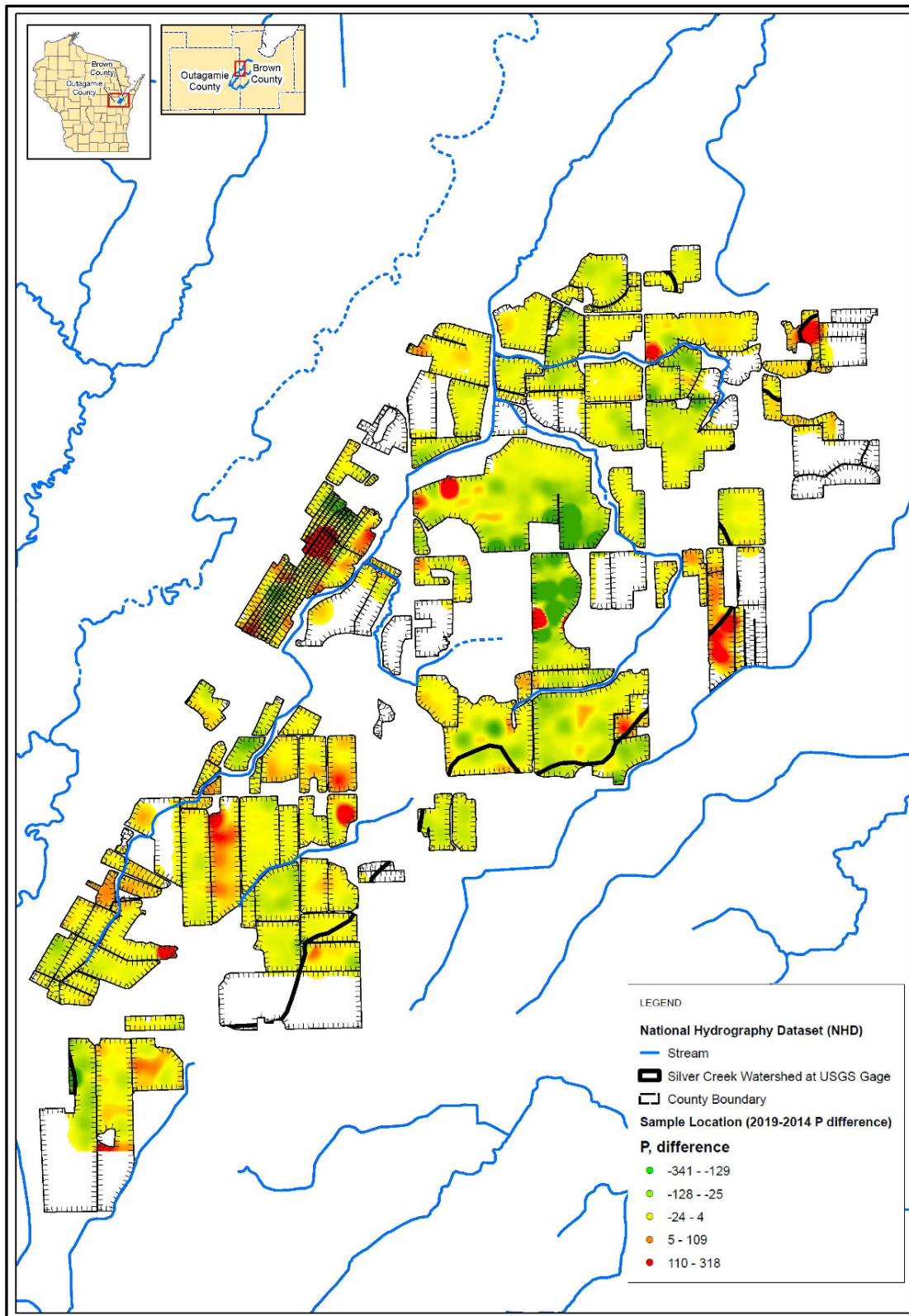


Figure 6 Net difference in soil phosphorus individual point data between 2014 and 2019

