

Upper Fox River and Wolf River Volunteer Monitoring Program  
Project Summary  
Final – September 2021

**Upper Fox River Basin and Wolf River Basin Volunteer Monitoring Program**

**Upper Fox and Wolf Basins TMDL**

**2020 Project Summary**

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Upper Fox River and Wolf River Volunteer Monitoring Program  
Project Summary  
Final – September 2021

**Table of Contents**

Project Summary.....	3
Project Location.....	3
Project Background.....	4
Project Goals.....	4
Proposed Work and Sampling Procedure.....	5
2020 Sampling Season.....	5
Summary.....	5
Outreach.....	6
Assessing Water Quality.....	6
Total Phosphorus and Dissolved Reactive Phosphorus Analysis.....	8
Stream Flow and Transparency.....	9
Conclusion.....	9
Acknowledgements.....	9
Appendices	
Appendix A: Upper Fox and Wolf Volunteer Monitoring Program Locations.....	10
Appendix B: Upper Fox and Wolf Volunteer Monitoring Location Descriptions.....	11
Appendix C: Monitoring Data.....	12
Appendix D: Impaired Waters.....	14
Appendix E: DRP % of TP.....	15
Appendix F: Stream Flow and Transparency Data.....	16
Appendix G: Graphs.....	20
Appendix H: Upper Fox and Wolf Volunteer Monitoring Program Fact Sheet.....	30

# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

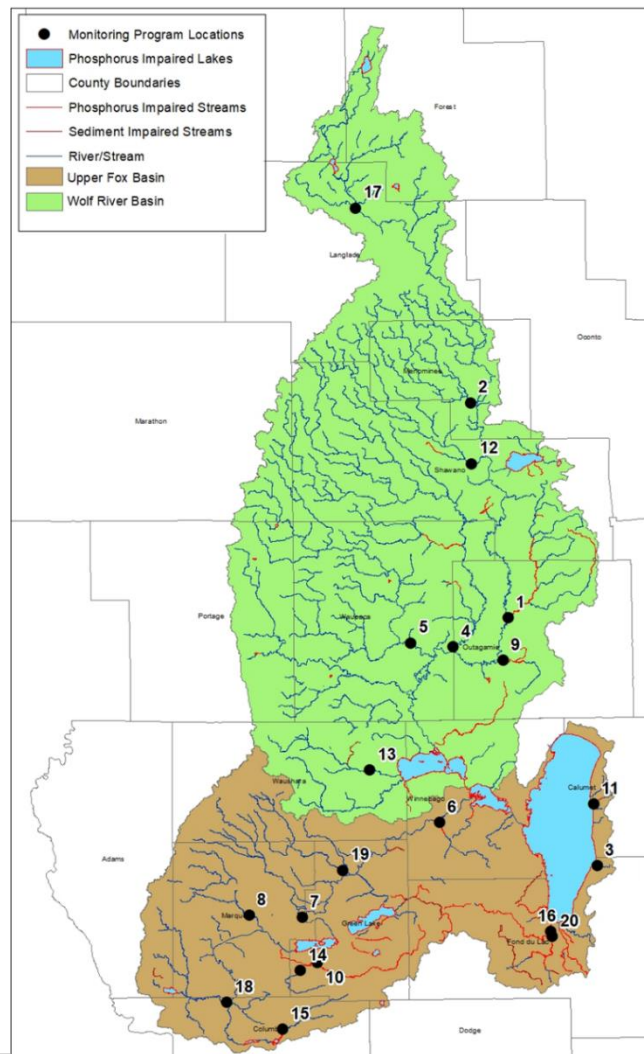
### Final – September 2021

### *Project Summary*

#### **Project Location**

The project area is located within the Upper Fox River basin and the Wolf River basins (UFWB) in northeast and central Wisconsin. The Wolf River basin is 3,700 square miles and extends from the headwaters of the Wolf River in Forest County to the Wolf River confluence with Lake Butte des Morts in Winnebago County. The Upper Fox basin is 2,200 square miles and extends from the headwaters of the Fox River in Columbia and Adams Counties to the outlet of Lake Winnebago. The Upper Fox basin also includes the direct drainage areas to Lake Winnebago. (Map below)

The Upper Fox and Wolf Volunteer Monitoring Program utilizes citizen volunteers to collect surface water samples from 20 different streams and rivers throughout the UFWB. Sampling locations are evenly distributed among the Upper Fox basin, Wolf basin, and Lake Winnebago region. These streams and rivers contribute nutrients and sediment to the Wolf River, Upper Fox River, and ultimately Lake Winnebago. Monitoring locations are displayed in map below and more detailed location information can be found in Appendix A.



# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

### Final – September 2021

#### ***Project Background***

The EPA approved the UFWB Total Maximum Daily Load (TMDL) in 2020. Implementation of the TMDL aims to improve water quality by reducing total phosphorus (TP) and total suspended solids (TSS) in waterbodies throughout the basins. The TMDL identifies and quantifies the sources and necessary phosphorus and sediment reductions to reach water quality goals. In order to determine effectiveness of TMDL implementation activities, one objective of the TMDL implementation stage is to evaluate long-term water quality trends within the entirety of the UFW watersheds.

The UFW Volunteer Monitoring Program was initiated in 2020 to achieve some of the monitoring objectives resulting from the TMDL. Twenty (20) sampling sites were chosen for monthly (May – October) surface water sampling. Each monitoring location was carefully selected for the program to assess long-term water quality trends throughout the basins. Monitoring locations and descriptions of why each site was chosen are provided in Appendix B.

Given the time commitment and the spatial extent of the monitoring sites in the UFWB, the assistance of volunteers is vital to the success of the program. Volunteers serve the essential role of data collectors, as they collect monthly surface water samples across the 20 monitoring streams in the UFWB. Volunteers are trained before each sampling season by Wisconsin DNR staff to ensure reliable and accurate results are achieved each month.

#### ***Project Goals***

There are two main goals for this project: (1) Increase public awareness and involvement of water quality issues by engaging residents 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 starting in 2025 if sufficient funds), TSS, total nitrogen (TN), and associated chemical and physical characteristics in 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 streams.

Additional goals of this project include:

1. Evaluate nutrient and sediment concentrations in the tributaries discharging to the Upper Fox River, Wolf River, and Lake Winnebago.
2. Monitor the health of the watershed overtime.
3. Provide a basis for evaluation of the long-term effectiveness of implementation of the Upper Fox and Wolf 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.

# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

### Final – September 2021

#### ***Proposed Work and Sampling Procedure***

The UFW Volunteer Monitoring Program kicked off in 2020. Coordination and implementation of volunteer monitoring efforts are administered by WDNR staff. Specifically, the WDNR:

- Continues to develop a well-trained volunteer base through various means of recruitment and community engagement:
  - o Volunteers are trained to follow Water Action Volunteer (WAV) (<https://wateractionvolunteers.org/>) monitoring protocol to ensure consistency is being met in each sample
  - o 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.
  - o Volunteers collect streamflow and transparency data at the time of surface water sample collection.
  - o Each year duplicate samples are collected randomly for 10% of the sampling events. These samples are collected at the same time as the regular sample. No duplicate samples were collected in 2020.
- Continue to provide support to volunteers as needed
  - o Ensure safe access and suitability at each monitoring station
  - o Ordering, preparing, and maintaining supplies for volunteers to successfully carry out monitoring activities and shipment of samples
  - o 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 sampling events per year.
- Compile monthly sampling data results to share with volunteers and stakeholders.
  - o Record data into tables and graphs for analysis
  - o Develop an annual report complete with data and figures to share with interested stakeholders to assess annual water quality.

#### ***2020 Sampling Season***

##### ***Summary***

Due to the COVID-19 pandemic, planning and coordination of the volunteer monitoring program was postponed delaying volunteer recruitment, equipment and supply purchases, and volunteer training. Water sample collection was delayed until August allowing only three sampling events (August, September, October) in 2020. New equipment was purchased for the volunteer monitoring program.

Due to the pandemic, a large event water sampling training was not held due to safety and health concerns with large gatherings. Instead, the project coordinator trained volunteers one-on-one at their sampling site during the months of August and September. Sampling was dependent on when new volunteers were available for a training. A total of 6 volunteers were trained and two volunteers did not need training. Five volunteers were trained in August and one volunteer was trained in September.

Volunteers collected surface water samples each month (August – October) which were analyzed for TP, DRP, TN, and TSS. Samples were collected at 12 of the 20 monitoring sites. A total of 3 samples were

# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

### Final – September 2021

missed at 7 sampling sites and 4 samples were missed at 5 sampling sites. Eight of the 20 sites were not sampled in 2020 because volunteers were not able to be found. A group of 8 volunteers monitored 12 sites: four volunteers sampled 2 sites and the other 8 sites were volunteered by one group or an individual.

#### ***Outreach***

- An Upper Fox and Wolf Volunteer Monitoring Fact Sheet (Appendix H) was shared across various means 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.
- An outreach article was featured in the Green Lake WAV newsletter to attract volunteers to sample sites in the Green Lake County area.
- County Land and Conservation departments were contacted to assist with sample collection in 2020.

#### ***Assessing Water Quality***

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. All streams and rivers sampled through the Volunteer Monitoring Program have a target median summer (May – October) TP concentration of 0.075 mg/L. Since no water quality criteria currently exist for TSS and TN for streams and rivers in the Upper Fox and Wolf Basins TMDL, the water quality assessment in this report will focus on Phosphorus.

According to the WDNR 2020 303(d) Impaired Waters list, 8 of the 20 sampling streams (Bear Creek, East Branch Fond du Lac River, Grand River, Mud Creek, Pipe Creek, Shioc River, Waukau Creek, and West Branch Fond du Lac River) are impaired due to high levels of total phosphorus (TP) and/or total suspended solid (TSS) levels in the water. Appendix D provides more information about the impaired monitoring streams.

