Lower Fox River Volunteer Monitoring Program

Project Summary

FINAL – August 2021

Lower Fox River Volunteer Monitoring Program

Lower Fox River Basin TMDL

2020 Project Summary

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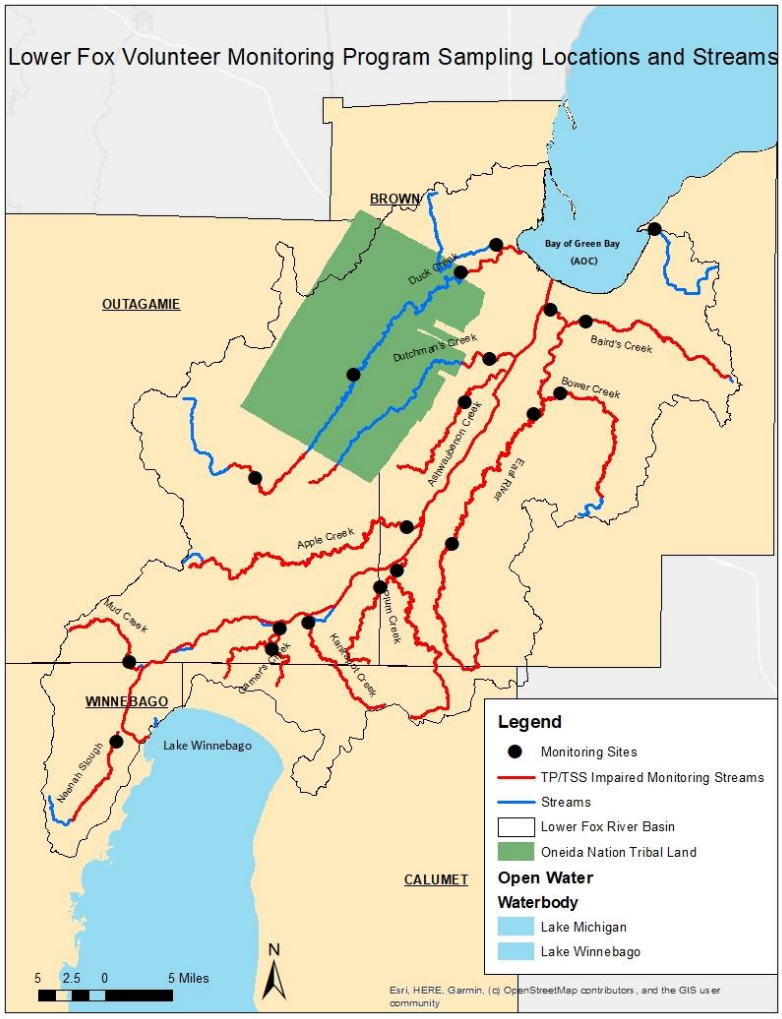
Project Location

The Lower Fox River Volunteer Monitoring Program [Program] is in support of the Lower Fox River Basin (LFRB) Total Maximum Daily Load (TMDL). Specifically, the Program monitors 20 sampling locations on 16 streams within the Lower Fox River Basin in Northeast Wisconsin. These tributaries and streams in the Basin contribute nutrients and sediment directly to the Fox River, Lower Green Bay, and Fox River Area of Concern (AOC). The LFRB is approximately 640 sq. miles and extends from the outlet of Lake Winnebago to Green Bay and includes portions of four counties (Outagamie, Brown, Winnebago, and Calumet) and Oneida Nation. (map below)

The Program relies on citizen volunteers to collect surface water samples from 20 sampling locations across 16 streams throughout the LFRB. The streams and monitoring locations are displayed in the map below and more detailed location information can be found in Appendix A.



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Project Background

The Lower Fox River TMDL was approved by the EPA in 2012. The goal of the TMDL is to improve water quality by reducing total phosphorus (TP) and total suspended solids (TSS) in the LFRB. The TMDL identifies and quantifies the sources and necessary phosphorus and sediment reductions to meet water quality goals. To facilitate TMDL implementation, smaller sub-basins were identified within the LFRB to help target high phosphorus and sediment loading watersheds. As TMDL implementation progresses, one objective is to evaluate long-term water quality trends within the entirety of the LFRB.

The Lower Fox Volunteer Monitoring Program began in 2015 to achieve some of the monitoring objectives resulting from the TMDL. The program started with 14 sampling locations across 13 tributary streams. Three new sites were added to the program in 2018 and an additional three new sites were added in 2020 to total 20 sampling sites across 16 streams. Some sampling sites were chosen because they represent the confluence of a tributary stream to the Lower Fox River and can therefore help represent the water quality of a TMDL sub-basin. Other sampling locations were chosen due to implementation activities beginning in the watershed or where high phosphorus and sediment loading is occurring.

Given the time commitment and spatial location of the sampling locations, the assistance of volunteers is vital to the success of the program. Volunteers serve the essential role of data collectors, as they collect monthly (May – October) surface water samples at 20 sampling locations across the LFRB. Volunteers are trained on the proper sampling protocol before the sampling season by Wisconsin DNR staff to ensure reliable and accurate results are achieved each month.

Problem Statement

The Lower Green Bay and waters within the LFRB are impaired due to excessive phosphorus and sediment loading. TMDL implementation focuses on restoring waters impaired by excessive sediment and/or high phosphorus concentrations. Phosphorus and sediment cause numerous impairments to waterways, including low dissolved oxygen concentrations, degraded habitat, and excessive turbidity. These impairments adversely impact fish and aquatic life, water quality, recreation, and potentially navigation.

Every two years, Sections 303(d) and 305(b) of the Clean Water Act (CWA) requires states to publish a list of all waters not meeting water quality standards and an overall report on surface water quality status of all waters in the state. Of the 16 sampling streams, 14 are listed as impaired for TP and/or TSS on the 2020 303(d) Impaired Waters List. Appendix B includes more information about the impaired monitoring streams.

All but two of the monitored streams, Lancaster Creek, which is a reference stream, and Wequiock Creek are impaired due to high levels of TP and/or TSS in the water. In addition, their

downstream receiving waters, the Lower Green Bay and Fox River (LGBFR), are also impaired for TP and TSS and an AOC has a total of 13 Beneficial Use Impairments (BUI's). The EPA-approved TMDL for the Lower Fox River Basin identifies the reductions needed to meet water quality goals. Since Phosphorus and sediment loading impacts several of the BUI's in the LGBFR AOC, the goals of the AOC and TMDL (removal of the BUI's and meeting the TMDL reductions, respectively) are closely intertwined, and effective implementation of the TMDL is critical to the restoration of the Lower Fox River and Bay.

Project Goals

There are two main goals for this project: (1) increase public awareness and involvement of water quality issues by engaging the public in citizen science and (2) the collection of reliable surface water quality data to assess long-term water quality trends/success. The Program aims to increase community awareness on local water quality issues and the impact of land use decisions around them. The focus is to raise awareness through building a volunteer base and increasing community involvement and engagement.

Through citizen science the Program goal is to collect reliable data to characterize TP, dissolved reactive phosphorus (DRP), diatom phosphorus index (every 10 years), TSS, total nitrogen (TN), and associated chemical and physical characteristics in the Lower Fox tributary streams during the primary algae and aquatic plant "growing season" of May through October. The monitoring data brings focus to which streams are affected by elevated phosphorus and sediment concentrations.

It is important to note, however, that research is currently underway into the relationship between the reduction of TP, DRP, and biological responses. The collection of both TP and DRP will help strengthen the understanding of these relationships and effects they may have on biological responses in the Lower Fox River tributaries.

Additional goals of this project include:

1. Evaluate nutrient and sediment concentrations in the tributaries discharging to the Fox River.
2. Monitor the health of the watershed overtime.
3. Provide a basis for evaluation of the long-term effectiveness of implementation of the Lower Fox River TMDL; are there water quality improvements in watersheds with the implementation of best management practices?
4. Share water quality data broadly among stakeholders to collectively assess water quality.

Proposed Work and Sampling Procedure

2020 is the sixth year the WDNR has led the Lower Fox River Volunteer Monitoring program. Project structure remained the same in 2020 as implementation of volunteer monitoring efforts are coordinated by WDNR staff. Specifically, the WDNR:

- Continues to develop a well-trained volunteer base through various means of recruitment and community engagement:
    - Volunteers are trained to follow Water Action Volunteer (WAV) (https://wateractionvolunteers.org/) monitoring protocol to ensure consistency is being met in each sample.
    - Volunteers collect and ship surface water samples in iced coolers to the Wisconsin State Lab of Hygiene for analysis of TP, DRP, TSS, and TN.
    - Volunteers collect streamflow and transparency data at the time of surface water sample collection
    - Duplicate samples are collected at randomly selected sites throughout the sampling season (Appendix G). Duplicates are collected on the same day and at the same time as the regular sample.
- Continue to provide support to volunteers as needed
    - Ensure safe access and suitability at each monitoring station
    - Ordering, preparing, and maintaining supplies for volunteers to successfully carry out monitoring activities and shipment of samples
    - Fostering an open line of communication with volunteers to ensure that all stations are being monitored at the frequency outlined in the project QAPP
- Confirm that all 20 monitoring locations are monitored monthly from May to October for a total of 6 monitoring events
- Compile monthly sampling data results to share with volunteers and stakeholders.
    - Record data into tables and graphs for analysis
    - Develop an annual report complete with data and figures to share with stakeholders to assess annual water quality.

2020 Sampling Season

Summary

The 2020 sampling season looked a lot different from previous seasons due to the COVID-19 pandemic. Planning and coordination of the program including, volunteer recruitment, supply inventory, volunteer training, and getting supplies to volunteers resumed in July. Replacement and additional equipment were purchased to account for additional monitoring sites.

Three new sites, Wequiock Creek (SWIMS ID 10010769), West Plum Creek (SWIMS ID 10016494), and Tributary to Garner's Creek (SWIMS ID 10047157), were added to the Lower Fox Volunteer Monitoring Program in 2020. Sample collection began in August yielding a total of three sampling events (August, September, and October) in 2020. 50% of samples (180 samples total (3 samples/site/month)) were not collected at any of the sites May, June, or July 2020 because of fieldwork delays due to the COVID 19 pandemic. A percent completeness by sampling site table is provided in Appendix C and all sampling data can be found in Appendix D.

Due to the pandemic, all DNR offices were closed. A large event water sampling training was not held due to safety and health concerns with large gatherings. Instead, the project coordinator trained new volunteers at their respective sampling site during the months of August and September. Sampling was dependent on when new volunteers were available for a training. Existing volunteers were not able to pick up their supplies from a DNR office so the project coordinator was responsible for delivering supplies to returning volunteers.

The Program began sampling for Total Nitrogen (TN) at each site in 2020. Nitrogen is often used and found in agricultural fields and may have similar impacts to water quality as phosphorus, therefore testing for TN may prove important in understanding its effects on water quality. Currently, there is no State water quality standard for Total Nitrogen. However, water quality data gathered through the Lower Fox Volunteer Monitoring program may provide useful input to establishing a State water quality standard for TN.

Outreach

- A Lower Fox River Volunteer Monitoring Fact Sheet (Appendix I) was shared broadly to help recruit volunteers.
- A newsletter article was featured in the Fox Wolf Watershed Alliance newsletter. The article was written to expand outreach in the region to recruit volunteers. Several people reached out to the DNR coordinator following the release.