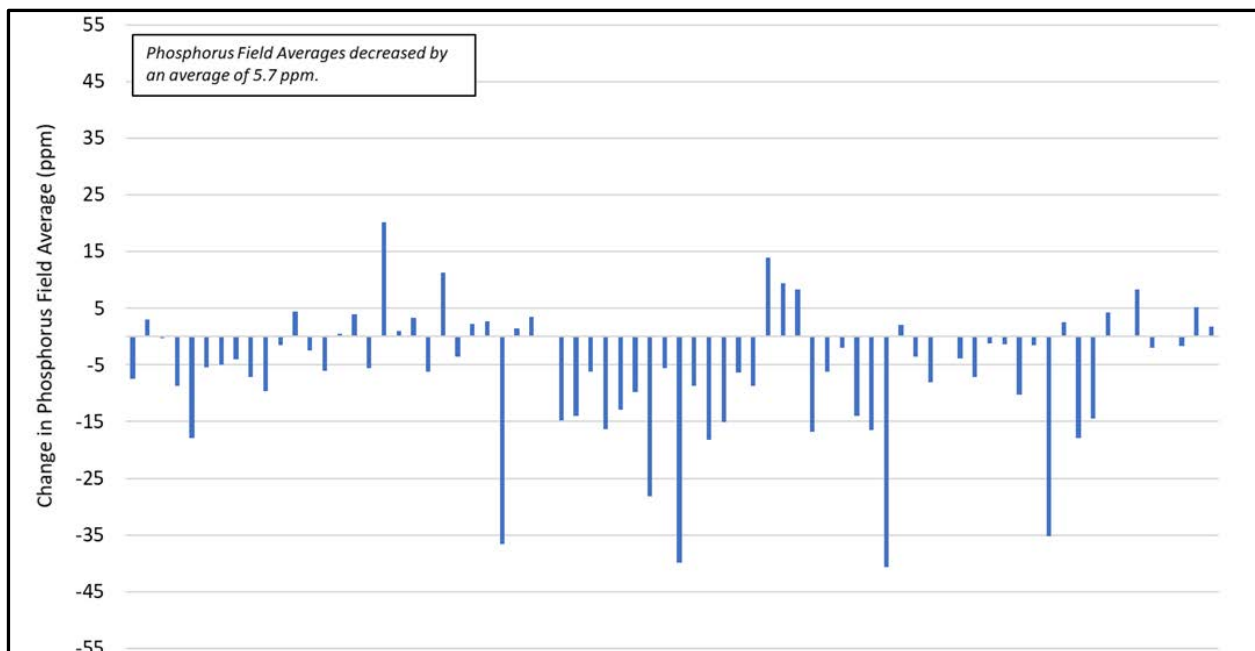


Figure 7 Change in soil phosphorus field average between 2014 and 2019

G. Biological Assessment

On December 5, 2019, for the sixth year of the project, Jim Snitgen of the Oneida Nation identified the aquatic organisms collected from Silver Creek on June 24, 2019. The data sheet shown on Figure 9 displays the taxonomy and number of