Of these 8 streams, 6 were sampled in 2020 (Bear Creek, East Branch Fond du Lac River, Grand River, Shioc River, Waukau Creek, and West Branch Fond du Lac River). Five of these monitoring sites had a median TP concentration exceeding the TP Water Quality standard of 0.075 mg/L. Bear Creek was the one impaired stream site with a median TP concentration below the TP water quality standard at 0.072 mg/L. However, samples were only collected in September and October.

Although sample collection was less than 100% in 2020, median and average values were still calculated. Median and average TP values for each monitoring station are provided below. These calculations do not consider variations in temperature, precipitation, or implementation of best management practices. These values also may not be a proper representation of the median and average TP values. Percent completion of sampling for each year is provided below. 2020 sampling data is provided in Appendix C.

Upper Fox River and Wolf River Volunteer Monitoring Program  
 Project Summary  
 Final – September 2021

Average TP (mg/L)	
Station	2020
Bear Creek	0.072
Belle Fountain Creek	
East Branch FDL River	0.180
Embarrass River	0.047
Fox River	
Grand River	0.172
Little Wolf River	0.043
Mecan River	
Montello River	
Mud Creek	
Neenah Creek	
Pine River	
Pipe Creek	
Red River	0.021
Shioc River	0.320
Waukau Creek	0.144
West Branch FDL River	0.200
West Branch Wolf River	0.018
White River	0.026
Wolf River	0.032

Median TP (mg/L)	
Station	2020
Bear Creek	0.072
Belle Fountain Creek	
East Branch FDL River	0.203
Embarrass River	0.047
Fox River	
Grand River	0.178
Little Wolf River	0.043
Mecan River	
Montello River	
Mud Creek	
Neenah Creek	
Pine River	
Pipe Creek	
Red River	0.024
Shioc River	0.320
Waukau Creek	0.143
West Branch FDL River	0.177
West Branch Wolf River	0.018
White River	0.024
Wolf River	0.036

Sample Collection Completeness (%) - Out of 6 samples per year	
Station Name	2020
Bear Creek	33.3%
Belle Fountain Creek	0.0%
East Branch FDL River	50.0%
Embarrass River	33.3%
Fox River	0.0%
Grand River	50.0%
Little Wolf River	33.3%
Mecan River	0.0%
Montello River	0.0%
Mud Creek	0.0%
Neenah Creek	0.0%
Pine River	0.0%
Pipe Creek	0.0%
Red River	50.0%
Shioc River	33.3%
Waukau Creek	50.0%
West Branch FDL River	50.0%
West Branch Wolf River	33.3%
White River	50.0%
Wolf River	50.0%
Combined Percentage	22.55%

# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

### Final – September 2021

#### ***Total Phosphorus and Dissolved Reactive Phosphorus Analysis***

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. 17 of 31 (54.8%) TP samples collected in 2020 met the State water quality standard (0.075 mg/L) for rivers and streams. 7 of the 12 (58%) sites sampled in 2020 had median TP values below the TP Water Quality standard of 0.075 mg/L. Four of the seven sampling sites with median TP values below the TP water quality standard had only two samples collected in 2020 while the rest of the sites had three samples collected in 2020.

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 31 TP samples collected in 2020, 28 samples (90%) had 50% or more of their concentration in the dissolved form (Table 1). A total of 5 DRP samples exceeded their TP concentrations, but all 5 of these samples had relatively low TP and DRP concentrations. The samples' TP concentrations were between the TP Level of Detection (LOD) of 0.008 mg/L and Level of Quantification (LOQ) of 0.028 mg/L. The absolute difference between each samples' results were also less than either tests' LOQ. This can be attributed to normal uncertainty or margin of error associated with the tests. A DRP percentage of TP table can be found in Appendix E.

The relationship between total phosphorus and dissolved reactive phosphorus will continue to be assessed as additional data is collected through the monitoring program. In addition to assessing the relationship between TP and DRP, total nitrogen analysis may provide valuable insight to water quality across the monitoring sites. Nitrogen may have similar impacts to water quality as Phosphorus does. Nitrogen is commonly found and used in agricultural settings, so testing for it may prove useful in assessing water quality across the UFWB. Additional data across all parameters will be useful as the program continues. Sampling data and graphs are located in Appendix C and G.

*Table 1- 90% of TP samples had >50% DRP*

TP Samples with > 50% DRP	2020
# Sites	12
# Samples Collected	31
# TP Samples with < 50% DRP	3
# TP Samples with > 50% DRP	28
% TP Samples with > 50% DRP	<b>90%</b>

*Table 2- 54.8% of TP samples met the TP water quality criteria in 2020.*

TP Samples Below 0.075 mg/L	2020
# Sites	12
# Samples Collected	31
# Above 0.075 mg/L	14
# Below 0.075 mg/L	17
% Below 0.075 mg/L	<b>54.8%</b>



# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

### Final – September 2021

#### ***Stream Flow and Transparency***

In addition to collecting surface water samples 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.

#### ***Conclusion***

The primary goal of the UFW Volunteer Monitoring Program is to engage the public and increase their awareness of water quality issues. In 2020, 8 volunteers collected samples across 12 streams. Some of these volunteers are part of larger organizations, making the contribution much higher.

Volunteer recruitment was carried out in different ways in 2020. Two main contributions to volunteer recruitment were newsletter articles and outreach to Land and Water Conservation Departments. 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.

The water quality data is crucial to tracking long-term trends in water quality. 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. Multiple watersheds within the UFW basin currently have or are developing 9 Key Element plans to reduce phosphorus and sediment in high loading watersheds. As implementation of these plans occur, monitoring data will be used to help track implementation progress and determine where additional data and information is needed to track progress.

#### ***Acknowledgements***

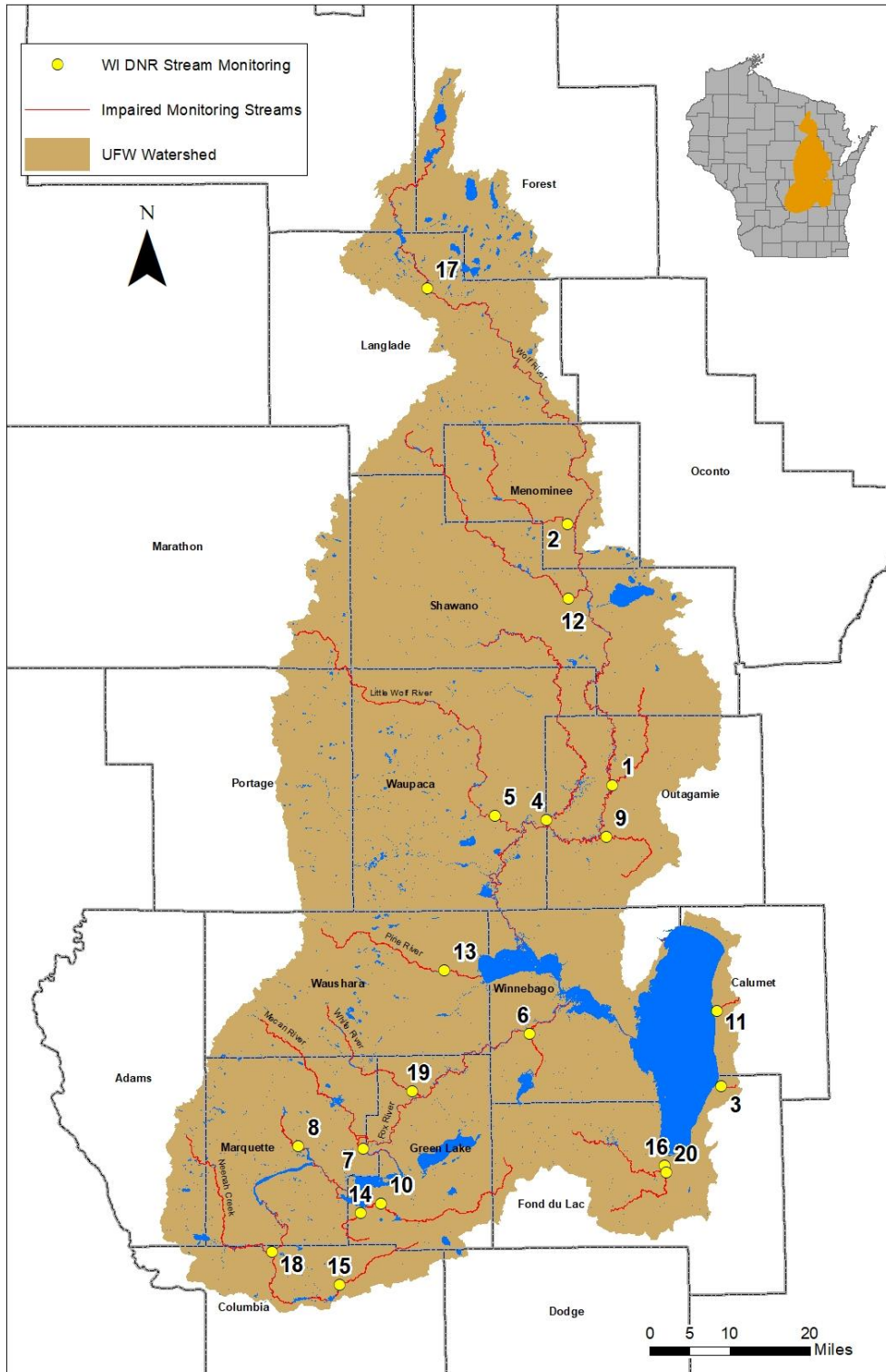
Thank you to all the volunteers who have made the Upper Fox and Wolf Volunteer Monitoring Program possible. Thank you to the Wisconsin DNR and the Water Action Volunteer program for funding and support.

# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

### Final – September 2021

#### Appendix A: Upper Fox and Wolf Volunteer Monitoring Program Locations



# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

### Final – September 2021

#### Appendix B: Upper Fox and Wolf Monitoring Location Descriptions

Sampling Location	SWIMS Station ID	Stream Name	SWIMS Station Name	County	X	Y	Reason For Sampling Location
1	453030	Shioc River	Shioc River At Sth 187	Outagamie	-88.5602	44.46438	Represents the outlet of TMDL subbasin 53, improvements can be demonstrated over time
2	403003	West Branch Wolf River	West Branch Wolf River West Branch Rd	Menominee	-88.6643	44.94093	Represents the outlet of the West Branch Wolf River HUC 10 watershed
3	10016803	Pipe Creek	Pipe Creek- Pipe Creek- 30 Feet Above Hwy 151 bridge	Fond du Lac	-88.3103	43.91841	Location monitored in 2012 to support the development of the TMDL, repeating the sampling can demonstrate improvements over time.
4	10033493	Embarrass River	Embarrass River at New London Hwy 54	Outagamie	-88.7302	44.40595	Location monitored in 2012 to support the development of the TMDL, repeating the sampling can demonstrate improvements over time.
5	693217	Little Wolf River	Little Wolf River at Royalton STH 54	Waupaca	-88.8565	44.41828	Location monitored in 2012 to support the development of the TMDL, repeating the sampling can demonstrate improvements over time.
6	713285	Waukau Creek	Waukau Creek at Cth E USGS Site ID 04073970	Winnebago	-88.7854	44.01841	Location monitored in 2012 to support the development of the TMDL, repeating the sampling can demonstrate improvements over time.
7	393005	Mecan River	Mecan River- CTH C	Marquette	-89.2095	43.81679	Represents the outlet of TMDL subbasin 21.
8	10022879	Montello River	Montello River At 11th St. Bridge USGS Site ID 04072845	Marquette	-89.3575	43.82047	Location monitored in 2012 to support the development of the TMDL, repeating the sampling can demonstrate improvements over time.
9	453259	Bear Creek	Bear Creek at Sth 76	Outagamie	-88.5779	44.36569	Location monitored in 2012 to support the development of the TMDL, repeating the sampling can demonstrate improvements over time.
10	243015	Grand River	Grand River at Cth H Near Kingston WI	Green Lake	-89.1541	43.71198	Represents the inlet of the Grand River Marsh and the outlet of a subbasin 14.
11	83121	Mud Creek	Mud Creek at Mud Creek Rd	Calumet	-88.3171	44.05352	Location monitored in 2012 to support the development of the TMDL, repeating the sampling can demonstrate improvements over time.
12	10014632	Red River	Red River- Maple Ave	Shawano	-88.6598	44.80352	Represents the outlet of the Red River HUC 10 watershed.
13	10032735	Pine River	Pine River at Hwy 49	Waushara	-88.9962	44.13583	Represents the outlet of TMDL subbasin 47, improvements can be demonstrated over time
14	243028	Belle Fountain Creek	Belle Fountain Creek at Cth B	Green Lake	-89.2148	43.70417	Represents the outlet of Belle Fountain Creek HUC 12 watershed.
15	10014339	Fox River	Fox River- Highway 33	Columbia	-89.277	43.56994	Represents the outlet of TMDL subbasin 5 and the water quality of headwater section of the Fox River. Improvements can be demonstrated over time
16	10037662	West Branch Fond du Lac River	West Branch FDL at Forest Ave	Fond du Lac	-88.4553	43.77697	Represents the outlet of TMDL subbasin 44. The West Branch Fond du Lac River is listed as impaired. Repeated sampling can demonstrate improvements over time.
17	343057	Wolf River	WOLF River- CTH T	Langlade	-89.0129	45.36753	Represents the outlet of subbasin 80.
18	113070	Neenah Creek	Neenah Creek - Cth Cm	Columbia	-89.4352	43.63128	Represents the outlet of Neenah Creek and TMDL subbasins 1 and 4. Improvements can be demonstrated over time
19	10041320	White River	White River- White River Rd Landing	Green Lake	-89.079	43.91748	Represents the outlet of TMDL subbasin 21.
20	10014745	East Branch Fond du Lac River	East Branch FDL at 12th St.	Fond du Lac	-88.4511	43.76557	Location monitored in 2012 to support the development of the TMDL, repeating the sampling can demonstrate improvements over time.

Upper Fox River and Wolf River Volunteer Monitoring Program  
Project Summary  
Final – September 2021

**Appendix C: Monitoring Data**

Stream Name	Month	TP 2020	DRP 2020	TSS 2020	TN 2020
Bear Creek	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August				
	September	0.0576	0.033	2.6	0.99
	October	0.0867	0.071	ND	0.763
East Branch FDL River	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August	0.203	0.179	5.6	3.51
	September	0.208	0.17	21	2.26
	October	0.129	0.116	4	3.12
Embarrass River	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August				
	September	0.0633	0.0264	44	2.88
	October	0.0298	0.0258	2.8	2.4
Grand River	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August	0.178	0.174	ND	2.07
	September	0.11	0.0808	2	3.32
	October	0.229	0.0965	17.8	3.94
Little Wolf River	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August				
	September	0.0664	0.0335	24	2.31
	October	0.02	0.0263	2	2.55
Red River	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August	0.0243	0.0207	ND	1.38
	September	0.0255	0.0228	4.4	1.5
	October	0.0142	0.0256	ND	2.2

Upper Fox River and Wolf River Volunteer Monitoring Program  
 Project Summary  
 Final – September 2021

Shioc River	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August				
	September	0.275	0.147	14.8	1.74
	October	0.365	0.257	5	1.34
Waukau Creek	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August	0.143	0.0659	7.4	0.964
	September	0.0432	0.032	7.6	1.03
	October	0.247	0.167	117	1.84
West Branch FDL River	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August	0.31	0.249	12	1.23
	September	0.177	0.179	7	0.938
	October	0.114	0.11	5	0.911
West Branch Wolf River	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August				
	September	0.0188	0.0251	ND	0.623
	October	0.0178	0.0174	8	0.892
White River	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August	0.0238	0.015	6.8	1.38
	September	0.0211	0.0258	4	1.95
	October	0.0326	0.0232	ND	1.5
Wolf River	May	-	-	-	-
	June	-	-	-	-
	July	-	-	-	-
	August	0.036	0.0182	4.4	0.755
	September	0.036	0.0254	4.6	0.711
	October	0.0249	0.0184	2.6	0.642

# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

### Final – September 2021

#### Appendix D: Impaired Waters

Local Waterbody	Waters ID	WBIC	County	Start Mile	End Mile	Total Size	Waterbody Condition	Date Listed	Source Category	Pollutant	Impairment	Listings Status	TMDL Priority	Listing Condition
Pipe Creek	10979	132800	Fond Du Lac	0	2.5	2.5	Category 5A	4/1/2020	NPS	Total Phosphorus	Degraded Biological Community	Proposed for List	High	TMDL Needed (5A)
West Branch Fond Du Lac River	10990	134000	Fond Du Lac	0	26.79	26.79	Category 5A	4/1/2016	PS/NPS	Unknown Pollutant	Elevated Water Temperature	303d Listed	Low	TMDL Needed (5A)
										Total Phosphorus	High Phosphorus Levels	TMDL Approved	Not Applicable	TMDL approved by EPA in 2020 (4A)
Bear Creek	9791	316000	Outagamie	0.5	2	1.5	Category 4A	4/1/2012	PS/NPS	Total Phosphorus	High Phosphorus Levels	TMDL Approved	Not Applicable	TMDL approved by EPA in 2020 (4A)
	9792			2	8	6	Category 4A	4/1/2012	NPS	Total Phosphorus	High Phosphorus Levels	TMDL Approved	Not Applicable	TMDL approved by EPA in 2020 (4A)
East Branch Fond Du Lac River	10991	135900	Fond Du Lac	0	14.5	14.5	Category 4A	4/1/2014	NPS	Total Phosphorus	Impairment Unknown	TMDL Approved	Not Applicable	TMDL approved by EPA in 2020 (4A)
	3990279			14.5	22.81	8.31	Category 4A	4/1/2018	PS/NPS	Total Phosphorus	High Phosphorus Levels	TMDL Approved	Not Applicable	TMDL approved by EPA in 2020 (4A)
Grand River	11097	159300	Green Lake, Marquette	0	21	21	Category 4A	4/1/2014	PS/NPS	Total Phosphorus	Degraded Biological Community	TMDL Approved	Not Applicable	TMDL approved by EPA in 2020 (4A)
	10702		Fond Du Lac, Green Lake, Marquette	21	43	22	Category 4A	4/1/2016	PS/NPS	Total Phosphorus	Impairment Unknown	TMDL Approved	Not Applicable	TMDL approved by EPA in 2020 (4A)
Mud Creek	10259	131600	Calumet	0	3	3	Category 4A	4/1/2016	NPS	Total Phosphorus	Degraded Biological Community	TMDL Approved	Not Applicable	TMDL approved by EPA in 2020 (4A)
Shioc River	9800	316800	Outagamie, Shawano	0	27.96	27.96	Category 4A	4/1/2012	NPS	Total Phosphorus	High Phosphorus Levels	TMDL Approved	Not Applicable	TMDL approved by EPA in 2020 (4A)
Waukau Creek	18163	140700	Winnebago	0	4.22	4.22	Category 4A	4/1/2014	NPS	Total Phosphorus	Impairment Unknown	TMDL Approved	Not Applicable	TMDL approved by EPA in 2020 (4A)

Upper Fox River and Wolf River Volunteer Monitoring Program  
 Project Summary  
 Final – September 2021

**Appendix E: DRP % of TP**

DRP % of TP												
	Bear Creek	East Branch FDL River	Embarrass River	Grand River	Little Wolf River	Red River	Shioc River	Waukau Creek	West Branch FDL River	West Branch Wolf River	White River	Wolf River
May 2020												
June 2020												
July 2020												
August 2020		88.18%		97.75%		85.19%		46.08%	80.32%		63.03%	50.56%
September 2020	57.29%	81.73%	41.71%	73.45%	50.45%	89.41%	53.45%	74.07%	101.13%	133.51%	122.27%	70.56%
October 2020	81.89%	89.92%	86.58%	42.14%	131.50%	180.28%	70.41%	67.61%	96.49%	97.75%	71.17%	73.90%

Figure 1: Red values indicate DRP concentrations which exceeded TP concentrations.