- The DNR coordinator reached out to members on the Green Bay Conservation Partnership Listserv to recruit volunteers. Several people reached out to the DNR coordinator following the email.
- Information about the Lower Fox Volunteer Monitoring Program is displayed on the Lower Fox TMDL webpage and the Water Action Volunteer website to further promote the program.

Volunteer Recruitment

A group of 16 volunteers monitored the 20 sites in 2020. Ten volunteers from the 2019 season returned for the 2020 season. The program gained six new volunteers and lost three volunteers from 2019. A total of 5 volunteers were trained: three were trained in August and two were trained in September. At the two sites where volunteers were trained in September, the project coordinator collected the August samples.

Volunteer recruitment is one aspect of the program that consistently needs to be carried out. The Program should continue to recruit volunteers despite having a volunteer at every stream. It would be better to have multiple volunteers at each sampling location to learn with each other and help each other collect the samples. The more volunteers that are recruited, the more the message gets out in the community, which is a main goal of the Program.

	2015	2016	2017	2018	2019	2020
New	8	11	8	6	1	6
Returning		1	4	8	12	10

Water Quality Data

Wisconsin Listing Methodology

Data for total phosphorus was compared to Wisconsin's TP criteria by calculating the median and the upper and lower 90% confidence intervals. This was then compared to the 0.075 mg/L water quality criteria to determine the confidence level (Figure 1) of data sets for each site between 2015 and 2020. Median, upper 90%, and lower 90% confidence values were calculated for each stream using all data points across all years. A minimum of 6 samples, one per month from May – October, are needed to calculate the confidence intervals. In years with less than 6 data points at a location, a data point from the same month from the most recent year of a full dataset was used instead. For example, in 2020 all sampling sites had less than 6 data points collected. Data points from 2019 were used to fill in the months of May – July at each site to calculate the confidence interval.

Based on the confidence values given (Appendix G), there was 1 stream (Lancaster Creek – 2019) that "Clearly Meets" the State water quality criteria of 0.075 mg/L. Lancaster Creek (2015 and 2017) also had sampling years where the stream "May Meet" water quality criteria. In addition, there were 4 streams (Garner's Creek (2018), Mud Creek (2018, 2019, 2020), Neenah Slough (2015, 2017, 2018, and 2020), and Lancaster Creek (2016, 2018, and 2020)) where the stream "May Exceed" the water quality criteria, while every other stream in all other years "Clearly Exceed" the TP water quality criteria.

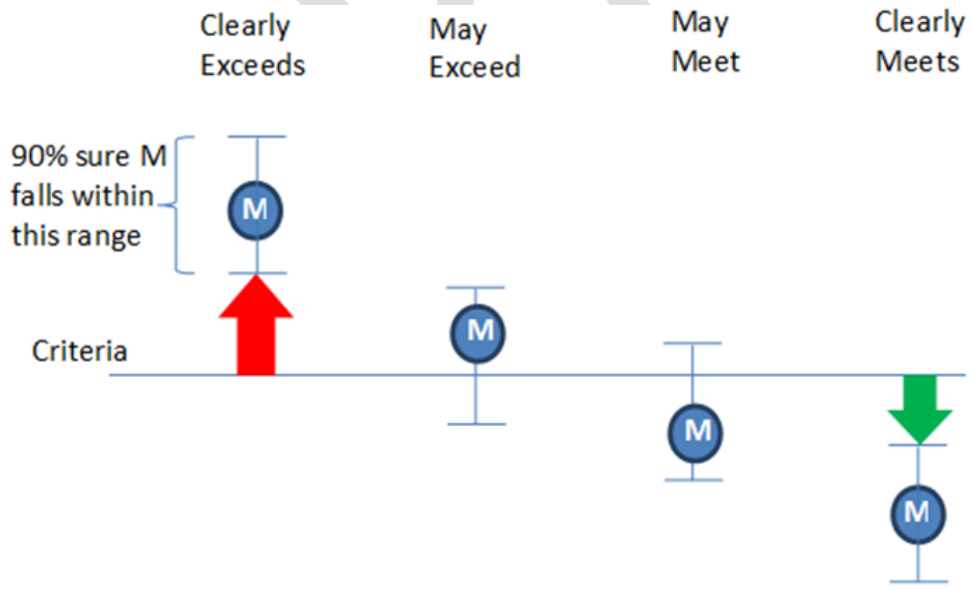


Figure 1: Wisconsin TP criteria confidence table. Criteria line indicates the 0.075 mg/L water quality criteria limit and M represents the Median value.

Total Phosphorus Analysis by monitoring station

Streams sampled through the Volunteer Monitoring Program have a target median summer (May – October) TP concentration of 0.075 mg/L. No numeric water quality target currently exists for TN and TSS, therefore the water quality assessment in this report will focus on Phosphorus.

Although sample collection was less than 100% at all the monitoring locations in 2020, median and average values were still calculated. Table 1 breaks down the average TP value for each monitoring station and Table 2 breaks down the median TP value for each monitoring station. Nearly all sites from 2015-2020 had yearly average and median values above the State water quality criteria of 0.075 mg/L except for Baird Creek (2020), Garner's Creek (2020), Lancaster Creek (2019), and Wequiock Creek (2020). The lower average and median TP values in 2020 can be attributed to only 50% of samples being collected at each site.

Red values in each table represent years with less than 100% sample collection. If sample collection was less than 100% at a location in a given year, the median and average values were still calculated. The value in those years may not be a proper representation of the median and average TP values at that stream location for the specific year.

Average	TP (mg/L)					
Sampling Location	2015	2016	2017	2018	2019	2020
Apple Creek	0.277	0.361	0.519	*0.189*	0.257	*0.172*
Ashwaubenon Creek	0.361	0.392	0.347	0.305	*0.475*	*0.147*
Baird Creek	0.280	*0.172*	0.303	0.335	0.436	*0.101*
Bower Creek	0.224	*0.243*	0.298	0.270	0.330	*0.235*
Lower Duck Creek	0.160	0.169	0.197	0.155	0.160	*0.118*
Dutchman Creek	*0.361*	*0.117*	0.166	0.210	0.270	*0.083*
Middle East River (G)	0.567	0.509	0.432	0.317	0.433	*0.292*
Lower East River (HLT)		0.274	0.216	0.323	0.198	*0.307*
Garner's Creek	0.204	*0.122*	0.124	0.097	0.116	*0.086*
Kankapot Creek	0.426	*0.293*	0.522	0.410	0.351	*0.279*
Mud Creek	*0.101*	0.104	0.103	0.097	0.091	*0.082*
Neenah Slough	*0.088*	0.157	0.094	0.102	0.122	*0.114*
Plum Creek	0.149	0.587	0.731	0.502	0.425	*0.449*
Lancaster Creek	0.089	0.107	0.077	0.093	0.057	*0.098*
Upper Duck Creek				0.282	0.169	*0.264*
Middle Duck Creek				0.167	0.203	*0.134*
Upper East River				0.491	0.487	*0.357*
Trib to Garner's Creek						*0.144*
West Plum Creek						*2.033*
Wequiock Creek						*0.075*
# Samples Collected	68	75	84	101	101	60

Table 1: Lower Fox River monitoring station breakdown (Average TP values). Red values indicate years with missing samples.

Median	TP (mg/L)					
Stream Name	2015	2016	2017	2018	2019	2020
Apple Creek	0.273	0.297	0.318	*0.168*	0.265	*0.126*
Ashwaubenon Creek	0.347	0.316	0.321	0.301	*0.485*	*0.119*
Baird Creek	0.288	*0.172*	0.317	0.289	0.506	*0.075*
Bower Creek	0.199	*0.229*	0.310	0.323	0.328	*0.232*
Lower Duck Creek	0.141	0.173	0.192	0.134	0.148	*0.121*
Dutchman Creek	*0.306*	*0.117*	0.157	0.141	0.280	*0.069*
Middle East River (G)	0.526	0.472	0.460	0.321	0.421	*0.303*
Lower East River (HLT)		0.252	0.143	0.321	0.170	*0.253*
Garner's Creek	0.139	*0.131*	0.129	0.100	0.128	*0.072*
Kankapot Creek	0.365	*0.292*	0.498	0.402	0.355	*0.277*
Mud Creek	*0.108*	0.098	0.088	0.097	0.092	*0.096*
Neenah Slough	*0.078*	0.112	0.091	0.076	0.110	*0.080*
Plum Creek	0.151	0.481	0.532	0.442	0.401	*0.423*
Lancaster Creek	0.086	0.085	0.076	0.091	0.061	*0.097*
Upper Duck Creek				0.247	0.154	*0.282*
Middle Duck Creek				0.158	0.210	*0.154*
Upper East River				0.529	0.503	*0.399*
Trib to Garner's Creek						*0.160*
West Plum Creek						*1.710*
Wequiock Creek						*0.065*
# Samples Collected	68	75	84	101	101	60

Table 2: Lower Fox River monitoring station breakdown (Median TP). Red values indicate years with missing data.

Phosphorus is an essential nutrient for plant growth. When excess amounts are introduced to a system, harmful algal blooms can occur. Total phosphorus is a key indicator of water quality. 10 of 60 (16.7%) TP samples collected in 2020 met the State water quality standard (0.075 mg/L) for rivers and streams. The percentage of samples meeting the 0.075 mg/L standard is the highest since the Program began in 2015, however 50% of samples were not collected in 2020. 4 of the 20 (20%) sites in 2020 had median TP values below the TP Water Quality standard of 0.075 mg/L. The TP samples do not account for variations in temperature, precipitation, or implementation of best management practices. Table 3 provides a yearly analysis of samples meeting the State water quality criteria.

TP Samples Below 0.075 mg/L							
	2015	2016	2017	2018	2019	2020	Total
# Sites	14	14	14	17	17	20	
# Samples Collected	68	75	84	101	101	60	489
# Above 0.075 mg/L	65	68	74	89	88	50	434
# Below 0.075 mg/L	3	7	10	12	13	10	55
% Below 0.075 mg/L	4.4%	9.3%	11.9%	11.9%	12.9%	16.7%	**11.2%**

Table 3: TP Samples below TP Water Quality Standard

DRP is a portion of TP and is the amount of phosphorus available for plant growth. DRP appears to be a large portion of TP across all monitoring sites. Of the 60 TP samples collected in 2020, 45 samples (75%) had 50% or more of their concentration in the dissolved form. Overall, 70% of TP samples collected since 2015 have had >=50% of their concentration in the dissolved P form (Table 4).

TP Samples with >= 50% DRP							
	2015	2016	2017	2018	2019	2020	Total
# Sites	14	14	14	17	17	20	
# Samples Collected	67	75	84	101	101	60	488
# TP Samples with <50% DRP	27	30	26	24	23	15	145
# TP Samples with >=50% DRP	40	45	58	77	78	45	343
% TP Samples with >= 50% DRP	60%	60%	69%	76%	77%	75%	**70%**
* No DRP sample collected at Ashwaubenon Creek in 2015							

Table 4: Percentage of TP samples with greater than 50% DRP

Field Quality Assurance/Quality Control Duplicate Samples

To document the accuracy and precision of the field data collected by volunteers, ten percent of the samples that are monitored for TP are chosen each year to participate in collection of additional quality assurance/quality control (QA/QC) samples. The samples are randomly selected from the list of stations that are monitored. These QA/QC tests document the accuracy and precision of the data collected and look at natural variability and sampling error.