Oneida Nation Water Resources Program Aquatic Invertebrate Data Sheet				Oneida Nation Water Resources Program Aquatic Invertebrate Data Sheet (Continued)			
Date of sample collection: <u>6/24/19</u> Sample location: <u>SC @ Florist Dr.</u> Sample collected by: <u>JR Snitgen</u> Sieve mesh size: <u>500um</u> Collection method: <u>Qualitative</u> Date sorted: _____ Sorted by: <u>L.S.R.</u> Date identified: <u>12/05/19</u> Identified by: <u>JR Snitgen</u>				Date data entered: <u>12/19/19</u> Data entered by: <u>J.S.</u> Total taxa: <u>27</u> Total no. organisms: <u>369</u> HBI taxa: <u>24</u> HBI total no. organisms: <u>324</u> Seasonality adjusted HBI total no. organisms: <u>5.25</u> <u>EPT = 6</u>			
Taxon	No.	Taxon	No.	Taxon	No.	Taxon	No.
Diptera		Diptera - Other		Hemiptera		Oligochaeta	
Chironomidae		<i>Ambrysus</i> sp.	1				
		<i>Simulium</i> sp. (no data)	2	Amphipoda			
<i>Brittonia dentata</i>	1	Trichoptera		<i>Gammarus pseudocaneus</i>	199		
<i>Canthocarpa</i> sp.	9	(V) <i>Hydropsyche albida</i>	6	Isopoda		Others	
<i>Eukiefferiella</i> sp.	2	(V) <i>Hydropsyche bipuncta</i>	3	<i>Cassidulus</i> sp.	52		
<i>Orthocentrus</i> sp.	3	(V) <i>Hydropsyche chlorina</i>	1	Pelecypoda		<i>Orcostoma rotunda</i>	1
<i>Orthocentrus</i> sp.	1	<i>Hydropsyche</i> sp.	4				
<i>Micropsectus quadricornis</i> sp.	4	Ephemeroptera		Gastropoda			
<i>Polyperla quinquefasciata</i> sp.	9	<i>Psectrocladius</i>	1	<i>Hydrobia</i> sp.	1		
<i>Polyperla</i> sp.	10	<i>Maccaffertium vicarium</i>	2	<i>Physidae</i> sp.	27		
<i>Polyperla trilineata</i>	1						
<i>Psectrocladius</i> sp.	2						
<i>Psectrocladius</i> sp.	1						
<i>Psectrocladius</i> sp.	15						
<i>Micropsectus</i> sp.	1	Plecoptera					
<i>Thraumatodes</i> sp.	1	<i>Plecoptera</i>	3				
		Coleoptera					
		<i>Dubocoptera</i> sp.	3				
		<i>Oxytelus</i> sp.	7				
		Odonata					

Figure 8 Aquatic invertebrate data sheet December 5, 2019

organisms identified. For the first time ever, new caddisflies and mayflies were found at this sampling location. The HBI value of 5.25 gives the stream a “Good” water quality rating and is the best yet since counts began in 2014. In addition, the EPT score of 6 is also the highest score ever recorded and shows improvements in water quality are occurring and thus the biological community is also recovering in response to BMP installations.

H. Managed Grazing – Paired Field Monitoring (UWGB applied research)

The 97-acre grazing fields are now being operated by the Tsyunhenkwa Farm, one of the agricultural businesses of the Oneida Nation of Wisconsin. The Oneidas began grazing beef cattle in the treatment study catchment in late summer 2019. UWGB researchers have stated that the fencing and grazing management has improved compared to the previous operator.

Record-setting rain in 2019 delayed planting in northeast Wisconsin, which greatly delayed and even prevented tillage and planting of crops in the grazing study area. Many farmers in the area decided to not plant their crops (Prevent Plant government program). As a result of the transition to a new operator and the extremely wet field conditions, the Control plot was not tilled or planted in 2019, and a fair amount of grasses are now growing in the fallow soil (instead of the planned corn silage). Because the wet soil conditions continued through the fall and winter of 2019, the planned conventional fall tillage operation was not possible in the Control catchment. This tillage would have reduced or removed the weeds that took over during the farm operation transition period.

Conventional tillage will be conducted in spring 2020 in the Control plot, and corn or a similar crop will then be planted to closely parallel the corn silage that was grown under the previous farm operation. Unfortunately, the transition to a new farm manager/operator, deep rutting of the field in late fall 2018, and an extreme record setting precipitation in 2019 combined to prevented the collection of meaningful water samples from the paired plots to support the treatment phase of the study. However, the spring 2020 weather is cooperating so far, and expected cooperation with the enthusiastic new farm operator (Oneida Nation, the owner throughout the study period) should help bring the sampling program back on track so that the project can proceed with the treatment phase of the study once the soil has been tilled.

I. Vegetated Water Treatment Systems (VWTS) Oneida Nation/UWGB (Sub-Awards)

These two Subawards have been completed and closed out as of March 2020. The VWTS project was a joint venture between the Oneida Nation and the University of Wisconsin Green Bay. The Oneidas are the land owner, construction manager, and harvesters of the “biomass” and UWGB is conducting research activities described below.