Upper Fox River and Wolf River Volunteer Monitoring Program  
Project Summary  
Final – September 2021

**Appendix F: Stream Flow and Transparency Data**

Stream Name	Month	Stream Flow 2020	Transparency 2020
Bear Creek	May	-	-
	June	-	-
	July	-	-
	August	-	-
	September		
	October	6.5	106
Belle Fountain Creek	May	-	-
	June	-	-
	July	-	-
	August		
	September		
	October		
East Branch FDL River	May	-	-
	June	-	-
	July	-	-
	August	0.6	60
	September	420	34
	October	26590	80.6
Embarrass River	May	-	-
	June	-	-
	July	-	-
	August	-	-
	September		62.5
	October		
Fox River	May	-	-
	June	-	-
	July	-	-
	August		
	September		
	October		
Grand River	May	-	-
	June	-	-
	July	-	-
	August		120
	September		120
	October		120
Little Wolf River	May	-	-



Upper Fox River and Wolf River Volunteer Monitoring Program  
 Project Summary  
 Final – September 2021

	June	-	-
	July	-	-
	August	-	-
	September		74
	October		
Mecan River	May	-	-
	June	-	-
	July	-	-
	August		
	September		
Montello River	May	-	-
	June	-	-
	July	-	-
	August		
	September		
Mud Creek	May	-	-
	June	-	-
	July	-	-
	August		
	September		
Neenah Creek	May	-	-
	June	-	-
	July	-	-
	August		
	September		
Pine River	May	-	-
	June	-	-
	July	-	-
	August		
	September		
Pipe Creek	May	-	-
	June	-	-
	July	-	-
	August		
	September		

Upper Fox River and Wolf River Volunteer Monitoring Program  
 Project Summary  
 Final – September 2021

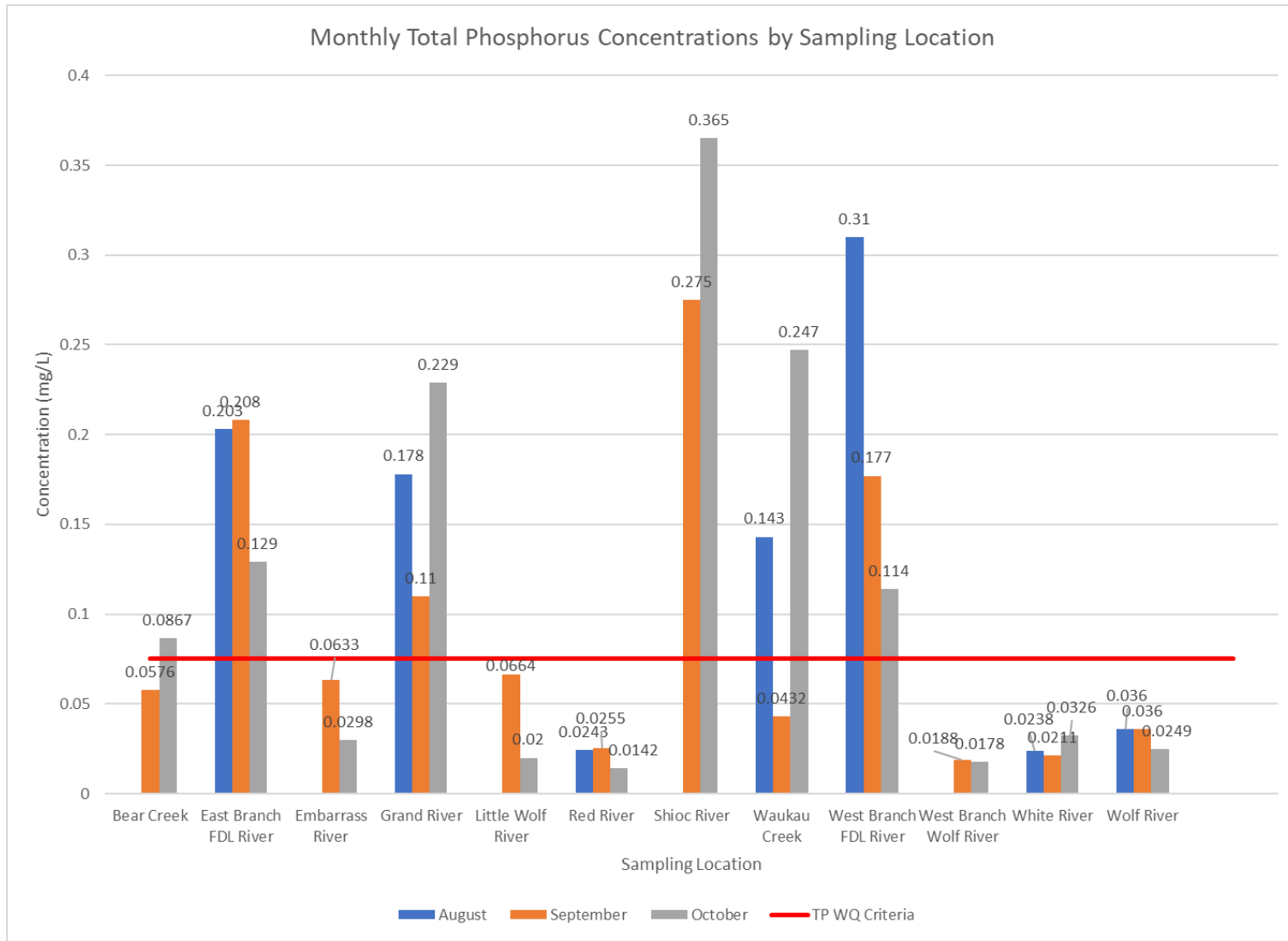
	October		
Red River	May	-	-
	June	-	-
	July	-	-
	August	209.76	120
	September		120
	October	93	120
Shioc River	May	-	-
	June	-	-
	July	-	-
	August	-	-
	September		
	October		51
Waukau Creek	May	-	-
	June	-	-
	July	-	-
	August		60.8
	September		75.4
	October		39.2
West Branch FDL River	May	-	-
	June	-	-
	July	-	-
	August		76
	September		95
	October		105.3
West Branch Wolf River	May	-	-
	June	-	-
	July	-	-
	August	-	-
	September		120
	October		67.4
White River	May	-	-
	June	-	-
	July	-	-
	August		120
	September		120
	October		120
Wolf River	May	-	-
	June	-	-
	July	-	-

Upper Fox River and Wolf River Volunteer Monitoring Program  
Project Summary  
Final – September 2021