Duplicate samples are collected on the same day and time as the regular samples. The result of the additional sampling is an additional sample for each parameter mailed to the lab. Duplicate samples were collected at Duck Creek – Pamperin Park and Neenah Slough in 2018 and Apple Creek and West Plum Creek in 2020. Duplicate sample results are in Appendix H.

Stream Flow and Transparency

In addition to collecting water chemistry data each month, volunteers collect stream flow and water transparency data. Stream flow is affected by the amount of water within a watershed and increases with rainstorms or snowmelt and decreases during dry periods. Flow defines the shape, size, and course of the stream.

Volunteers measure streamflow using a velocity-area approach. A 20 ft. length of stream is assessed followed by measuring the width and the water depth at numerous locations across the width. Water velocity is determined by measuring the time it takes for a tennis ball to float along the stream length. Streamflow data can be found in Appendix F.

Water transparency is collected each month with a transparency tube. Water clarity is closely tied to suspended sediment in the water. Water clarity is also affected by dissolved material and algae. Transparency data can be found in Appendix F.

Trends and Analysis for 2015-2020

- Apart from Lancaster Creek (reference stream), yearly median TP concentrations from 2015-2020 show every location was above Administrative Code NR 102 TP standard of 0.075 mg/L.
- In 2020, there were 3 sites, Wequiock Creek, Baird Creek, and Dutchman Creek, with a yearly median TP value at or below 0.075 mg/L. From 2015-2019, Baird Creek and Dutchman Creek had Average and Median TP values well above 0.075 mg/L. Three sampling events were missed in 2020 so do not provide an accurate representation of the Median TP value.

- A total of four sampling events from 2015-2020 (one in 2017 and three in 2020) yielded DRP concentrations that exceeded their TP concentrations. This can be attributed to normal uncertainty or margin of error associated with the tests. The absolute difference between each samples' results are less than the TP Level of Quantification (LOQ) (0.028 mg/L) and the DRP LOQ (0.015 mg/L).
- Yearly median TP concentrations from 2015-2020 appear to be decreasing for 11 of the 14 original sampling sites. Two sites, Bower Creek and East River at Harold Lewis Trail, appear to be increasing. One site, Neenah Slough, appears to remain steady. However, with 3 missed sampling events from 2020 and missing data from other years we cannot positively confirm these trends.
- Since 2015, the percentage of DRP in TP samples have increased each year except for 2020. The percentage of TP samples meeting the 0.075 mg/L water quality criteria have also increased each year.

Data Conclusions

The data collected thus far continues to make a strong case for the establishment of best management practices in each watershed. Since 2015, every stream but Lancaster Creek (our reference stream), based on their yearly median concentrations, has exceeded the 0.075 mg/L water quality criteria set in Wisconsin Administrative Code NR 102.

At this moment in time, there is not enough data to see a definitive trend in our streams. The program is still young, and trends will change throughout its existence, especially when best management practices and implementation start to grab ahold and improve the water quality in given watersheds. Raw data may suggest that variations in weather patterns, temperature, and time of year may have an impact on the TP, DRP, TSS, and TN concentrations. These are additional reasons definitive conclusions cannot be made at this time. It is also noteworthy that TSS concentrations are not mirroring TP-DRP concentrations at this point of the project.

Dissolved phosphorus was a higher fraction of total phosphorus than expected. Appendix E breaks down the percentage of DRP in TP samples and table 4 shows the percentage of TP samples with greater than 50% DRP. 75% of samples collected in 2020 had 50% or more of total phosphorus come from the dissolved form. There were four instances since 2015 where the DRP concentration was greater than the TP concentration in the sample.

The dissolved form of phosphorus is readily available for plant uptake and contribute to algal blooms. What does this mean for TMDL implementation? What are the sources of DRP; is it a sign of a higher input of phosphorus through agricultural tiling? What kind of BMPs can/should be implemented to reduce dissolved phosphorus? It would be interesting to explore agricultural tiling in each watershed and if there is any correlation to dissolved phosphorus levels. Do point source dischargers contribute to dissolved P?

Throughout the entirety of the project, there have been many TSS samples that reported no detects (ND) or less than 4 mg/L, which is highly unexpected in the streams that we sample. At this time, it is unknown what is causing such low TSS concentrations, but further inquiries are being made. Many low concentrations are occurring in the Autumn months of September and October. Cooler weather and cooler water temperatures may be contributing to the low TSS concentrations being reported.

Total Nitrogen was a new parameter added to the list of parameters in 2020. Currently there are no water quality standards established for total nitrogen in the Lower Fox River TMDL area. Total Nitrogen may have similar impacts to water quality as Phosphorus does. Nitrogen is often found and used in agricultural settings, so testing for it may prove important as most land use coverage in the Lower Fox basin is agricultural. As the program moves forward, more insight will be provided on Total Nitrogen trends. Will Nitrogen and Phosphorus concentrations correlate each

sampling month? We will be able to use this data to gain a better understanding of the relationships between Total Phosphorus and Total Nitrogen concentrations moving forward.

Given the consistently high levels of phosphorus, and unexpected levels of dissolved reactive phosphorus, it is recommended to continue this program at its current capacity.

Program Conclusions

The main goal of the Lower Fox River Volunteer Monitoring Program is the engagement of the public and increasing their awareness on water quality issues. In total, there have been 40 volunteers that have collected samples for the program since it started in 2015. However, several of the 40 volunteers were/are a part of larger organizations that are involved with the program, possibly making the volunteer contribution much higher. With the knowledge our past and present volunteers possess, they can teach others and be an extension of the program. Our volunteers can talk about their experiences and the things they have seen with others, which allows the information to be carried out to even more individuals in the basin.

Volunteer recruitment has been carried out in several ways throughout the project. Two main contributions to volunteer recruitment have been newsletter articles and presenting for larger organizations. Newsletter articles allowed the DNR to recruit volunteers on a bigger platform. The articles reached a bigger audience and many contacts have been made to the DNR following the release of different articles. Presentations were also a key contributor to spreading awareness of water quality issues. PowerPoint presentations provided information to the public and individuals that may not realize the impact of water quality on everyday life. The presentations were very well received, and many people commented on how the information opened their eyes to the issue we are seeing in the Lower Fox River Basin.

The use of volunteers has proved important for success. Many volunteers are involved with the program which requires constant coordination and communication by the DNR coordinator to ensure success of the program. Communication proves to be the most important aspect of the DNR coordinator's position. The coordinator is the liaison between the volunteers and other DNR staff that are involved within the program. Without proper communication, some aspects of the program can potentially be impacted.

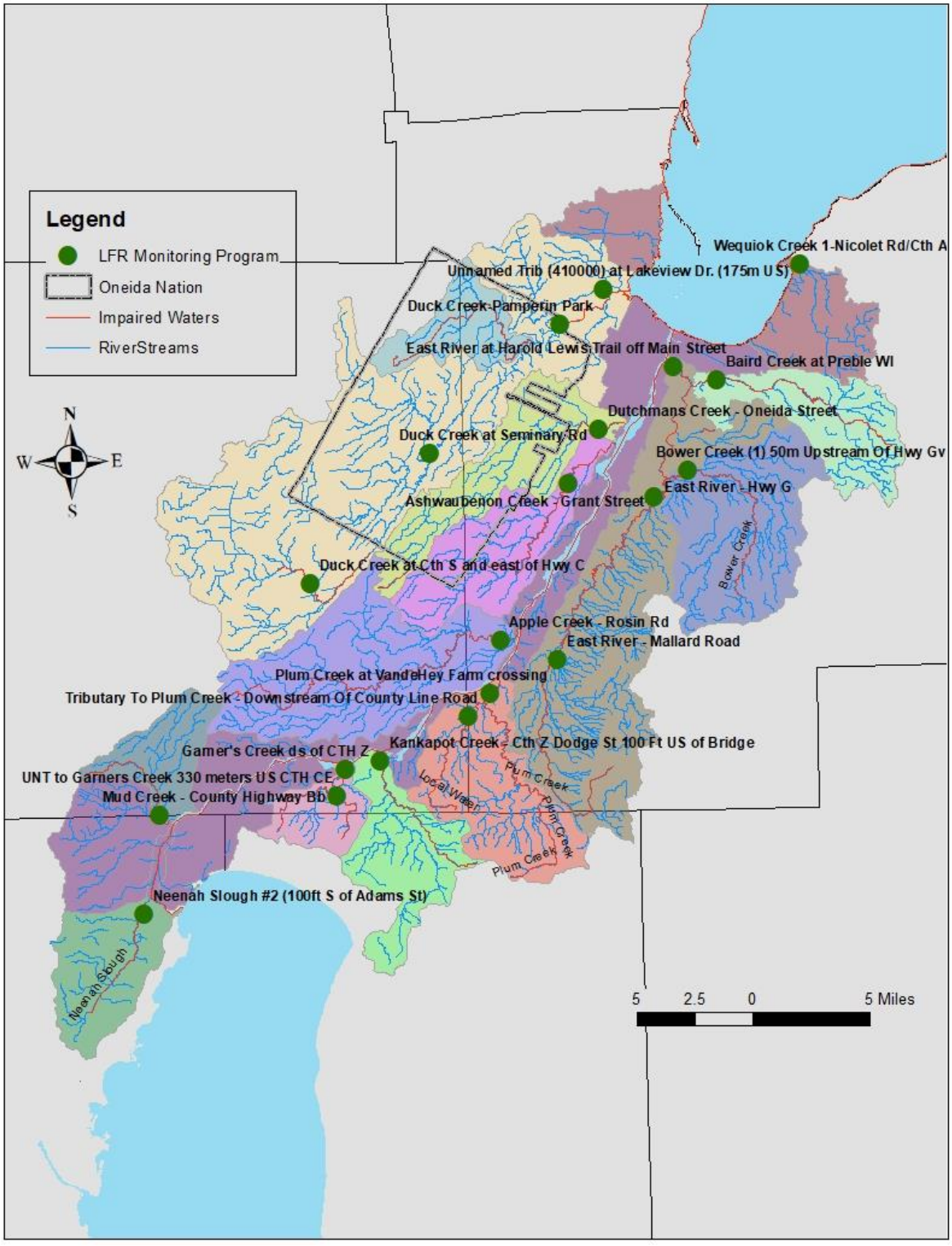
As funding and resources become available additional sites are added to the monitoring program. Most of the sampling sites represent the pour point or confluence of TMDL sub-basins. These sites give us good insights of the water quality of those basins. We can use the water quality data to determine where additional monitoring should occur when additional resources become available. Also important is measuring implementation progress. There are 8 active 9 Key Element Plans within the Lower Fox River TMDL area. These plans assess the causes and sources of pollution and prioritize restoration and protection strategies to address water quality problems. As implementation of these plans occurs, we can use monitoring data to help track

implementation and determine where additional data and information is needed to track progress.

Acknowledgements

Thank you to all the volunteers that we have had present and past that have made the Lower Fox River Volunteer Monitoring Program possible. Thank you to the Wisconsin DNR and the WAV program for funding and support.