Mike Troge of the Oneida Nation provided the following update on the Oneida activities of the VWTS project: *Overall the project performed as intended since construction in 2017. Ground cover is established, the basins are intercepting field runoff, and sediment from Field ONF42 is captured before the water is slowly released to Silver Creek. Site visits last spring found that the inlet pipe for one of the basins had been pushed up from the previous winter's ice. It turned out to be a management error; stoplogs in the control structure were raised allowing water to exit the basin. The water level was low and below the inlet. The water froze and pushed the pipe up and out of its designed elevation. In summer 2019 the raised pipe was removed and replaced to design elevation. Anchors were put in place to provide greater rigidity. Stop logs are in place to raise water elevations above the pipe.*

UWGB Researchers continue data analyses on plant (grasses and legumes) uptake of soil phosphorus from various plots. Field work for Approaches 1 and 2 of **Goal #1** is complete and data analyses and final quality assurance checks are ongoing.

Goal #2 research monitors the long-term functioning and effectiveness of a newly established Vegetated Water Treatment Systems (VWTS) within the Silver Creek Watershed. Researchers have evaluated soil properties, harvestable biomass, and biomass P concentrations. In late September 2019, composite soil samples were collected from the established transects. Soil samples were transported to UW-Green Bay on the same day, frozen at -18°C until thawed at room temperature for processing.

Two remaining transects were sampled in October 2019 and laboratory processing and analyses for bulk density, Bray P and P content was completed. A final Report is Due June 2020.

UWGB-VWTS Sub-award policy requirements	
<i>Has UWGB submitted their invoices in a timely manner?</i>	Yes, invoices are submitted 1/4ly
<i>Is UWGB payment history consistent with progress to date?</i>	Yes, as per work plan
<i>Date of most recent UWGB invoice?</i>	Jan 7, 2020
<i>Is UWGB providing VWTS reports/updates?</i>	Yes, every six months
<i>Is there sufficient progress?</i>	Yes
<i>Is UWGB experiencing any issues completing activities identified in the VWTS work plan?</i>	Not at this time
<i>Summarize any management actions taken by the grantee to correct any UWGB-VWTS issues</i>	N/A
<i>At the time of this report, were any sub-awards made that were not included in the work plan?</i>	No

Oneida Nation-VWTS Sub-award policy requirements	
<i>Has Oneida Nation submitted their invoices in a timely manner?</i>	Yes, an invoice is submitted after the work is performed
<i>Is Oneida Nation payment history consistent with progress to date?</i>	Yes, as per work plan
<i>Date of most recent Oneida Nation invoice?</i>	January 2, 2020
<i>Is the Oneida Nation providing VWTS reports/updates?</i>	Yes, as per work plan
<i>Is there sufficient progress?</i>	Yes
<i>Is Oneida experiencing any issues completing activities identified in the VWTS work plan?</i>	Somewhat, due to lack of staff
<i>Summarize any management actions taken by the grantee to correct any Oneida VWTS issues</i>	N/A
<i>At the time of this report, were any sub-awards made that were not included in the work plan?</i>	No

Brown County Subaward

This Subaward has been completed and is closed out as of March 2020.

Brown County Sub-award policy requirements	
<i>Has Brown County submitted their invoices in a timely manner?</i>	Yes, on a yearly basis
<i>Is Brown County payment history consistent with progress to date?</i>	Yes, as per work plan
<i>Date of most recent Brown County invoice?</i>	January 8, 2020
<i>Is Brown County providing reports/updates?</i>	Yes
<i>Is there sufficient progress?</i>	Yes
<i>Is Brown County experiencing any issues completing activities identified in the work plan?</i>	No
<i>Summarize any management actions taken by the grantee to correct any Brown County issues</i>	None
<i>At the time of this report, were any sub-awards made that were not included in the work plan?</i>	No