	August	109
	September	
	October	95

# Upper Fox River and Wolf River Volunteer Monitoring Program Project Summary Final – September 2021

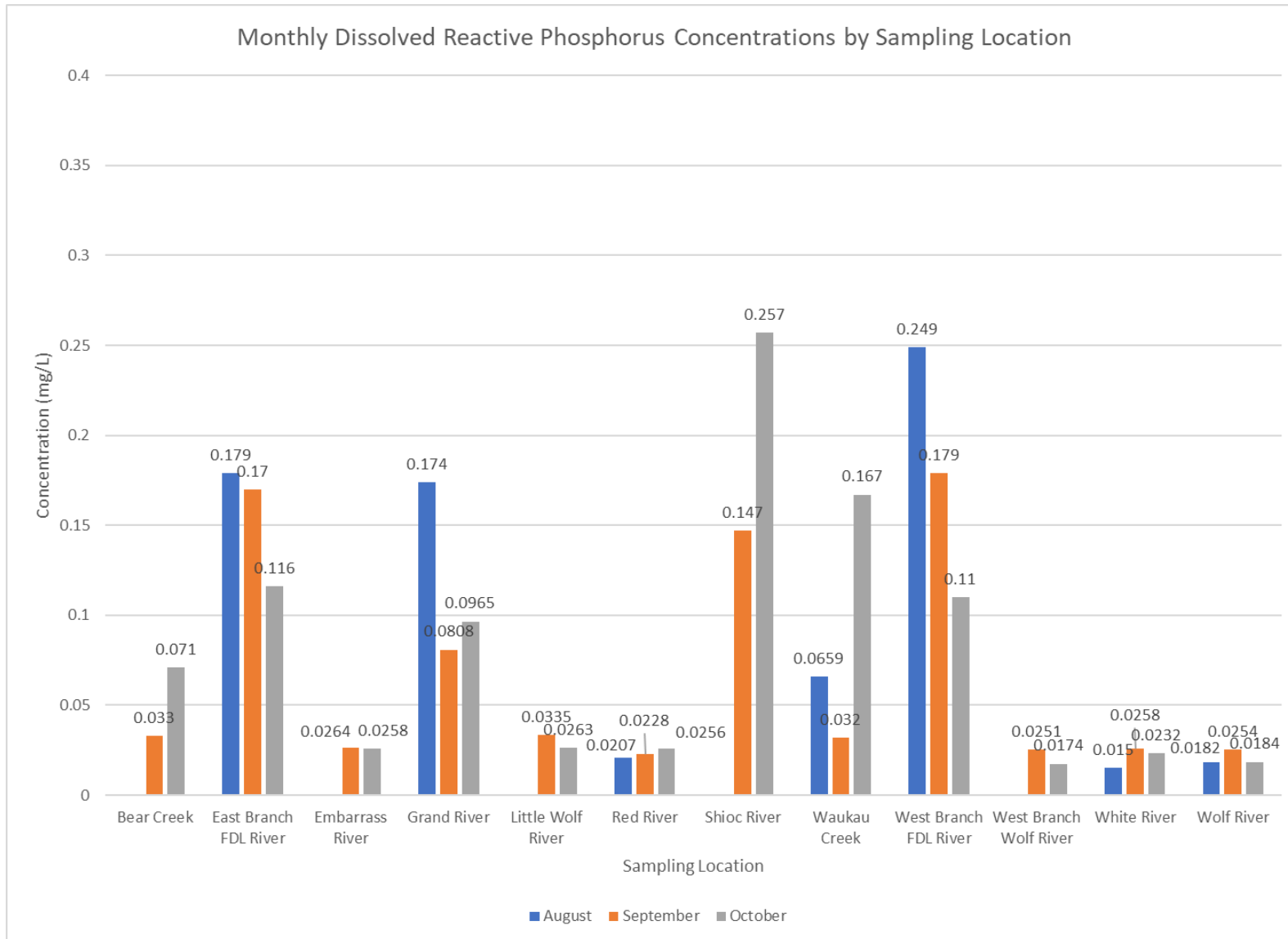
## Appendix G: Graphs



# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

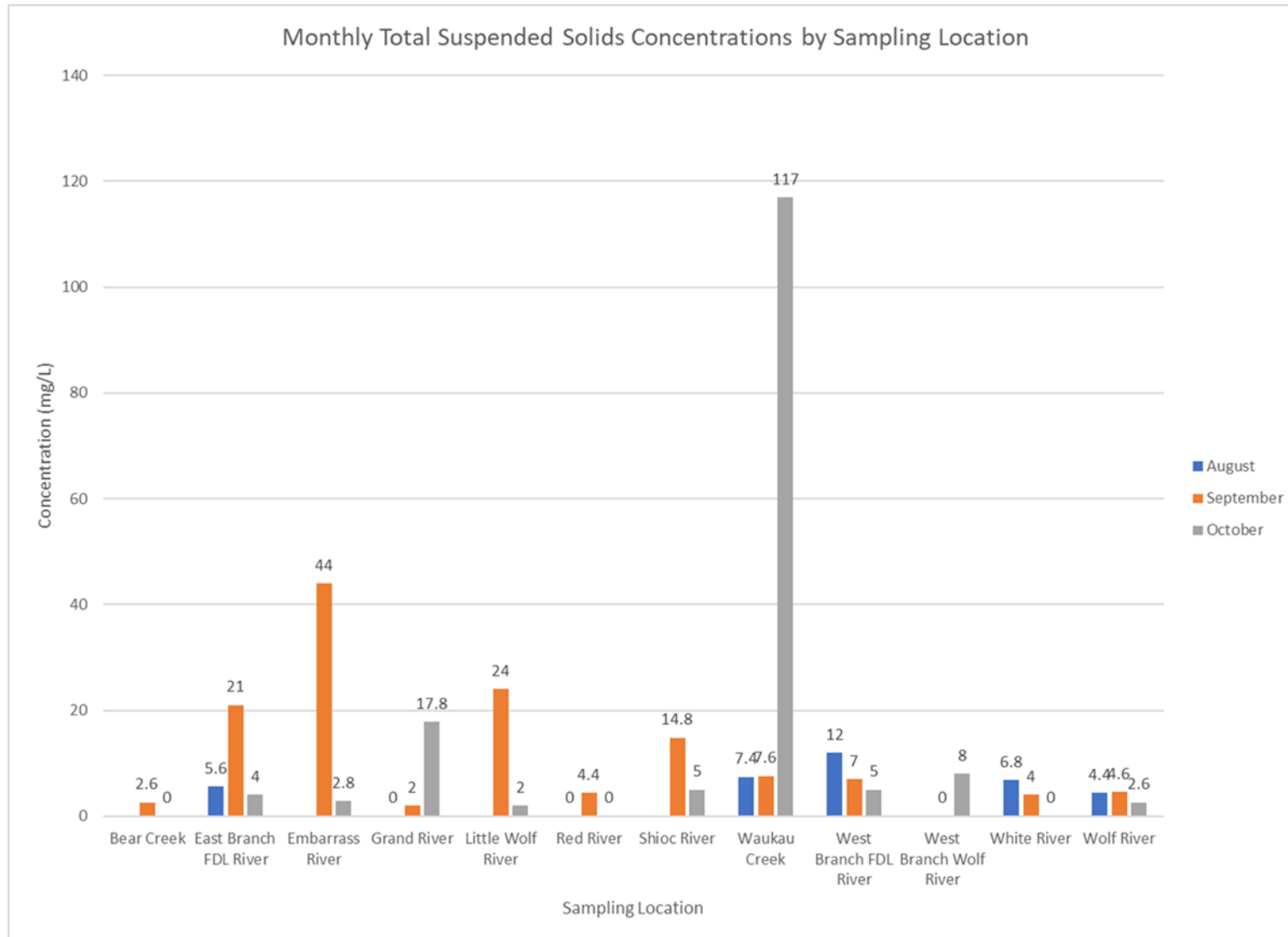
### Final – September 2021



# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

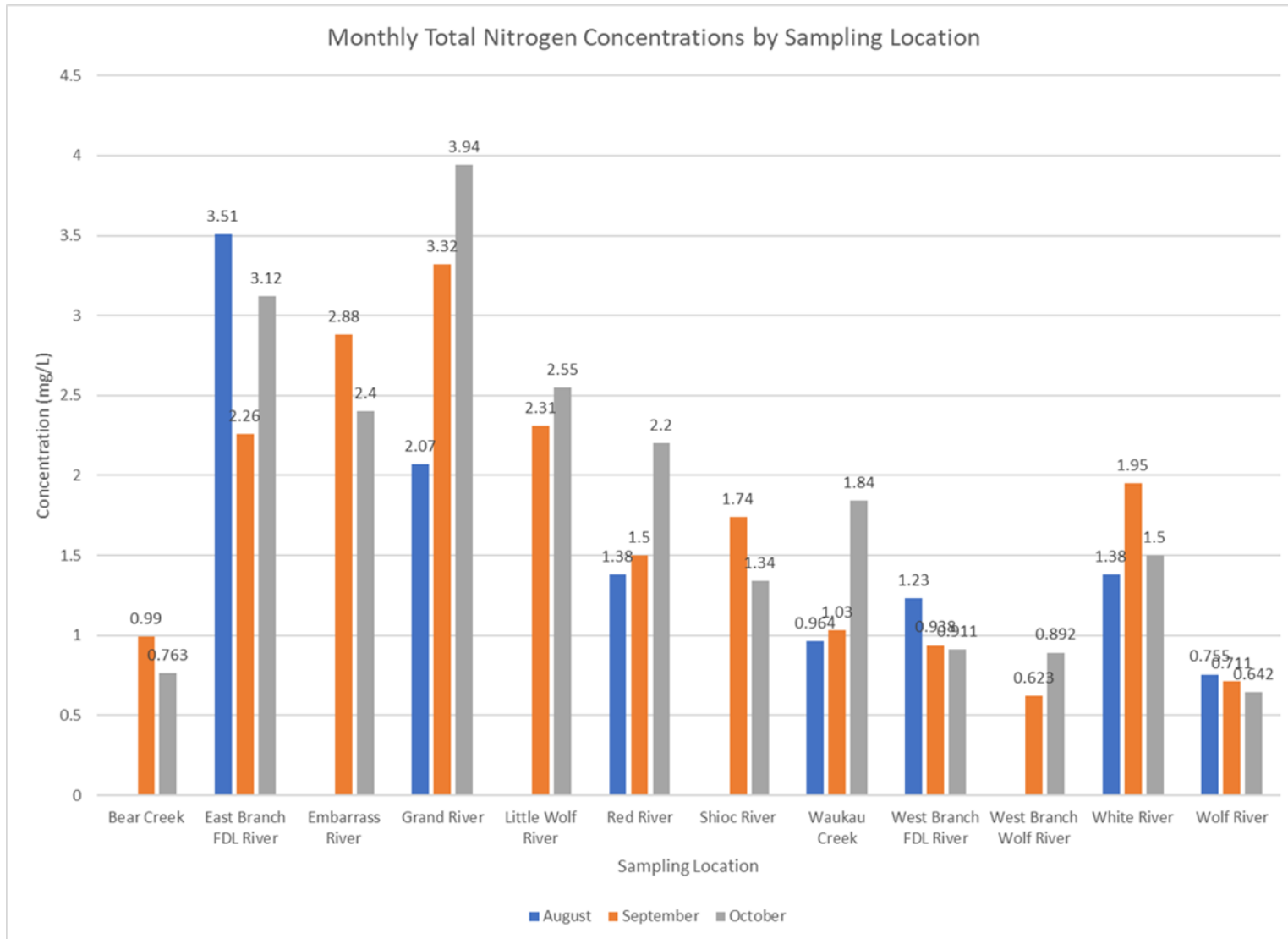
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# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

