



Campground Creek  
Photo by Dave Bolha, DNR

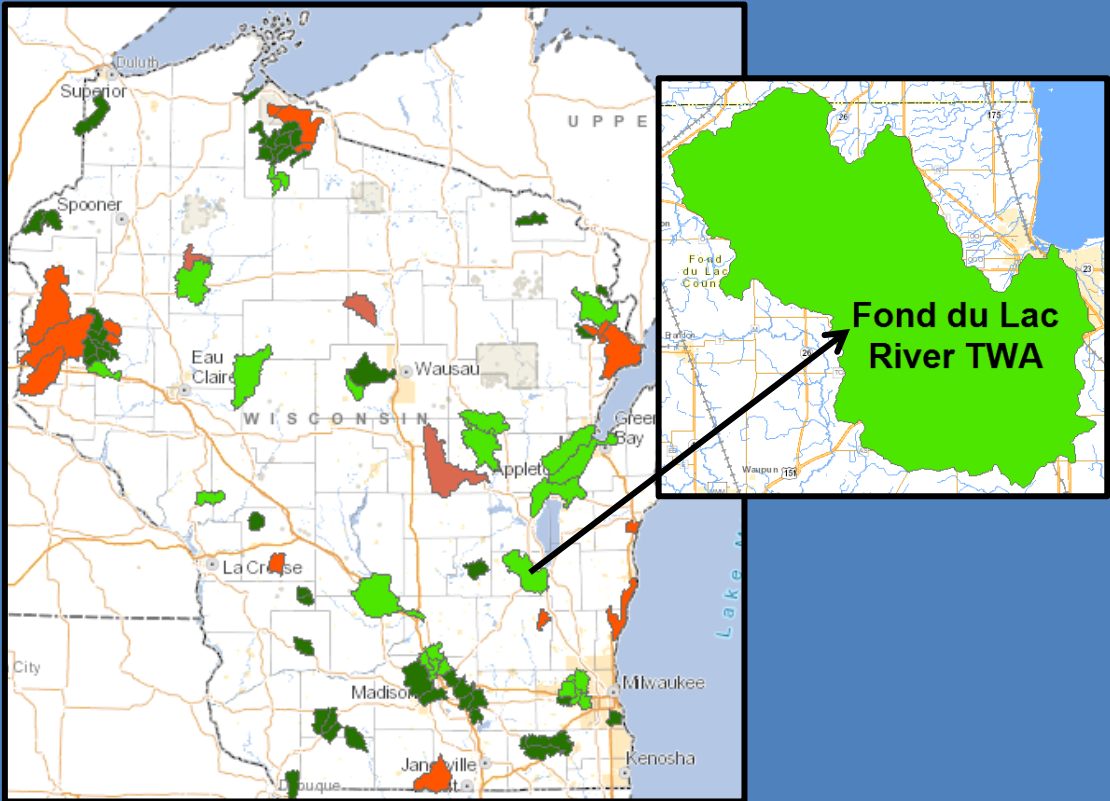
07/07/2015

# FOND DU LAC RIVER TWA

## WQM PLAN 2017

*Fond du Lac River (UF03)*  
*HUC: 0403020302, Monitored 2015*

*Watershed Report  
created by the Bureau of  
Water Quality in support  
of the Clean Water Act.*



EGAD # 3200-2017-08  
Water Quality Bureau,  
Wisconsin DNR

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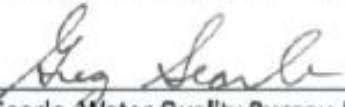
## Wisconsin Water Quality Monitoring and Planning

This Water Quality Management Plan was created under the state's Water Quality Management Planning and Water Resources Monitoring Program. The plan reflects Water Quality Bureau goals and priorities and Water Resources Monitoring Strategy 2015-2020 and fulfills Areawide Water Quality Management Planning milestones under the Clean Water Act, Section 208. Condition information and resource management recommendations support and guide program priorities for the plan area.

This plan is hereby approved by the Wisconsin DNR Water Quality Program and is a formal update to the Upper Fox Areawide Water Quality Management Plan and Wisconsin's Statewide Areawide Water Quality Management Plan. This plan will be forwarded to USEPA for certification as a formal plan update.