J. Wetlands

The Oneida Nation has now taken over operation and maintenance of the treatment wetlands. Anthony Kuchma, Wetland Project Manager provides the following update: *All of the wetland projects have been mowed this season. The vegetation is looking as expected, with some of planted native species doing well. It will be another year or two before it is known how successful the plantings were. One exception is the southern basin at site 7. That area looked really good compared to the other seeded areas. Water levels will remain the same, that is, the water control structures will not be raised while vegetation becomes established. Given the concerns over nuisance levels of waterfowl, the presence of cattails is a positive attribute. Unfortunately a regrowth of phragmites was noted in the vicinity of the central basin at site 7. It was mowed prior to going to seed and a follow up herbicide treatment is scheduled. Gary Van Vreede of the US Fish and Wildlife Service is recommending the inlet pipes be secured with earth anchors. Damage was noted at another project location caused by frost heaving. The inspections per Wetland Permit requirements are being conducted by APHIS (The Animal and Plant Health Inspection Service of the USDA). During inspections made by the Oneida Nation staff, no evidence was observed of waterfowl nesting activity or numbers of waterfowl that would be considered a nuisance.*

<i>Ducks Unlimited (DU) "Sub-recipient" policy requirements</i>	
<i>Has DU submitted their invoices in a timely manner?</i>	DU does not submit invoices to NEW Water
<i>Is DU payment history consistent with progress to date?</i>	Yes
<i>Date of most recent DU invoice?</i>	N/A
<i>Is DU providing reports/updates?</i>	Yes
<i>Is there sufficient progress?</i>	Yes
<i>Is DU experiencing any issues completing activities identified in the work plan?</i>	No
<i>Summarize any management actions taken by the grantee to correct any DU issues</i>	None
<i>At the time of this report, were any sub-awards made that were not included in the work plan?</i>	No

K. Education/Outreach

<http://newwater.us/projects/silver-creek-project/>



NEW Water continues to use a wide variety of outreach tools including PowerPoint presentations, a website, factsheets, Twitter feeds, Facebook posts and newspaper and magazine articles to talk about the Silver Creek Pilot Project. Table 5 contains a list of venues where project updates were presented during this reporting period. Select other outreach and educational efforts are described on the following pages. Please Note: NEW Water's website is currently undergoing a Department-wide revision and face-lift; it is expected to be fully up-to-date by June 2020.

Green Bay Press Gazette/Journal Sentinel Article Lee Berquist, Dec 13, 2019

<https://www.greenbaypressgazette.com/story/news/special-reports/dairy-crisis/2019/12/13/megafarms-and-pollution-future-of-dairy-is-tested-in-brown-county/4401828002/>

This story is part of a yearlong effort by the Milwaukee Journal Sentinel and USA TODAY NETWORK-Wisconsin to examine the plight of the state's dairy industry. Journalists from newsrooms across the state are exploring how sagging milk prices, economic factors and global forces are driving hundreds of farmers out of one of the state's most important industries.

Press Gazette. HOME NEWS BUSINESS JOBS USA TO

"In the Green Bay system, I am more encouraged than I have ever been," Klump said. "I think the ag community really understands the nature of the problem."

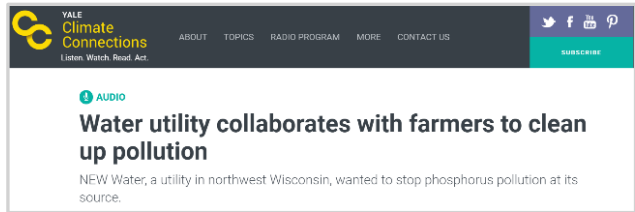
The cost estimates for the cleanup are based on a five-year pilot project of the Green Bay Metropolitan Sewerage District on 15-mile Silver Creek, which flows through another creek to Green Bay.

During the program, agronomists and farmers experimented with an array of strategies:

Planting cover crops to prevent erosion, constructing wetlands to retain water, creating strips of grass along waterways to intercept pollutants and plowing fields in ways where there is less soil disturbance.

The result: Less phosphorus is turning up in Silver Creek.