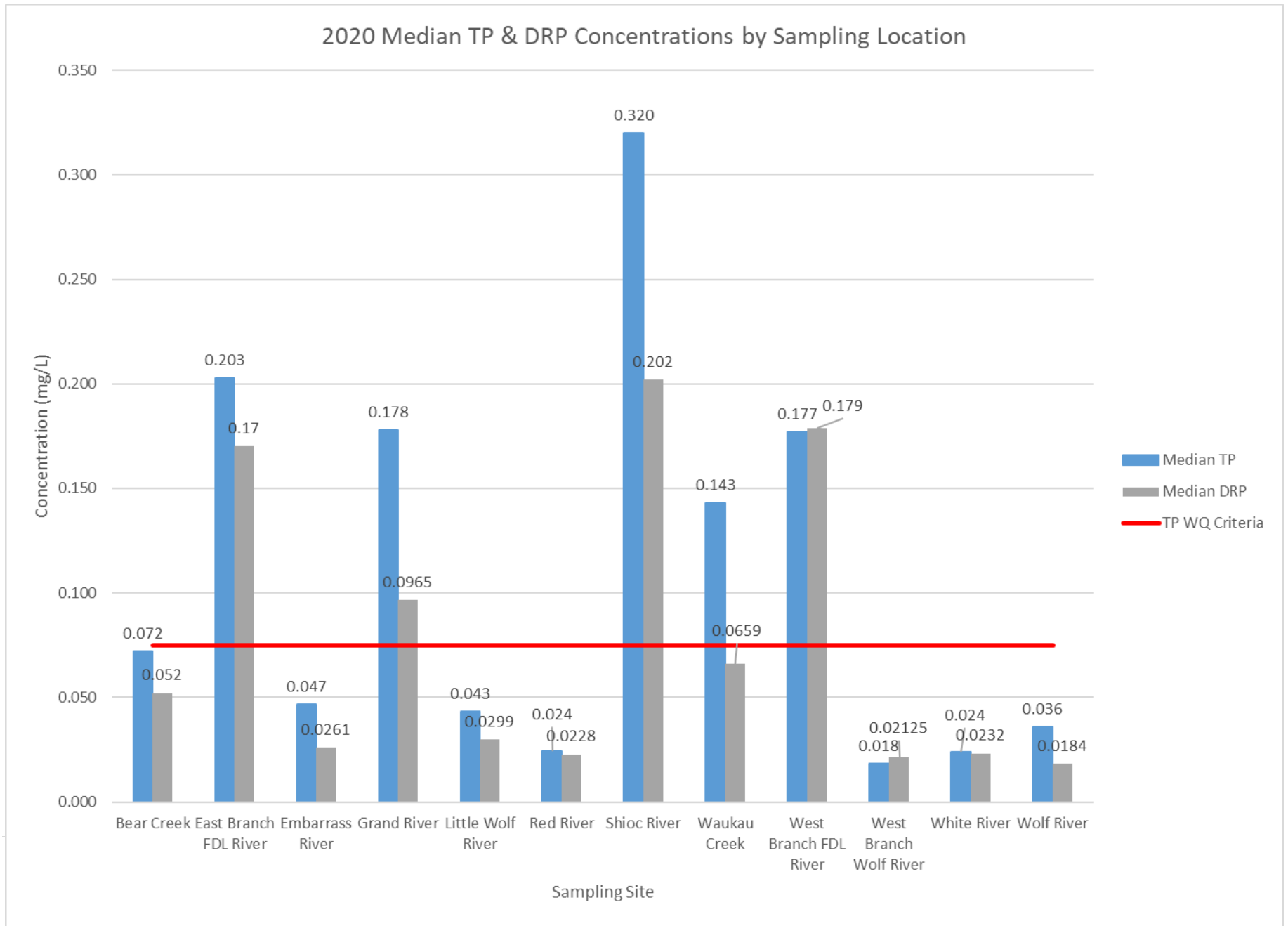
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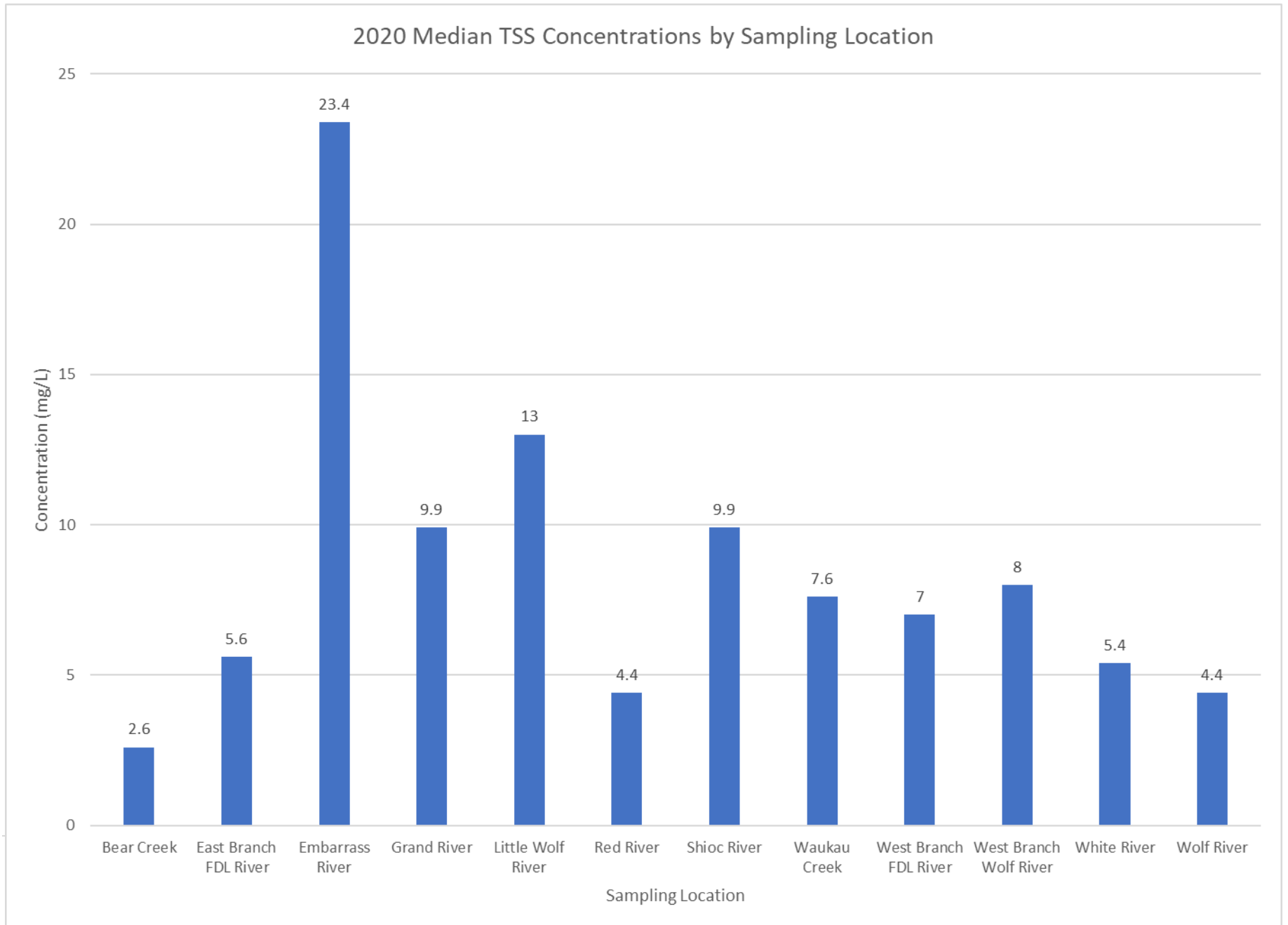
## Project Summary

### Final – September 2021

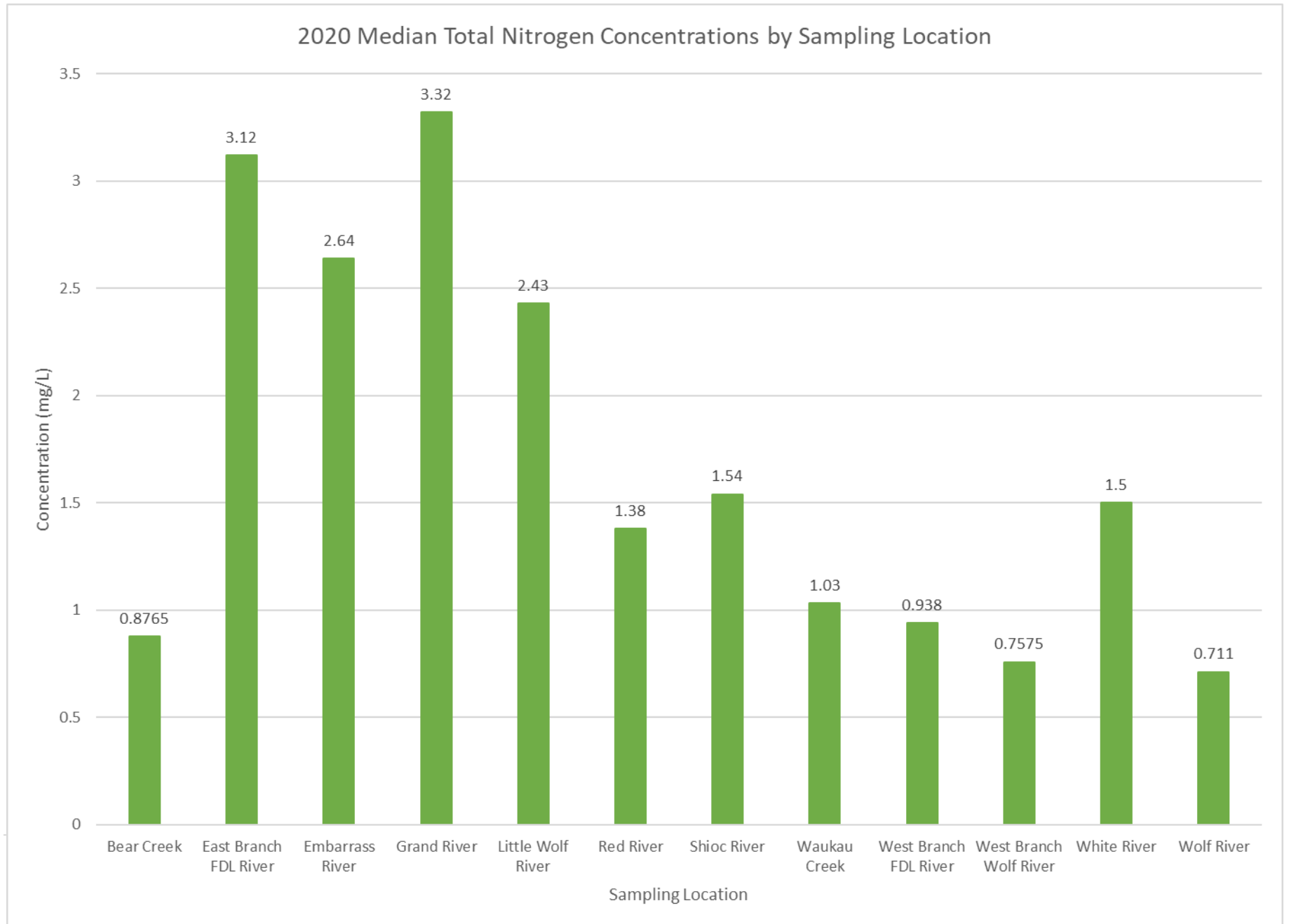




Upper Fox River and Wolf River Volunteer Monitoring Program  
Project Summary  
Final – September 2021