  
 \_\_\_\_\_  
 Water Quality Field Supervisor - *Aukay*

1/29/2018  
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## Basin/Watershed Partners

- Natural Resource Conservation Service
- USGS

## Report Acknowledgements

- Dave Bolha, Primary Author and Investigator, Eastern District, Wisconsin DNR
- Victoria Ziegler, Program Support, Water Quality Bureau, Wisconsin DNR
- Lisa Helmuth, Program Coordinator, Water Quality Bureau, Wisconsin DNR

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## List of Abbreviations/Glossary

**BMP: Best Management Practice.** A practice that is determined effective and practicable (including technological, economic, and institutional considerations) in preventing or reducing pollution generated from nonpoint sources to a level compatible with water quality goals.

**DNR: Department of Natural Resources.** Wisconsin Department of Natural Resources is an agency of the State of Wisconsin created to preserve, protect, manage, and maintain natural resources.

**FBI: Fish Index of biological integrity (Fish IBI).** An Index of Biological Integrity (IBI) is a scientific tool used to identify and classify water pollution problems. An IBI associates anthropogenic influences on a water body with biological activity in the water and is formulated using data developed from biosurveys. In Wisconsin, Fish IBIs are created for each type of natural community in the state's stream system.

**HUC: Hydrologic Unit Code.** A code or sequence of numbers that identify one of a number of nested and interlocked hydrologic catchments delineated by a consortium of agencies including USGS, USFS, and Wisconsin DNR.

**MIBI: Macroinvertebrate Index of biological integrity.** In Wisconsin, the MIBI, or macroinvertebrate Index of biological integrity, was developed specifically to assess Wisconsin's macroinvertebrate community (see also Fish IBI).

**Natural Community.** A system of categorizing waterbodies based on their inherent physical, hydrologic, and biological assemblages. Both Streams and Lakes are categorized using an array of "natural community" types.

**Monitoring Seq. No.** Monitoring Sequence Number refers to a unique identification code generated by the Surface Water Integrated Monitoring System (SWIMS), which holds much of the state's water quality monitoring data.

**SWIMS ID.** Surface Water Integrated Monitoring System (SWIMS) Identification Code is the unique monitoring station identification number for the location where monitoring data was gathered.

**TWA: Targeted Watershed Assessment.** A statewide study design a rotating watershed approach to gathering of baseline monitoring data with specialized targeted assessments for unique and site specific concerns, such as effectiveness monitoring of management actions.

**WATERS ID:** The Waterbody Assessment, Tracking and Electronic Reporting System Identification Code (WATERS ID) is a unique numerical sequence number assigned by the WATERS system, also known as "Assessment Unit ID code".

**WBIC: Water Body Identification Code.** WDNR's unique identification codes assigned to water features in the state. The lines and information allow the user to execute spatial and tabular queries about the data, make maps, and perform flow analysis and network traces.

## Watershed Discussion & Management Recommendations

### Watershed Goals

The overall goal of this plan is to improve and protect water quality in the basin. This Targeted Watershed Assessment monitoring project provided substantial data to analyze current conditions and to make recommendations for future management actions in the area. This plan is designed to present monitoring study results, identify issues or concerns in the area found during the project and to make recommendations to improve or protect water quality consistent with Clean Water Act guidelines and state water quality standards.

### Watershed Overview

The Fond du Lac River watershed is located primarily in Fond du Lac County, but extends north to the southeast corner of Winnebago County along the western shore of Lake Winnebago. Fond du Lac River TWA (Figure 1) is located in the Fond du Lac River watershed. The watershed is 156,632 acres in size and contains 461 miles of streams and rivers, 991 acres of lakes and 16,649 acres of wetlands.

### Land Use

The watershed is dominated by agriculture (68%), wetlands (14%) and is ranked high for nonpoint source issues affecting streams and groundwater. Municipalities in the watershed include Fond du Lac, North Fond du Lac, Oakfield, Rosendale, and portions of Oshkosh.