Yale Climate Connection, Samantha Harrington, Oct 2, 2019
<https://www.yaleclimateconnections.org/2019/10/water-utility-collaborates-with-farmers-to-clean-up-pollution/>



The [NEW Water] utility worked with crop and soil experts and farmers to minimize runoff. They experimented with planting cover crops, tilling the soil less, and planting grass buffers alongside fields. Erin Houghton says the goal is “keeping those nutrients and soil where they need to be, and on those fields, and really working for that farmer.”

Date 2019	Organization/venue
Oct 21	Lee Bergquist – Milwaukee Journal Sentinel interview (see clip above)
Oct 30	Adaptive Management Utilities meeting
Nov 1	Water Summit
Nov 14	Virtual presentation at Omro High School
Nov 22	“Actual 2019 C&ENMP” meeting with agronomists, Jacobs, Counties
Dec 3	Silver Creek Grower Landowner Luncheon
Dec 11	Silver Creek Stakeholder Meeting
Dec 20	Milk Source Dairy Meeting
Dec 2	Presentation to Northeast WI Technical College
Date 2020	
Jan 6	Kevin Boneski – Times Villager Newspaper
Jan 16	Austin Straubel Airport Staff
Feb 10	Oneida Nation Leadership meeting with NEW Water Leadership
Feb 12	Verhassalt Farms Meeting
Feb 12	R&E Farms meeting
Feb 25	Neighborhood Dairy meeting
Feb 26	ACDC Kick-off meeting

Table 5 Silver Creek outreach efforts

3. GLRI Work Projected for Next Reporting Period: April 2020 to October 2020

BMP activities described herein and the updated July 2019 Work Plan will continue as planned assuming the weather cooperates. The writing of the Draft GLRI Silver Creek Final Report will also begin.

Managed Grazing

Conventional tillage will be conducted this spring 2020 in the control plot, and corn or a similar crop will then be planted to closely parallel the corn silage that was grown under the previous farm operation. The spring 2020 weather is cooperating so far, and expected cooperation with the enthusiastic new farm operator (Oneida Nation, the owner throughout the study period) should help bring the sampling program back on track.

4. Object Class Category Changes

none

5. Problems Encountered

none

6. Spending

		October 2019 to March 2020	
Object Class Category	Activity	Semi #10	#10 accumulative spent to date
Personnel	Grant Specialist	\$10,556	\$100,953
Fringe Benefits	Grant Specialist	\$1,056	
Contractual	JACOBS	\$21,130	\$748,823
	AEG	\$0	\$7,000
	Grazing Specialist	\$973	\$8,322
Supplies	Drone	\$0	\$2,341
Other	Cost Sharing/BMPs/signage	\$22,555	\$200,216
	CSAs Oneida	\$0	\$11,383
	Grazing infrastructure	\$0	\$91,114
	Grazing UWGB	\$6,365	\$150,683
	UWGB (Sub) VWTS	\$1,543	\$72,463
	Oneida VWTS	\$208	\$58,062
	Brown County (sub)	\$2,100	\$16,800
	Wetlands	\$0	\$31,166
	Misc	\$0	\$1,163
	TOTAL		\$66,486

A. Percent of Budgeted Amount Spent-to-Date (~March 2020) for the 6-year Project

~89 % (\$1,500,489/\$1,686,669)

B. NEW Water & Other In-kind Hours/Dollars this Reporting Period 10/01/2019–3/31/2020

NEW Water	Hours	Match \$
Watershed Programs Manager	98	\$3,724
Director of Environmental Programs	104	\$4,992
Water Resources Specialist	97	\$2,716
Lab Analyst	35	\$735
Communication & Education	120	\$3,360
Fringe (60%)		\$9,316
Total New Water Hours	454	
Total NEW Water Match \$		\$24,843
Outagamie County Technician (no federal funds)		\$3,519
Oneida Nation In-kind \$		0

C. Recipient and Other In-Kind Match to-Date (February 2015 – March 2020):

	Work Plan Total In-Kind match	\$ In-Kind to-date	% In-Kind to-date
Recipient: NEW Water	\$616,881	\$629,233	102%
Other:			
Oneida Nation \$103,773	\$300,000	\$294,192	98%
Ducks Unlimited \$ 93,535			
Outagamie County \$ 93,365			
Total	916,818	\$923,425	100%