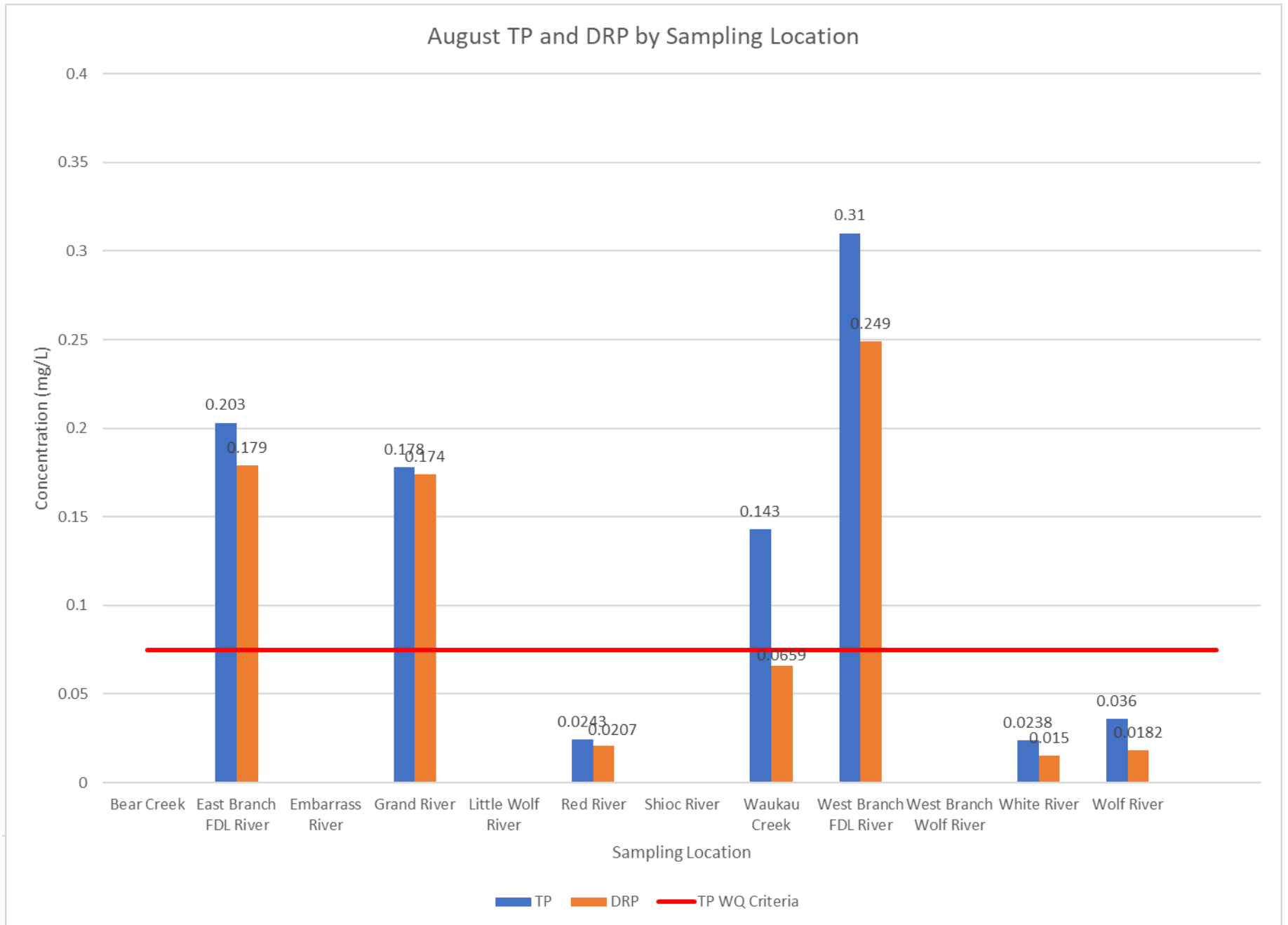
Upper Fox River and Wolf River Volunteer Monitoring Program  
Project Summary  
Final – September 2021



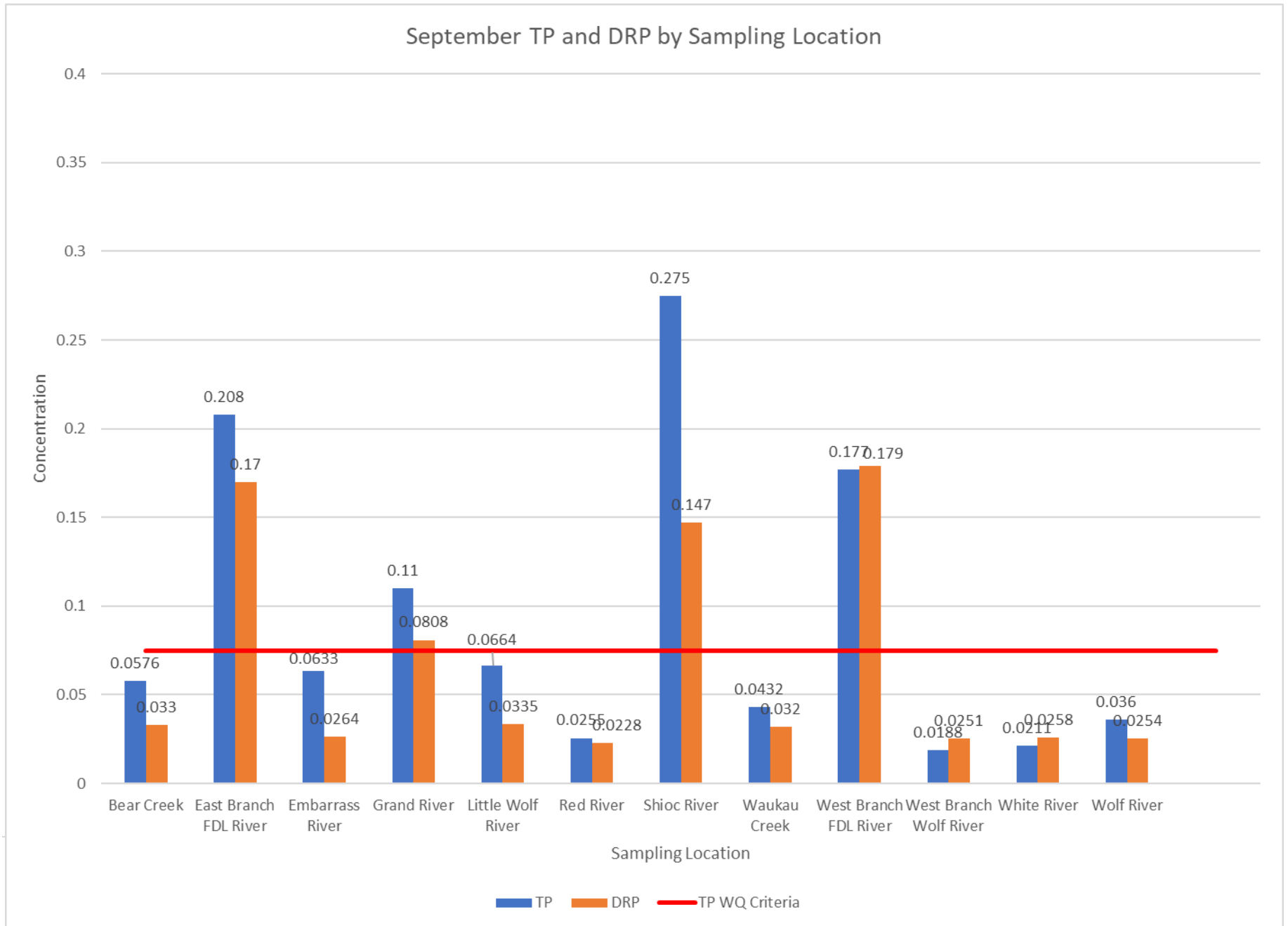
# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