Appendix A: Lower Fox River Basin and TMDL Sub-basin Boundaries



Lower Fox River Tributary Volunteer Monitoring Program

Project Summary

Draft #1 – February 2021

Stream Name	SWIMS ID	SWIMS Station Name	X	Y
Ashwaubenon Creek	10016502	Ashwaubenon Creek - Grant Street	-88.101373	44.445027
Duck Creek	10038644	Duck Creek - Pamperin Park	-88.102972	44.543283
Wequiock Creek	10010769	Nicolet Rd/Cty A	-87.890966	44.576114
Bower Creek	10009445	Bower Creek (1) 50m Upstream of Hwy Gv	-87.99585	44.453503
East River	53508	East River at Mallard Rd	-88.111276	44.335537
West Plum Creek	10016494	Downstream of County Line Rd	-88.191967	44.29915
Duck Creek	453255	Duck Creek at Seminary Rd	-88.215525	44.466286
Baird Creek	53683	Baird Creek at Preble WI	-87.970044	44.507873
East River	10043279	East River @ Harold Lewis Trail off Main Street	-88.0065	44.515369
Plum Creek	10046999	Plum Creek - VandeHey Farm Crossing	-88.17243	44.313688
Trib to Garners Cr	10047157	US CTH CE	-88.30943	44.251832
Dutchman Creek	10015851	Dutchmans Creek - Oneida Street	-88.073155	44.478821
Duck Creek	10029975	Duck Creek at CTH S	-88.31982	44.389055
Garner's Creek	10043028	Garner's Creek - DS of Cty Z	-88.296227	44.26877
Kankapot Creek	453261	Kankapot Creek - Cth Z Dodge St 100 Ft US of Bridge	-88.264213	44.276284
Lancaster Creek	10034510	Unnamed Trib. (410000) - Lakeview Dr	-88.063943	44.56433
Mud Creek	453258	Mud Creek - County Highway BB	-88459029	44.243669
East River	53675	East River - Hwy G	-88.026784	44.434625
Apple Creek	53684	Apple Creek - Rosin Rd	-88.160301	44.345476
Neenah Slough	10032175	Neenah Slough #2 (100ft S of Adams St)	-88.473302	44.18332

Appendix B: Impaired Sampling Streams

Local Waterbody Name	Waters ID	WBIC	County	Start Mile	End Mile	Total Size	Date Listed	Source Category	Pollutant	Impairment	Listing Condition Category
Apple Creek	313933	124100	Brown	0	3.99	3.99	4/1/1998	NPS	Total Phosphorus	Low DO	TMDL approved by EPA in 2012 (4A)
									Sediment/Total Suspended Solids	Elevated Water Temperature, Degraded Habitat	
	10839		Brown, Outagamie	3.99	23.88	19.89			Total Phosphorus	Low DO	
									Sediment/Total Suspended Solids	Elevated Water Temperature, Degraded Habitat	
Ashwaubenon Creek	10834	122200	Brown	0	14.15	14.15	4/1/2008	PS/NPS	Total Phosphorus	Low DO	TMDL approved by EPA in 2012 (4A)
									Sediment/Total Suspended Solids	Degraded Habitat	

Baird Creek	10681	118100	Brown	0	3.5	3.5	4/1/2006	NPS	Total Phosphorus	Low DO	TMDL approved by EPA in 2012 (4A)
									Sediment/Total Suspended Solids	Degraded Habitat	
	10682			3.5	13.1	9.6	4/1/2008	PS/NPS	Total Phosphorus	Low DO	
									Sediment/Total Suspended Solids	Degraded Habitat	
Bower Creek	10683	118400	Brown	0	3	3	4/1/2008	NPS	Total Phosphorus	Low DO, Degraded Biological Community	TMDL approved by EPA in 2012 (4A)
									Sediment/Total Suspended Solids	Degraded Habitat	
	10684			3	13	10			Total Phosphorus	Low DO	
									Sediment/Total Suspended Solids	Degraded Habitat	
Duck Creek	10850	409700	Brown	0	4.96	4.96	4/1/1998	NPS	Total Phosphorus	Low DO	TMDL approved by EPA in 2012 (4A)
									Sediment/Total Suspended Solids	Degraded Habitat	

	10851		Outagamie	25.69	32.9	7.21	4/1/1998	PS/NPS	Total Phosphorus	Low DO	
									Sediment/Total Suspended Solids	Degraded Habitat	
Dutchman Creek	10832	121600	Brown	0	4.04	4.04	4/1/1998	NPS	Total Phosphorus	Low DO, Degraded Biological Community	TMDL approved by EPA in 2012 (4A)
	1854741		Outagamie	16.05	17.97	1.91			Total Phosphorus	Low DO	
East River	10679	118000	Brown	0	14.15	14.15	4/1/1998	PS/NPS	Total Phosphorus	Low DO, Degraded Biological Community, High Phosphorus Levels	TMDL approved by EPA in 2012 (4A)
								NPS	Sediment/Total Suspended Solids	Degraded Habitat	
	10680	118000	Brown, Calumet	14.15	42.25	28.1	4/1/1998	NPS	Total Phosphorus	Low DO, Degraded Biological Community	

									Sediment/Total Suspended Solids	Degraded Habitat	
Garners Creek	10845	127700	Calumet, Outagamie	0	6.99	6.99	4/1/2008	PS/NPS	Total Phosphorus	Degraded Biological Community, Degraded Habitat	TMDL approved by EPA in 2012 (4A)
									Sediment/Total Suspended Solids	Degraded Habitat	
Kankapot Creek	10844	126800	Outagamie	0	2.66	2.66	4/1/2008	PS/NPS	Total Phosphorus	Degraded Biological Community, Degraded Habitat	TMDL approved by EPA in 2012 (4A)
	357763		Calumet, Outagamie	2.66	9.57	6.91			Sediment/Total Suspended Solids	Degraded Habitat	
Mud Creek	10846	129500	Outagamie, Winnebago	0	3.71	3.71	4/1/2008	PS/NPS	Total Phosphorus	Degraded Habitat	TMDL approved by EPA in 2012 (4A)
									Sediment/Total Suspended Solids		

	10847	129500	Outagamie	3.71	6.87	3.16	4/1/1998	PS/NPS	Sediment/Total Suspended Solids		
Neenah Slough	10848	130800	Winnebago	0	2.77	2.77	4/1/1998	PS/NPS	Total Phosphorus	Low DO	TMDL approved by EPA in 2012 (4A)
	357915			2.77	3.54	0.77				Low DO	
	357955			3.55	6.12	2.57				Low DO, Degraded Biological Community	
Plum Creek	10841	125100	Brown	0	13.86	13.86	4/1/2008	PS/NPS	Total Phosphorus	Degraded Biological Community, Degraded Habitat	TMDL approved by EPA in 2012 (4A)
							4/1/1998		Sediment/Total Suspended Solids	Elevated Water Temperature, Degraded Habitat	
	357670	125100	Brown, Calumet	13.87	16.42	2.55	4/1/1998	PS/NPS	Sediment/Total Suspended Solids	Elevated Water Temperature, Degraded Habitat	

Local Water (Trib to Garner's Creek)	3993962	5022162	Calumet, Outagamie	0	4.71	4.71	4/1/2016	PS/NPS	Total Phosphorus	Degraded Biological Community	Watershed Plan (5W)

Appendix C: Percent Completeness by Sampling Site

Sample Collection Completeness (%) - Out of 6 samples per year						
Station Name	2020	2019	2018	2017	2016	2015
Apple Creek	50%	100%	83.3%	100%	100%	100%
Ashwaubenon Creek	50%	83.3%	100%	100%	100%	100%
Baird Creek	50%	100%	100%	100%	83.3%	100%
Bower Creek	50%	100%	100%	83.3%	66.67%	100%
Dutchman Creek	50%	100%	100%	83.3%	33.3%	33.3%
Garner Creek	50%	100%	100%	100%	83.3%	100%
Kankapot Creek	50%	100%	100%	100%	83.3%	100%
Lancaster Creek	50%	100%	100%	100%	100%	50%
Lower Duck Creek	50%	100%	100%	100%	100%	100%
East River @ HLT	50%	100%	100%	100%	100%	0%
Mid Duck Creek	50%	100%	100%			
East River @ HWY G	50%	100%	100%	100%	100%	100%
Mud Creek	50%	100%	100%	100%	100%	33.3%
Neenah Slough	50%	100%	100%	100%	100%	100%
Plum Creek	50%	100%	100%	100%	100%	100%
Upper Duck Creek	50%	100%	100%			
Upper East River	50%	100%	100%			
Trib to Garner's Creek	50%					
West Plum Creek	50%					
Wequiock Creek	50%					
Combined Percentage	50.00%	99.02%	99.02%	97.61%	89.28%	79.76%

Lower Fox River Tributary Volunteer Monitoring Program

Project Summary

Draft #1 – February 2021

Appendix D: 2015-2020 Sampling Data

			TP (mg/L)						DRP (mg/L)						TSS (mg/L)						TN (mg/L)
Stream Name		Month	2015	2016	2017	2018	2019	2020	2015	2016	2017	2018	2019	2020	2015	2016	2017	2018	2019	2020	2020
Apple Creek	1	May	0.34	0.071	0.33	0.168	0.23	-	0.16	0.027	0.141	0.086	0.109	-	61	3.2	47.7	15	82	-	-
	2	June	0.268	0.342	1.67	0.244	0.262	-	0.18	0.187	0.323	0.167	0.123	-	4.4	82.3	1010	13.3	82.3	-	-
	3	July	0.354	0.407	0.35	0.319	0.267	-	0.27	0.259	0.251	0.264	0.219	-	11.4	61.4	39.3	7	13.6	-	-
	4	August	0.278	0.251	0.21	-	0.288	0.267	0.201	0.173	0.126		0.136	0.0950	17.4	13.2	14.7	-	11.5	59.2	1.16
	5	September	0.199	0.954	0.31	0.147	0.273	0.126	0.139	0.341	0.238	0.072	0.188	0.0623	8.75	420	11.6	2.6	19.8	-	1.44
	6	October	0.224	0.141	0.25	0.069	0.224	0.122	0.182	0.106	0.15	0.034	0.16	0.0861	7.8	3.2	7.8	ND	39.5	-	0.122
Ashwaubenon Creek	7	May	0.513	0.3	0.25	0.291	-	-	-	0.17	0.156	0.207	-	-	-	49.5	21.5	15	-	-	-
	8	June	0.435	0.295	0.53	0.293	0.313	-	0.221	0.19	0.383	0.102	0.242	-	26.7	16.5	40.8	34	22.5	-	-
	9	July	0.472	0.332	0.39	0.332	0.544	-	0.306	0.247	0.288	0.256	0.352	-	17.3	14.6	19.2	20.7	62	-	-
	10	August	0.226	0.259	0.2	0.313	0.317	0.223	0.128	0.103	0.071	0.087	0.259	0.159	20.6	38.8	60.8	670	24	13.2	1.71
	11	September	0.258	0.489	0.24	0.309	0.715	0.0989	0.126	0.288	0.191	0.199	0.498	0.07	17.2	69.5	5.4	13.8	68.5	8.6	1.3
	12	October	0.259	0.678	0.47	0.289	0.485	0.119	0.203	0.486	0.375	0.259	0.346	0.0938	15.2	44.3	15	3.4	58	ND	0.823
Baird Creek	13	May	0.477	0.123	0.2	0.23	0.578	-	0.345	0.057	0.142	0.158	0.278	-	ND	4.33	4.25	5	68	-	-
	14	June	0.317	0.179	0.39	0.191	0.502	-	0.216	0.099	0.243	0.106	0.337	-	12	19	29	5.5	12	-	-
	15	July	0.319	0.212	0.45	0.348	0.201	-	0.183	0.134	0.276	0.152	0.145	-	24.8	13.4	36	77.7	8.2	-	-
	16	August	0.181	-	0.36	0.187	0.51	0.16	0.12	-	0.29	0.134	0.274	0.109	ND	-	7.2	6.4	81.5	3.2	0.734
	17	September	0.258	0.252	0.27	0.555	0.572	0.0691	0.188	0.154	0.216	0.476	0.439	0.0746	3.2	6.8	3.4	8.6	23	2.8	0.433
	18	October	0.127	0.133	0.14	0.499	0.253	0.0753	0.098	0.096	0.101	0.326	0.158	0.0711	2.8	3.2	ND	39.2	18.3	2.4	0.389
Bower Creek	19	May	0.179	0.126	0.14	0.093	0.262	-	0.112	0.066	0.047	0.044	0.142	-	8.8	8	7.5	3.6	98	-	-
	20	June	0.187	0.257	0.32	0.344	0.289	-	0.097	0.154	0.229	0.232	0.192	-	40.8	27.3	25.1	24.4	8.6	-	-
	21	July	0.401	0.388	0.3	0.384	0.395	-	0.118	0.293	0.21	0.265	0.251	-	37	23.4	22.7	9.25	40.8	-	-
	22	August	0.21	0.2	0.22	0.326	0.367	0.319	0.108	0.119	0.13	0.174	0.178	0.14	16.8	13.4	12.4	44	51	21	1.11
	23	September	0.213	-	0.45	0.319	0.436	0.154	0.145	-	0.295	0.244	0.306	0.0468	9.4	-	15	10.6	28	12.2	0.856
	24	October	0.152	-	0.36	0.152	0.233	0.232	0.12	-	0.03	0.095	0.113	0.118	7.6	-	7	ND	14.5	3	0.876