D. Funding Rate (per drawdowns)

Percentage of Grant Spent	% Federal	% Non Federal	Footnotes: Draw Down# \$/* * = \$1,686,669 total award	Footnotes: NEW Water (Match+Fringe)+Oneida/DU/Outagamie in-kind/** ** = \$916,881 (non-federal total)
1. Mar 2015 – Sep 2015	12.36 ¹⁾	11.87 ²⁾	1) DD1 \$208,467/*	2) \$87,619+\$21,181=\$108,800/** Correction after 7/2016 Assistance Amendment
2. Oct 2015 – Mar 2016	1.6 ³⁾	10.93 ⁴⁾	3) DD2&3 \$27,217/*	4) \$78,269+\$21,904=\$100,173/** Correction after 7/2016 Assistance Amendment
3. Apr 2016 – Sept 2016	12.18 ⁵⁾	11.22 ⁶⁾	5) DD4&5 \$205,450/*	6) \$78,534+\$24,370/**
4. Oct 2016 – Mar 2017	5.9 ⁷⁾	8.2 ⁸⁾	7) DD6&7 \$100,198/*	8) \$65,534 + \$10,039/**
5. Apr 2017 – Sep 2017	8.9 ⁹⁾	19.5 ¹⁰⁾	9) DD8 \$150,247/*	10) \$77,472+\$8,446+\$93,535(DU)/**
6. Oct 2017 – Mar 2018	17.6 ¹¹⁾	8.3 ¹²⁾	11) DD9&10: \$297,239/*	12) \$68,655+\$7,588/**
7. Apr 2018 – Sep 2018	13.5 ¹³⁾	10.8 ¹⁴⁾	13) DD11+DD12: \$227,603/*	14) \$66,398+\$30,556 + \$2,240/**
8. Oct 2018 – Mar 2019	5.6 ¹⁵⁾	8.5 ¹⁶⁾	15) DD13: \$94,540/*	16) \$45,902+\$30,622+\$1,116/**
9. Apr 2019 – Sep 2019	5.3 ¹⁷⁾	8.2 ¹⁸⁾	17) DD14: \$89,327/*	18) \$36,007+\$32,183+\$6,899/**
10. Oct 2019 – Mar 2020	5.7 ⁽¹⁹⁾	3.1 ⁽²⁰⁾	19) DD15: 95,778/*	20) \$24,843 + \$3,519/**
Total to Date	88.64%	100.62%		

7. Changes

Is there a change in principal investigator? No Erin Houghton continues as Project Manager

Will the project take longer than the approved project period?
No, the approved project period has been extended to March 2021.

8. Drawdowns

Semi #	Interval	Drawdown Request #	Date	Amount
1	Mar 2015-Sep 2015	1	10/13/2015	\$ 208,467
2	Oct 2015-Mar 2016	2	05/17/2016	\$ 21,250
2	Oct 2015-Mar 2016	3	06/27/2016	\$ 5,967
3	Apr 2016-Sep 2016	4	07/01/2016	\$ 56,484
3	Apr 2016-Sep 2016	5	10/07/2016	\$ 148,966
4	Oct 2016-Mar 2017	6	12/9/2016	\$ 11,694
4	Oct 2016-Mar 2017	7	3/30/2017	\$ 88,504
5	Apr 2017-Sep 2017	8	6/28/2017	\$ 150,247
6	Oct 2017-Mar 2018	9	10/12/2017	\$ 148,585
6	Oct 2017-Mar 2018	10	1/18/2018	\$ 148,654
7	Apr 2018- Sep 2018	11	5/9/2018	\$ 71,591
7	Apr 2018- Sep 2018	12	10/31/2018	\$ 156,012
8	Oct 2018 - Mar 2019	13	4/22/2019	\$ 94,540
9	Apr 2019 - Sep 2019	14	10/2/2019	\$ 89,327
10	Oct 2019 - Mar 2020	15	1/22/2020	\$ 95,778
Total Drawdowns to Date (Mar 2020)				\$1,496,066