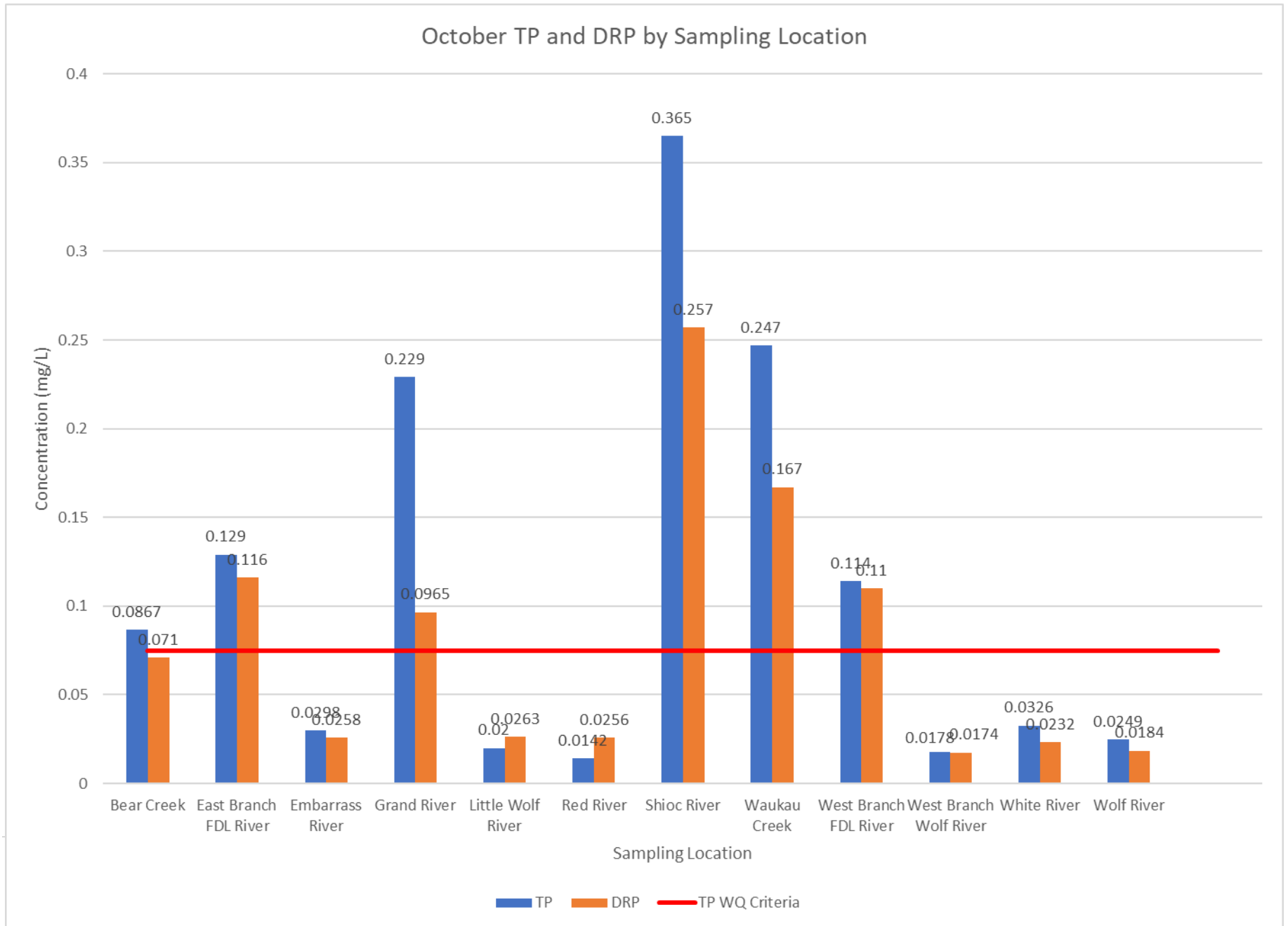
### Final – September 2021



Upper Fox River and Wolf River Volunteer Monitoring Program  
 Project Summary  
 Final – September 2021



Upper Fox River and Wolf River Volunteer Monitoring Program  
Project Summary  
Final – September 2021



# Upper Fox River and Wolf River Volunteer Monitoring Program

## Project Summary

### Final – September 2021

#### Appendix H: Upper Fox and Wolf Volunteer Monitoring Fact Sheet

## Upper Fox & Wolf Volunteer Monitoring Fact Sheet

The EPA approved the Upper Fox-Wolf (UFW) TMDL in 2020. The TMDL identifies the need for reductions in Total Phosphorus (TP) and Total Suspended Solids (TSS) in waterbodies throughout the basin to meet water quality standards. A total of 43 streams and rivers and 19 lakes and reservoirs are impaired for excess phosphorus while a total of 19 streams and rivers are impaired for excess sediment. Phosphorus is an essential nutrient for plant growth, but can have detrimental effects on lakes, rivers, and streams when excess amounts are introduced. 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.

To assess long-term trends in water quality, 20 stream sites were chosen as part of the UFW volunteer monitoring program to collect water samples throughout the UFW basin beginning in 2020. The UFW volunteer monitoring program relies on volunteers to collect reliable data to assist the DNR in tracking water quality trends overtime. Volunteers collect water samples once per month, May through October. Samples are shipped to the State Lab of Hygiene in Madison and are analyzed for TP, TSS, and Total Nitrogen (TN).

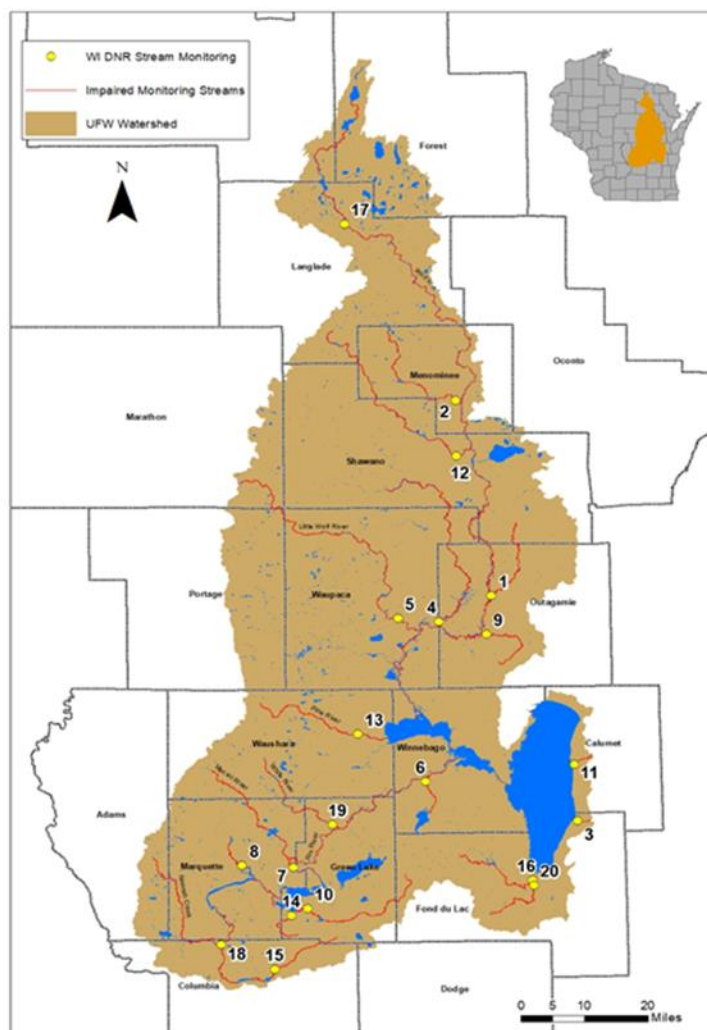
#### UFW BASIN QUICK FACTS

- 5,900 square mile watershed area
- Covers 18 counties
- Includes 5 Tribal Lands
- 32 Concentrated Animal Feeding Operations (CAFOs)
- 29 permitted Municipal Separate Storm Sewer System (MS4s)
- 78 Dischargers (municipal and industrial)

#### Want to get involved?

Hannah Vorrie  
 Watershed Restoration Coordinator  
 Upper Fox & Wolf Volunteer Stream  
 Monitoring Coordinator  
 T: (920) 296-5126  
 Hannah.vorrie@wisconsin.gov

See Backside for exact sample locations



Upper Fox River and Wolf River Volunteer Monitoring Program  
Project Summary  
Final – September 2021

Sampling Location	SWIMS Station ID	Stream Name	SWIMS Station Name	County	X	Y
1	453030	Shioc River	Shioc River At Sth 187	Outagamie	-88.56017	44.464379
2	403003	West Branch Wolf River	West Branch Wolf River- West Branch Rd	Menominee	-88.66435	44.94093
3	10016803	Pipe Creek	Pipe Creek- Pipe Creek- 30 Feet Above Hwy 151 bridge	Fond du Lac	-88.3103	43.91841
4	10033493	Embarrass River	Embarrass River at New London Hwy 54	Outagamie	-88.73024	44.405953
5	693217	Little Wolf River	Little Wolf River at Royalton STH 54	Waupaca	-88.85648	44.418276
6	713285	Waukau Creek	Waukau Creek at Cth E USGS Site ID 04073970	Winnebago	-88.7854	44.01841
7	393005	Mecan River	Mecan River- CTH C	Marquette	-89.20955	43.816794
8	10022879	Montello River	Montello River At 11th St. Bridge USGS Site ID 04072845	Marquette	-89.3575	43.82047
9	453259	Bear Creek	Bear Creek at Sth 76	Outagamie	-88.57791	44.365693
10	243015	Grand River	Grand River at Cth H Near Kingston WI	Green Lake	-89.1541	43.711983
11	83121	Mud Creek	Mud Creek at Mud Creek Rd	Calumet	-88.3171	44.05352
12	10014632	Red River	Red River- Maple Ave	Shawano	-88.65981	44.803515
13	10032735	Pine River	Pine River at Hwy 49	Wausara	-88.9962	44.13583
14	243028	Belle Fountain Creek	Belle Fountain Creek at Cth B	Green Lake	-89.21482	43.704172
15	10014339	Fox River	Fox River- Highway 33	Columbia	-89.27703	43.569939
16	10037662	West Branch Fond du Lac River	West Branch FDL at Forest Ave	Fond du Lac	-88.4553	43.77697
17	343057	Wolf River	WOLF River- CTH T	Langlade	-89.01287	45.367529
18	113070	Neenah Creek	Neenah Creek - Cth Cm	Columbia	-89.43518	43.631283
19	10041320	White River	White River- White River Rd Landing	Green Lake	-89.07898	43.917482
20	10014745	East Branch Fond du Lac River	East Branch FDL at 12th St.	Fond du Lac	-88.4511	43.76557

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

Want to find out more? Visit <https://dhr.wi.gov/topic/TMDLs/>