Lower Duck Creek @ Pamperin Park	25	May	0.095	0.067	0.07	0.059	0.0742	-	0.045	0.019	0.025	0.018	0.033	-	5.975	ND	4.75	5	6.3	-	-
	26	June	0.314	0.142	0.19	0.319	0.192	-	0.141	0.08	0.121	0.193	0.093	-	61.6	12.3	19.3	50.7	55	-	-
	27	July	0.172	0.183	0.28	0.186	0.237	-	0.091	0.131	0.18	0.113	0.19	-	13.4	18.9	25.5	13.8	15.8	-	-
	28	August	0.122	0.163	0.15	0.098	0.104	0.121	0.074	0.077	0.095	0.03	0.059	0.0405	11.7	22	11.4	11.8	12.3	23.8	1.26
	29	September	0.159	0.257	0.19	0.114	0.269	0.0344	0.111	0.179	0.124	0.081	0.196	0.0127	11.3	15.7	16.5	3.6	19.8	7.2	1.35
	30	October	0.097	0.203	0.31	0.153	0.0867	0.2	0.047	0.156	0.177	0.12	0.063	0.167	4.75	7.67	39	3.8	4.2	5.4	3.87
Dutchman Creek	31	May	0.547	0.107	0.1	0.104	0.363	-	0.084	0.032	0.041	0.046	0.246	-	75.3	10.8	10.8	6	44.3	-	-
	32	June	0.231	-	0.27	0.569	0.196	-	0.716	-	0.198	0.378	0.136	-	15	-	12.3	59.6	16	-	-
	33	July	0.306	-	0.21	0.165	0.396	-	0.193	-	0.164	0.115	0.286	-	153	-	9.6	9	25.8	-	-
	34	August	-	0.126	0.1	0.116	0.113	0.126	-	0.05	0.045	0.067	0.056	0.108	-	8.4	15.8	10.8	21.7	5	0.944
	35	September	-	-	0.19	0.201	0.423	0.0538	-	-	0.146	0.163	0.343	0.0319	-	-	3.4	4.6	13	6.6	0.926
	36	October	-	-	0.13	0.106	0.128	0.0692	-	-	0.103	0.08	0.087	0.0429	-	-	3.5	ND	7	3.2	0.879
Middle East River (G)	37	May	0.307	0.275	0.44	0.276	0.23	-	0.205	0.146	0.199	0.184	0.12	-	5.2	50.5	67	15.3	42.7	-	-
	38	June	0.631	0.409	0.55	0.366	0.447	-	0.396	0.303	0.302	0.282	0.265	-	62	52.5	98	4	89.3	-	-
	39	July	1.05	0.585	0.48	0.471	0.394	-	0.831	0.488	0.195	0.375	0.349	-	17.8	26.6	55.3	25.3	12.8	-	-
	40	August	0.598	0.494	0.49	0.261	0.37	0.303	0.455	0.288	0.314	0.171	0.274	0.206	35	134	46.3	75	20	21	1.02
	41	September	0.453	0.885	0.29	0.368	0.605	0.209	0.341	0.526	0.232	0.311	0.467	0.169	22	69.5	11.8	201	32	13.3	0.751
	42	October	0.361	0.368	0.34	0.159	0.551	0.363	0.256	0.312	0.293	0.107	0.338	0.291	38.8	8.2	11	2.8	52	12.4	7.05
Lower East River @ Harold Lewis Trail	43	May	-	0.092	0.06	0.14	0.0827	-	-	0.019	0.022	0.084	0.053	-	-	11	12.3	15.3	35	-	-
	44	June	-	0.189	0.62	0.294	0.0954	-	-	0.104	0.296	0.165	0.044	-	-	13	24	4	16.8	-	-
	45	July	-	0.347	0.21	0.155	0.182	-	-	0.257	0.122	0.045	0.105	-	-	14.4	29.7	25.3	33.3	-	-
	46	August	-	0.314	0.12	0.348	0.29	0.121	-	0.093	0.147	0.018	0.037	0.0246	-	28.8	26.3	75	57	32	1.39
	47	September	-	0.524	0.12	0.623	0.381	0.548	-	0.336	0.038	0.194	0.194	0.0623	-	43	19.2	201	2	70.3	3.79
	48	October	-	0.178	0.16	0.375	0.158	0.253	-	0.078	0.056	0.171	0.095	0.124	-	29	32	48.5	17.7	70.3	3.07
Garner's Creek	49	May	0.124	0.077	0.12	0.046	0.075	-	0.042	0.031	0.032	0.011	0.009	-	25.7	8.4	21.3	7.25	12.6	-	-
	50	June	0.14	-	0.15	0.155	0.143	-	0.056	0.059	0.053	0.06	0.039	-	27.8	40	38.7	33.3	54.2	-	-
	51	July	0.326	0.131	0.14	0.142	0.151	-	0.021	0.059	0.081	0.065	0.067	-	53	36.6	16.5	16	34	-	-

	52	August	0.099	0.183	0.14	0.122	0.113	0.125	0.019	0.049	0.068	0.077	0.026	0.0445	14.3	44.8	23.6	14.2	23	10.6	0.938
	53	September	0.395	0.132	0.11	0.078	0.143	0.0722	0.018	0.003	0.064	0.049	0.061	0.0395	74	27	9.8	4.6	26.3	13.8	0.875
	54	October	0.137	0.088	0.09	0.038	0.07	0.0594	0.04	0.031	0.052	0.023	0.033	0.0374	9.6	5.4	3.67	4.2	10.8	4.4	0.493
Kankapot Creek	55	May	0.38	0.169	0.31	0.437	0.222	-	0.171	0.077	0.182	0.306	0.149	-	24.5	12	20.5	20	5.2	-	-
	56	June	0.321	0.392	0.41	0.366	0.345	-	0.186	0.224	0.218	0.221	0.149	-	25	41.5	72	15.4	33.8	-	-
	57	July	0.351	0.292	0.49	0.462	0.364	-	0.236	0.179	0.282	0.335	0.255	-	26.2	12.8	35.9	7.5	27.5	-	-
	58	August	0.315	0.257	0.66	0.678	0.386	0.351	0.197	0.113	0.424	0.448	0.246	0.229	17	19.4	87	50.8	23	11.6	1.73
	59	September	0.38	-	0.75	0.311	0.462	0.277	0.235	-	0.564	0.213	0.304	0.161	17.6	-	37	6	58	-	1.23
	60	October	0.812	0.353	0.51	0.208	0.327	0.21	0.471	0.206	0.384	0.122	0.194	0.146	ND	16.3	6	ND	13.3	16	4.39
Mud Creek	61	May	0.108	0.082	0.07	0.083	0.0441	-	0.033	0.027	0.03	0.023	0.01	-	7.4	2.6	ND	2.6	6.2	-	-
	62	June	0.119	0.108	0.1	0.112	0.0836	-	0.057	0.059	0.066	0.066	0.02	-	4.25	7.25	ND	2.5	5.2	-	-
	63	July	-	0.147	0.19	0.142	0.138	-	-	0.096	0.096	0.096	0.089	-	-	3.4	7.65	ND	4.5	-	-
	64	August	0.075	0.096	0.11	0.119	0.101	0.122	0.038	0.049	0.055	0.071	0.065	0.0892	2.8	4.4	4.8	2	ND	3.2	0.897
	65	September	-	0.1	0.07	0.074	0.121	0.0294	-	0.032	0.039	0.047	0.045	0.0264	-	29	2	2.6	27.3	2.4	0.366
	66	October	-	0.093	0.07	0.05	0.0585	0.096	-	0.06	0.043	0.024	0.036	0.0565	-	10	3	2.4	4.6	6	1.07
Neenah Slough	67	May	0.134	0.075	0.1	0.19	0.0962	-	0.040	0.031	0.016	0.119	0.046	-	33	4.2	42	17.5	8	-	-
	68	June	-	0.352	0.16	0.167	0.102	-	-	0.223	0.1	0.115	0.055	-	-	23	9.5	8.33	4.8	-	-
	69	July	0.078	0.231	0.08	0.061	0.118	-	0.033	0.163	0.049	0.036	0.102	-	2.4	4.86	ND	ND	2.4	-	-
	70	August	0.094	0.061	0.06	0.038	0.0525	0.0804	0.071	0.038	0.028	0.007	0.036	0.0399	3	ND	ND	ND	ND	4.4	0.938
	71	September	0.057	0.086	0.05	0.088	0.234	0.0376	0.031	0.05	0.019	0.055	0.146	0.0182	ND	ND	ND	9.8	21.3	6	0.582
	72	October	0.076	0.138	0.12	0.065	0.131	0.223	0.05	0.094	0.054	0.042	0.085	0.164	2.8	3.8	69.7	2.6	50.23	9.6	1.48
Plum Creek	73	May	0.16	0.3	0.46	0.266	0.184	-	0.073	0.067	0.321	0.159	0.108	-	25.7	128	16.5	19	9.2	-	-
	74	June	0.125	0.188	0.4	0.446	0.375	-	0.028	0.064	0.26	0.311	0.284	-	25.3	42.7	52.8	34.5	39.3	-	-
	75	July	0.105	0.191	0.46	0.529	0.426	-	0.008	0.059	0.354	0.319	0.331	-	14.5	34.3	41	24.7	31.8	-	-
	76	August	0.204	1.34	0.6	0.437	0.335	0.375	0.009	0.197	0.29	0.326	0.227	0.222	37	27.4	32.4	15	34	16.8	1.31
	77	September	0.16	0.839	0.88	1.05	0.505	0.549	0.03	0.633	0.726	0.877	0.393	0.326	27.5	30	12.3	76.9	30.5	12.3	1.21
	78	October	0.141	0.661	1.59	0.283	0.727	0.423	0.063	0.571	1.21	0.203	0.399	0.318	18.4	10.2	11.7	2.2	140	19.1	11.9

Upper Duck Creek @ CTH S	79	May	-	-	-	0.24	0.073	-	-	-	-	0.124	0.04	-	-	-	-	52	5	-	-
	80	June	-	-	-	0.253	0.109	-	-	-	-	0.09	0.064	-	-	-	-	61.5	7	-	-
	81	July	-	-	-	0.355	0.171	-	-	-	-	0.225	0.138	-	-	-	-	20	16.6	-	-
	82	August	-	-	-	0.537	0.136	0.322	-	-	-	0.37	0.105	0.198	-	-	-	16	6.5	34.8	1.68
	83	September	-	-	-	0.238	0.254	0.189	-	-	-	0.158	0.169	0.115	-	-	-	6	16.2	7.4	0.992
	84	October	-	-	-	0.071	0.273	0.282	-	-	-	0.046	0.151	0.217	-	-	-	ND	27.7	ND	0.217
Middle Duck Creek @ Seminary Rd	85	May	-	-	-	0.107	0.128	-	-	-	-	0.06	0.071	-	-	-	-	5.33	10	-	-
	86	June	-	-	-	0.172	0.29	-	-	-	-	0.128	0.122	-	-	-	-	5	68.5	-	-
	87	July	-	-	-	0.224	0.247	-	-	-	-	0.174	0.18	-	-	-	-	4.25	33	-	-
	88	August	-	-	-	0.214	0.173	0.154	-	-	-	0.169	0.156	0.112	-	-	-	5.6	6.67	4.4	2.26
	89	September	-	-	-	0.144	0.286	0.0859	-	-	-	0.111	0.213	0.0513	-	-	-	ND	40.5	5	3
	90	October	-	-	-	0.143	0.0941	0.162	-	-	-	0.113	0.073	0.141	-	-	-	2.6	2.75	6	4.33
Upper East River @ Mallard Rd	91	May	-	-	-	0.453	0.213	-	-	-	-	0.345	0.139	-	-	-	-	24.7	12	-	-
	92	June	-	-	-	0.505	0.452	-	-	-	-	0.17	0.313	-	-	-	-	55.6	61.5	-	-
	93	July	-	-	-	0.553	0.562	-	-	-	-	0.153	0.491	-	-	-	-	42.5	28.2	-	-
	94	August	-	-	-	0.683	0.454	0.421	-	-	-	0.578	0.353	0.33	-	-	-	25.2	23.3	40.6	2.7
	95	September	-	-	-	0.556	0.691	0.252	-	-	-	0.414	0.492	0.195	-	-	-	38.8	25.7	25.5	2.15
	96	October	-	-	-	0.196	0.551	0.399	-	-	-	0.139	0.338	0.346	-	-	-	4	52	13.2	5.85
Lancaster Creek	97	May	0.054	0.049	0.05	0.091	0.0621	-	0.018	0.011	0.034	0.043	0.021	-	11.3	8	8.5	16.3	23.8	-	-
	98	June	0.086	0.106	0.12	0.092	0.0576	-	0.043	0.052	0.046	0.051	0.043	-	18	20.3	29	12	7.2	-	-
	99	July	0.128	0.113	0.08	0.12	0.072	-	0.064	0.051	0.039	0.077	0.049	-	31	12	15.4	12	7.6	-	-
	100	August	-	0.251	0.07	0.171	0.0656	0.112	-	0.037	0.045	0.034	0.033	0.0743	-	133	9.2	83.1	17.6	31.6	1.4
	101	September	-	0.065	0.08	0.058	0.059	0.0969	-	0.034	0.041	0.028	0.035	0.0385	-	3.2	4	8.4	5.6	107	1.91
	102	October	-	0.056	0.06	0.028	0.0284	0.0836	-	0.023	0.031	0.016	0.023	0.0306	-	ND	ND	ND	2	73.1	2.15
Trib to Garner's Creek	103	May	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	104	June	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	105	July	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	106	August	-	-	-	-	-	0.183	-	-	-	-	-	0.134	-	-	-	-	-	5	0.981
	107	September	-	-	-	-	-	0.0897	-	-	-	-	-	0.0615	-	-	-	-	-	2.6	0.509
	108	October	-	-	-	-	-	0.16	-	-	-	-	-	0.0683	-	-	-	-	-	10.5	1.49
West Plum Creek	109	May	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	110	June	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	111	July	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	112	August	-	-	-	-	-	1.09	-	-	-	-	-	0.845	-	-	-	-	-	29.4	1.91
	113	September	-	-	-	-	-	1.71	-	-	-	-	-	1.23	-	-	-	-	-	-	2.9
	114	October	-	-	-	-	-	3.3	-	-	-	-	-	2.86	-	-	-	-	-	-	4.54
Wequiock Creek	115	May	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	116	June	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	117	July	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	118	August	-	-	-	-	-	0.123	-	-	-	-	-	0.0968	-	-	-	-	-	8.8	2.91
	119	September	-	-	-	-	-	0.0651	-	-	-	-	-	0.0734	-	-	-	-	-	3.2	2.07
	120	October	-	-	-	-	-	0.0369	-	-	-	-	-	0.0422	-	-	-	-	-	ND	1.26

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Appendix E: Dissolved Reactive Phosphorus % of Total Phosphorus

DRP % of TP																				
	Apple Creek	Ashwaubenon Creek	Baird's Creek	Bower Creek	Lower Duck Creek	Dutchman's Creek	East River @ HLT	East River @ HWY G	Garner's Creek	Kankapot Creek	Mud Creek	Neenah Slough	Plum Creek	Upper East River	Upper Duck Creek	Mid Duck Creek	Lancaster Creek	Trib to Garner's Creek	West Plum Creek	Wequiock Creek
May-15	47.06%	NA	72.33%	62.57%	46.06%	15.34%		66.78%	34.19%	45.12%	30.19%	29.78%	45.81%				33.64%			
Jun-15	67.16%	50.80%	68.14%	51.82%	44.90%	76.19%		62.76%	40.14%	57.94%	47.82%		22.56%				49.88%			
Jul-15	76.27%	64.83%	57.37%	29.43%	53.14%	63.07%		79.14%	6.50%	67.24%		42.35%	7.43%				49.61%			
Aug-15	72.30%	56.64%	66.30%	51.43%	60.25%			76.09%	19.19%	62.54%	50.40%	75.51%	4.17%							
Sep-15	69.85%	48.84%	72.87%	68.08%	69.81%			75.28%	4.58%	61.84%		54.82%	19.00%							
Oct-15	81.25%	78.38%	77.40%	78.95%	48.19%			70.91%	29.05%	58.00%		65.70%	44.75%							
May-16	37.25%	56.67%	46.59%	52.46%	28.38%	29.72%	20.15%	53.09%	40.31%	45.50%	32.97%	40.88%	22.37%				21.50%			
Jun-16	54.68%	64.41%	55.53%	59.92%	56.48%		55.03%	65.48%		57.14%	54.35%	63.35%	33.83%				48.58%			
Jul-16	63.64%	74.40%	62.97%	75.52%	71.58%		74.06%	83.42%	45.11%	61.30%	65.24%	70.56%	30.79%				45.40%			
Aug-16	68.92%	39.77%		59.50%	47.42%	39.29%	29.65%	58.30%	26.83%	43.97%	51.09%	61.24%	14.70%				14.70%			
Sep-16	35.74%	58.90%	61.11%		69.65%		64.12%	59.44%	2.35%		32.53%	57.91%	75.45%				52.86%			
Oct-16	75.18%	71.68%	72.41%		76.85%		43.54%	84.78%	35.22%	58.36%	64.73%	68.12%	86.38%				42.01%			
May-17	42.60%	61.42%	69.61%	34.89%	35.73%	41.56%	37.35%	44.82%	26.78%	58.15%	42.11%	15.50%	69.48%				61.75%			
Jun-17	19.34%	72.40%	61.83%	72.01%	62.69%	73.06%	47.44%	54.51%	36.12%	52.91%	64.71%	62.77%	65.82%				39.91%			
Jul-17	72.75%	74.23%	61.33%	69.54%	65.22%	77.36%	57.82%	41.05%	57.79%	57.79%	51.72%	60.15%	76.96%				46.41%			
Aug-17	60.87%	34.80%	79.89%	58.04%	65.72%	44.51%	122.50%	63.56%	48.56%	63.95%	48.33%	46.86%	48.17%				60.19%			
Sep-17	78.03%	79.92%	79.70%	65.41%	65.26%	78.07%	30.65%	80.28%	55.88%	75.50%	57.27%	42.79%	82.69%				52.99%			
Oct-17	59.06%	80.47%	73.72%	8.22%	57.47%	81.10%	34.78%	87.20%	59.34%	75.74%	58.12%	47.04%	76.10%				53.37%			
May-18	51.25%	71.13%	68.70%	47.90%	44.42%	44.42%	59.79%	66.67%	23.85%	70.02%	27.99%	62.63%	59.77%	76.16%	51.67%	55.89%	47.36%			
Jun-18	68.44%	34.81%	55.50%	67.44%	66.43%	66.43%	56.12%	77.05%	38.97%	60.38%	59.11%	68.86%	69.73%	33.66%	35.38%	74.42%	55.56%			
Jul-18	82.76%	77.11%	43.68%	69.01%	69.70%	69.70%	29.29%	79.62%	45.42%	72.51%	67.32%	58.47%	60.30%	27.67%	63.38%	77.68%	63.92%			
Aug-18		27.76%	71.66%	53.37%	57.67%	57.67%	5.03%	65.52%	62.95%	66.08%	59.83%	18.47%	74.60%	84.63%	68.90%	78.97%	19.82%			
Sep-18	49.25%	64.40%	85.77%	76.49%	81.09%	81.09%	31.14%	84.51%	62.77%	68.49%	63.71%	62.27%	83.52%	74.46%	66.39%	77.08%	48.80%			
Oct-18	49.35%	89.62%	65.33%	62.24%	75.09%	75.09%	45.60%	67.30%	61.87%	58.65%	47.19%	64.25%	71.73%	70.92%	64.79%	79.02%	58.99%			
May-19	47.39%		48.10%	54.20%	44.88%	67.77%	63.48%	52.17%	11.87%	67.12%	48.23%	48.23%	58.70%	65.26%	54.79%	55.23%	33.33%			
Jun-19	46.95%	77.32%	67.13%	66.44%	48.33%	69.39%	45.60%	59.28%	27.34%	43.19%	53.82%	53.82%	75.73%	69.25%	58.72%	42.07%	75.35%			
Jul-19	82.02%	64.71%	72.14%	63.54%	80.17%	72.22%	57.69%	88.58%	44.57%	70.05%	86.44%	86.44%	77.70%	87.37%	80.70%	72.87%	68.06%			
Aug-19	47.22%	81.70%	53.73%	48.50%	57.12%	49.38%	12.59%	74.05%	23.36%	63.73%	68.95%	68.95%	67.76%	77.75%	77.21%	90.17%	49.54%			
Sep-19	68.86%	69.65%	76.75%	70.18%	72.86%	81.09%	50.92%	77.19%	42.45%	65.80%	62.39%	62.39%	77.82%	71.20%	66.54%	74.48%	58.64%			
Oct-19	71.43%	71.34%	62.45%	48.50%	72.78%	68.28%	60.38%	61.34%	46.57%	59.33%	64.73%	64.73%	54.88%	61.34%	55.31%	77.68%	82.04%			
May-20																				
Jun-20																				
Jul-20																				
Aug-20	35.58%	71.30%	68.13%	43.89%	33.47%	85.71%	20.33%	67.99%	35.60%	65.24%	73.11%	49.63%	59.20%	78.38%	61.49%	72.73%	66.34%	73.22%	77.52%	78.70%
Sep-20	49.44%	70.78%	107.96%	30.39%	36.92%	59.29%	11.37%	80.86%	54.71%	58.12%	89.80%	48.40%	59.38%	77.38%	60.85%	59.72%	39.73%	68.56%	71.93%	112.75%
Oct-20	70.57%	78.82%	94.42%	50.86%	83.50%	61.99%	49.01%	80.17%	62.96%	69.52%	58.85%	73.54%	75.18%	86.72%	76.95%	87.04%	36.60%	42.69%	86.67%	114.36%

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Appendix F: Stream Flow and Transparency Data

		Stream Flow (CFS)						Transparency (CM)					
Stream Name	Month	2020	2019	2018	2017	2016	2015	2020	2019	2018	2017	2016	2015
Apple Creek	May				40.1					41.4	10.48		
	June				55.7				12	59	5		
	July									46.5	5.11		
	August							25					
	September				6.2			26	32	0.5	7.4		38.5
	October									70			
Ashwaubenon Creek	May					0.818				42.3		18	
	June									17.33		31.1	
	July		27.1			14.6			27.3	12.33		40.4	
	August		0	0	46.4	0		28.49	25.7	32	15.5	15.2	
	September			0	13.9	16.8		51.4	9.2	21	68	11.5	17.9
	October	0		0	36.6	54		101	13	35	21	17.6	
Baird Creek	May			4.94	11.2	2.5			17	79.2	110.3	122	
	June		18.44	74.69	12.6	0.56				54	23.5	55.2	
	July		2.57	6.1	10				56.3	10	18.35		
	August		38.25	47.23	4.5			120	7.5	76			
	September			59.9				115	39.5	55	102.35		82.5
	October				4.1	4.5		20.32	29.3	26	120	81.2	
Bower Creek	May			19.2	8.6	1.178			15	62	84.7	97	
	June		84.47		2.2	1			55	21		34.6	
	July			1.3	2.3				21	64	10.7		
	August			0	3.5			37	15	78	80		
	September			12.8				27	17	38	56.15		36.2
	October			23.5	4.2				58	113	56		

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Lower Duck Creek @ Pamperin Park	May			74.1	49.5	10.95		120	105	99.1	55	
	June		54.7	510.3	42.2	14.9		15.1	32.5	45.4	21.7	
	July		97.2	16.5	40.5	7.1		31	46.3	25.1	28.3	
	August	20.3	102	7.2	52.9	3.8	25.1	44.85	52.5	55.25	31.5	
	September	10.2	240	49.3	40.1	27.2	83.5	29	93	52.5	55	
	October	82.1	154.9		98.3	34.1	68.5	95.5		22.7	78	
Dutchman Creek	May			19.5	38.54	7.713		17	83	55.1	72	
	June							37	14	47		
	July			1.3	7.1			24	45	58		
	August			1.3			35	26	62	35	55.01	
	September						108.5	29	62.8	105		
	October			0.5				34	120	2		
Middle East River @ HWY G	May		0	6.5	26.3	10.7		29	16	16	23	
	June			6	33.1			12	24	9.6		
	July				31			36.5	15	14.5		
	August			16.8	42.4		39	28	27	9.55		
	September			8	9.5		50.5		16.1	44.45	1.5	
	October				4.9		27	21	74			
Lower East River @ Harold Lewis Trail	May							0.31	32	50	40	
	June							0.5	15	30		
	July							32	21	16		
	August						0.25	11		29		
	September							6	4	32		
	October						15	33	14	29		
Garner's Creek	May		16.97	8.35	8.24	8.24		53.3	45	23	23	
	June		9.55	14.6	13.85	13.85		13	16	9	9	
	July		5.74	1.83	2.31	2.31		21.5	26.5	25	25	

	August		3.79	1.93	0	3.77		41	22.25	29.5	19	13	
	September		26.66	6.83		5.3		34	20.5	63.5	35	22.5	
	October		25.53	8.08	3.22	0		96	43	120	80	32	
Kankapot Creek	May		25.6			0.0015			78.2		16.2	56	
	June		0.8		16.6	10.6			22	28	7.46	10.23	
	July		139	0	2.1	0			27	54	12	5.3	
	August		0.17	0	1.5	0.17		55	26	9	44	18	
	September	0.097		0	0.269			32	13.4	0.09	7.5		
	October	1	1.33	0	1.868	0.3		40	30.2	90	42.5	44.1	
Mud Creek	May		0	3.2	14.7	12.9			67	84.1	100.2	120	
	June			6.4	7.4				81.2	93.1	114.2	53	
	July			2.6	24.7					101.5	76	120	
	August	1.18		0.6	24.6	3740				108	78.8	94	
	September	0.9		7.5	0.2	223.51		120		88.95	71.2	47.9	
	October	18.7			45.7	4.2		56		120	79.65	120	
Neenah Slough	May		0	4.59		12.4			45.8	117.4	41.8	120	18
	June			20.87					87.4	142	42.7	19.1	
	July			5.3	7	15.41			120	120	120	93.2	
	August				9.7	13.2		81.1	115	1.2	118	120	
	September	0			26			65.5	26	120	120		
	October				13.4	7.7		31.3	50.23	120	45.5	116	
Plum Creek	May		13.2	2.3	3.7				51.5	26	34	10	
	June		4.9	36.3	16				20	13.8	12	15	
	July		3.3	3.3	4.7				21.5	20.5	15	21.2	
	August	0.7	7	0.8	0.9	2.6		29.5	18	29.5	15	19	
	September	0.8		9.1		2.7		41.5	20.5	8	46.3	6.5	
	October	13	66.3	7	1.3	2.6		22	6	75	29.8	32	

Upper Duck Creek @ CTH S	May		55.6						56	82		
	June		9.2						69.9	65		
	July		28.7						47.6	33		
	August		2.9					34.26	54.6	35		
	September	0						31	34.2	58		
	October	0						67	25	69		
Middle Duck Creek @ Seminary Rd	May								51	120		
	June		232						13.75	83		
	July		46						45.5	75		
	August	6.1	20.2					90	75.1	67		
	September	3.9	127.3					95	40.5	1.5		
	October	34.7	63.7					83	100			
Upper East River @ Mallard Rd	May		32	5.6					50.5	24.5		
	June		8.7	49.6					12.25	14.5		
	July		6.2	3.4					24	12.75		
	August	1.4	15.7	0.7				16	27	32.5		
	September	1.5		23.5				27	20	15		
	October	23.5		13.7				30	10.5	66.5		
Lancaster Creek	May			4.9	24.9				43.6	65	104.33	89
	June			6.4		0			101.3	61.3		0
	July			2.49	8.64	0				64.6	65.2	54.3
	August	0			8.99	0		120	84.6	22.9	77.47	12.3
	September			23.4	2.98	0		120	120	95.2	120	117
	October			6.12	5.07	0		105.5	120	120	120	117.2
Trib to Garner's Creek	May											
	June											
	July											

	August		48.5
	September		120
	October		26
West Plum Creek	May		
	June		
	July		
	August	0	23
	September		16
	October		15
Wequiock Creek	May		
	June		
	July		
	August		69
	September	0.192	120
	October	0.05	115

Appendix G: 2015-2020 Confidence Interval Table

River	TP Calculation	2020	2019	2018	2017	2016	2015
Apple Creek	**Median (mg/L)**	0.246	0.2645	0.1875	0.3180	0.2965	0.2730
	L90% (mg/L)	0.1600	0.2414	0.1264	0.2427	0.1537	0.2369
	U90% (mg/L)	0.2526	0.2721	0.2388	0.5980	0.4522	0.3110
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Ashwaubenon Creek	**Median (mg/L)**	0.257	0.4010	0.3010	0.3210	0.3160	0.3470
	L90% (mg/L)	0.1505	0.3364	0.2943	0.2568	0.2955	0.2747
	U90% (mg/L)	0.2793	0.5231	0.3142	0.4121	0.4607	0.4249
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Baird Creek	**Median (mg/L)**	0.1805	0.5060	0.2890	0.3170	0.1755	0.2875
	L90% (mg/L)	0.1107	0.3057	0.2276	0.2136	0.1446	0.1937
	U90% (mg/L)	0.3295	0.5321	0.4064	0.3681	0.1967	0.3402
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Bower Creek	**Median (mg/L)**	0.2755	0.3280	0.3225	0.3100	0.2065	0.1985
	L90% (mg/L)	0.2179	0.2772	0.1703	0.2162	0.1639	0.1739
	U90% (mg/L)	0.3206	0.3741	0.3396	0.3600	0.2643	0.2600
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Lower Duck Creek	**Median (mg/L)**	0.1565	0.1480	0.1335	0.1915	0.1730	0.1405
	L90% (mg/L)	0.0761	0.1018	0.0949	0.1286	0.1183	0.1110
	U90% (mg/L)	0.1855	0.1980	0.1909	0.2452	0.2071	0.1910
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Dutchman Creek	**Median (mg/L)**	0.161	0.2795	0.1405	0.1570	0.1570	0.2090

	L90% (mg/L)	0.0931	0.1653	0.1150	0.1201	0.1307	0.1477
	U90% (mg/L)	0.2540	0.3368	0.2512	0.1987	0.2020	0.3076
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
East River (G)	**Median (mg/L)**	0.333	0.4205	0.3210	0.4595	0.4715	0.5255
	L90% (mg/L)	0.2602	0.3360	0.2388	0.3627	0.3740	0.3986
	U90% (mg/L)	0.3752	0.5087	0.3765	0.4898	0.6056	0.6797
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
East River @Harold	**Median (mg/L)**	0.1515	0.1700	0.3210	0.1425	0.2515	
	L90% (mg/L)	0.1110	0.1192	0.2015	0.1015	0.1639	
	U90% (mg/L)	0.2603	0.2456	0.3987	0.2610	0.3428	
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	
Garner's Creek	**Median (mg/L)**	0.1	0.1280	0.1000	0.1285	0.1315	0.1385
	L90% (mg/L)	0.0767	0.0899	0.0586	0.1089	0.0991	0.1255
	U90% (mg/L)	0.1244	0.1360	0.1212	0.1376	0.1457	0.2484
		Clearly Exceeds	Clearly Exceeds	May Exceed	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Kankapot Creek	**Median (mg/L)**	0.311	0.3545	0.4015	0.4975	0.4228	0.3653
	L90% (mg/L)	0.2486	0.2960	0.3024	0.4142	0.2440	0.3238
	U90% (mg/L)	0.3333	0.3972	0.4893	0.6059	0.3581	0.4965
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
Mud Creek	**Median (mg/L)**	0.0898	0.0923	0.0975	0.0883	0.0978	0.1038
	L90% (mg/L)	0.0519	0.0649	0.0726	0.0762	0.0909	0.0910
	U90% (mg/L)	0.1078	0.1100	0.1149	0.1211	0.1155	0.1201
		May Exceed	May Exceed	May Exceed	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds

Neenah Slough	**Median (mg/L)**	0.0991	0.1100	0.0765	0.0907	0.1120	0.0860
	L90% (mg/L)	0.0678	0.0828	0.0595	0.0655	0.0846	0.0725
	U90% (mg/L)	0.1359	0.1486	0.1260	0.1131	0.1939	0.1581
		May Exceed	Clearly Exceeds	May Exceed	May Exceed	Clearly Exceeds	May Exceed
Plum Creek	**Median (mg/L)**	0.399	0.4005	0.4415	0.5320	0.4805	0.1505
	L90% (mg/L)	0.2961	0.2972	0.3324	0.4684	0.2723	0.1271
	U90% (mg/L)	0.4620	0.5164	0.6053	0.8822	0.7344	0.1676
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds	Clearly Exceeds
East River @ Mallard	**Median (mg/L)**	0.41	0.5025	0.5290			
	L90% (mg/L)	0.2904	0.3590	0.3528			
	U90% (mg/L)	0.4540	0.5869	0.5986			
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds			
Upper Duck Creek	**Median (mg/L)**	0.18	0.1535	0.2465			
	L90% (mg/L)	0.1204	0.1128	0.1603			
	U90% (mg/L)	0.2374	0.2076	0.3622			
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds			
Mid Duck Creek	**Median (mg/L)**	0.158	0.2100	0.1580			
	L90% (mg/L)	0.1259	0.1414	0.1371			
	U90% (mg/L)	0.2144	0.2471	0.1918			
		Clearly Exceeds	Clearly Exceeds	Clearly Exceeds			
Lancaster Creek	**Median (mg/L)**	0.0778	0.0606	0.0913	0.0758	0.0854	0.0754
	L90% (mg/L)	0.0672	0.0451	0.0552	0.0637	0.0629	0.0629
	U90% (mg/L)	0.0917	0.0676	0.1181	0.0879	0.1297	0.1291

	May Exceed	Clearly Meets	May Exceed	May Meet	May Exceed	May Meet

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Appendix H: Duplicate Sample Dates and Data

Site Name	Date	Parameter	Duplicate Sample	Regular Sample	Absolute Difference	
Apple Creek - Rosin Rd	9/15/2020	PHOSPHATE ORTHO DISS	0.063	0.0623	0.0007	MG/L
Apple Creek - Rosin Rd	9/15/2020	PHOSPHORUS TOTAL	0.125	0.126	0.001	MG/L
Apple Creek - Rosin Rd	9/15/2020	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	22.3	NA	NA	MG/L
Apple Creek - Rosin Rd	9/15/2020	NITROGEN TOTAL	1.43	1.44	0.01	MG/L
Duck Creek-Pamperin Park	8/14/2018	PHOSPHATE ORTHO DISS	0.0301	0.0302	0.0001	MG/L
Duck Creek-Pamperin Park	8/14/2018	PHOSPHORUS TOTAL	0.103	0.0975	0.0055	MG/L
Duck Creek-Pamperin Park	8/14/2018	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	18.8	11.8	7	MG/L
Neenah Slough #2 (100ft S of Adams St)	9/25/2018	PHOSPHATE ORTHO DISS	0.04944	0.0548	0.00536	MG/L
Neenah Slough #2 (100ft S of Adams St)	9/25/2018	PHOSPHORUS TOTAL	0.078	0.088	0.01	MG/L
Neenah Slough #2 (100ft S of Adams St)	9/25/2018	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	31.4	9.8	21.6	MG/L
West Plum Creek - DS of County Line Rd	9/14/2020	PHOSPHORUS TOTAL	1.7	1.71	0.01	MG/L
West Plum Creek - DS of County Line Rd	9/14/2020	PHOSPHATE ORTHO DISS	1.21	1.23	0.02	MG/L
West Plum Creek - DS of County Line Rd	9/14/2020	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	33.8	NA	NA	MG/L
West Plum Creek - DS of County Line Rd	9/14/2020	NITROGEN TOTAL	2.92	2.9	0.02	MG/L

	Level of Detection (LOD)	Level of Quantification (LOQ)
TP	0.009	0.03
DRP	0.0023	0.008
TSS	2.5	2.5
TN	0.058	0.192

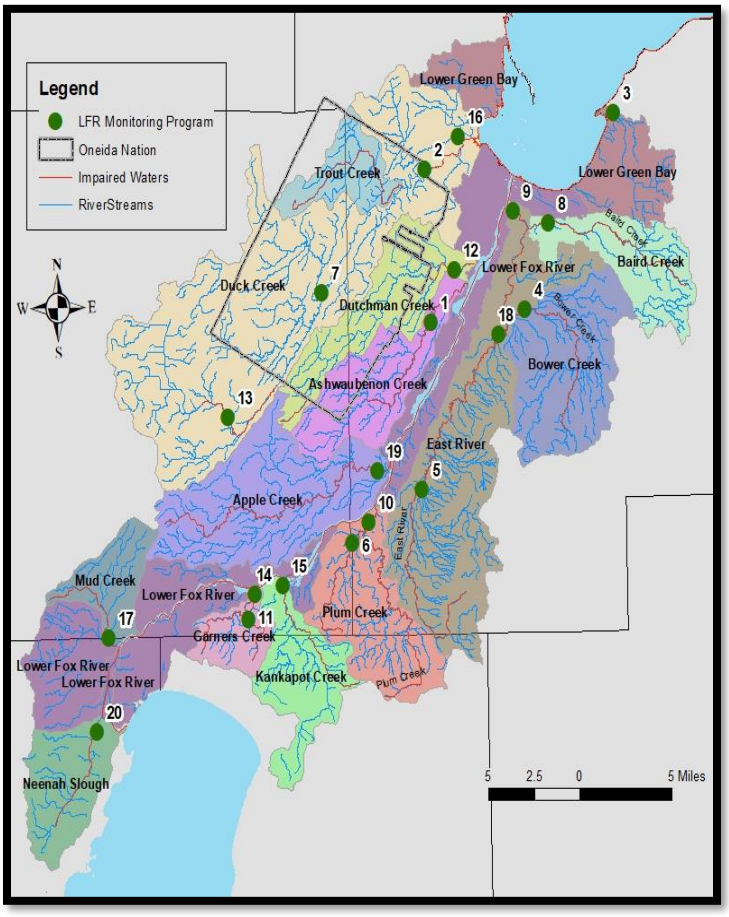
Appendix I: Lower Fox River Volunteer Monitoring Fact Sheet

Lower Fox River Basin Monitoring Fact Sheet

In 2012, the EPA approved the Lower Fox River Total Maximum Daily Load (TMDL). The TMDL identifies the need for pollutant reductions in waterbodies throughout the basin to meet water quality standards. There are 27 stream segments in the Lower Fox basin listed as impaired due to excess phosphorus and/or sediment loading.

Phosphorus is an essential nutrient for plant growth, but can have detrimental effects on lakes, rivers, and streams when excessive amounts are introduced to these systems. Common forms of pollutant delivery in these systems include surface runoff from urban and agricultural areas and discharges from wastewater treatment facilities, industrial businesses, and farms. Excess phosphorus in a river system can create harmful algal blooms during the summer months which impact human, plant, and animal life.

In 2015, the Lower Fox River Volunteer Monitoring program began to help achieve the monitoring goals outlined in the TMDL. There are 20 stream monitoring locations total across 16 tributary streams which are monitored by citizen volunteers. Volunteers are relied upon to collect surface water samples following WDNR protocol on a monthly basis between the months of May and October. Water samples are shipped to the State Lab of Hygiene in Madison and are analyzed for Total Phosphorus, Total Suspended Solids, and Total Nitrogen



Basin facts

- Watershed area: 641 square miles (403,657 acres)
- Includes 4 counties (Brown, Outagamie, Calumet, Winnebago) and Oneida Tribal Land.
- 27 impaired waterbody segments
- Approx. 300 farms
- 29 MS4s*
- 32 Dischargers
  - 14 municipal
  - 18 industrial

Want to get involved or have questions? Contact:

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*MS4s - municipal separate storm sewer system; municipalities with WPDES permits for stormwater management.

More information can be found at: https://dnr.wisconsin.gov/topic/TMDLs/LowerFox/VolunteerMonitoring.html

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	Stream Name	*WBIC*	*SWIMS ID*	*SWIMS Station Name*	*Latitude*	*Longitude*	*Impairment*
1	**Ashwaubenon Creek**	122200	10016502	Ashwaubenon Creek - Grant Street	44.44508	-88.09875	TP and TSS
2	**Lower Duck Creek**	409700	10038644	Duck Creek - Pamperin Park	44.54773	-88.10285	TP and TSS
3	**Wequiock Creek**	3000022	10010769	Nicolet Rd/CTY A	44.57651	-87.89083	
4	**Bower Creek**	118400	10009445	Bower Creek (1) 50m Upstream of Hwy Gv	44.45179	-87.99543	TP and TSS
5	**Upper East River**	118000	53508	East River at Mallard Rd	44.33542	-88.11198	TP and TSS
6	**West Plum Creek**	125200	10016494	Downstream of County Line Rd	44.30296	-88.18901	TP
7	**Mid Duck Creek**	409700	453255	Duck Creek at Seminary Rd	44.46608	-88.21892	TP and TSS
8	**Baird's Creek**	118100	53683	Baird Creek at Preble WI	44.50741	-87.96754	TP and TSS
9	**East River**	118000	10043279	East River @ Harold Lewis Trail off Main Street	44.51633	-88.00587	TP and TSS
10	**Plum Creek**	125100	10046999	Plum Creek - VandeHey Farm Crossing	44.31540	-88.17154	TP and TSS
11	**Tributary to Garners Creek**	5022162	10047157	US CTH CE	44.25392	-88.30658	TP
12	**Dutchman's Creek**	121600	10015851	Dutchmans Creek - Oneida Street	44.47859	-88.0723	TP
13	**Upper Duck Creek**	409700	10029975	Duck Creek at CTH S	44.38665	-88.32509	TP and TSS
14	**Garner's Creek**	127700	10043028	Garner's Creek - DS of Cty Z	44.2701	-88.29816	TP and TSS
15	**Kankapot Creek**	126800	453261	Kankapot Creek - Cth Z Dodge St 100 Ft US of Bridge	44.27504	-88.26778	TP and TSS
16	**Lancaster Creek**	410000	10034510	Unnamed Trib. (410000) - Lakeview Dr	44.56583	-88.06471	
17	**Mud Creek**	129500	453258	Mud Creek - County Highway BB	44.24417	-88.46037	TP and TSS

18	**East River (G)**	118000	53675	East River - Hwy G	44.43550	-88.02457	TP and TSS
19	**Apple Creek**	124100	53684	Apple Creek - Rosin Rd	44.34861	-88.16119	TP and TSS
20	**Neenah Slough**	130800	10032175	Neenah Slough #2 (100ft S of Adams St)	44.18274	-88.47481	TP

*SWIMS – Surface Water Integrated Monitoring System; a Wisconsin DNR information system that holds chemistry (water, sediment), physical, and biological (macroinvertebrate, aquatic invasive species) surface water data.