The Rosendale and Oakfield wastewater treatment facilities discharge into the watershed. Additionally, a number of industrial facilities also discharge into the watershed. There are large and growing urban areas in the watershed; however these currently only make up 3% of the watershed. Major urban areas in the watershed include large parts of the Cities of Fond du Lac and Oshkosh and a corridor along the lakeshore and U.S. Highway 41 between Oshkosh and Fond du Lac. Other urban areas in the watershed include North Fond du Lac, Oakfield, and Rosendale.

### Ecological Landscapes

The Southeast Glacial Plains Ecological Landscape makes up the bulk of the non-coastal land area in southeast Wisconsin. This Ecological Landscape is made up of glacial till plains and moraines. Most of this Ecological Landscape is composed of glacial materials deposited during the Wisconsin Ice Age, but the southwest portion consists of older, pre-Wisconsin till with a more dissected topography. Soils are lime-rich tills overlain in most areas by a silt-loam loess cap.

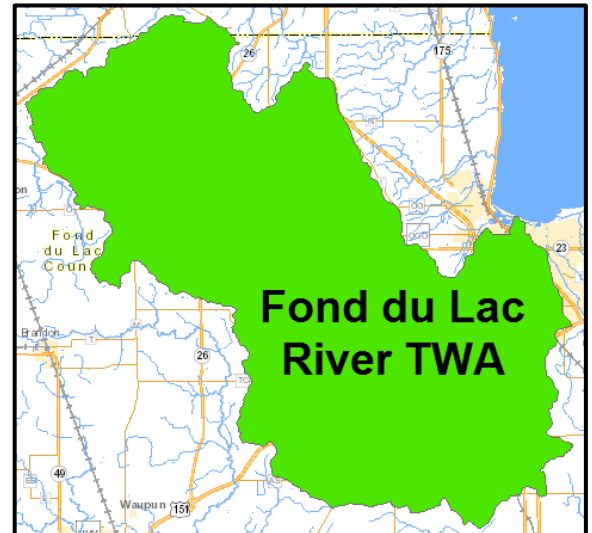


Figure 1: Fond Du Lac TWA Watershed Map

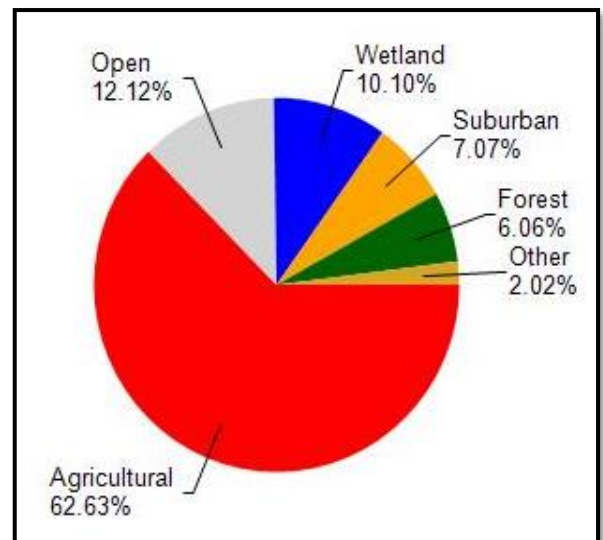


Figure 2: Land use in the Fond du Lac River Watershed.

Agricultural and residential interests throughout the landscape have significantly altered the historical vegetation. Most of the rare natural communities that remain are associated with large moraines or in areas where the Niagara Escarpment occurs close to the surface. Historically, vegetation in the Southeast Glacial Plains consisted of a mix of prairie, oak forests and savanna, and maple-basswood forests. Wet-mesic prairies, southern sedge meadows, emergent marshes, and calcareous fens were found in lower portions of the Landscape. End moraines and drumlins supported savannas and forests.

Agricultural and urban land use practices have drastically changed the land cover of the Southeast Glacial Plains since Euro-American settlement. The current vegetation is primarily agricultural cropland. Remaining forests occupy only about 10% of the land area and consist of maple-basswood, lowland hardwoods, and oak. No large mesic forests exist today except on the Kettle Interlobate Moraine which has topography too rugged for agriculture. Some existing forest patches that were formerly savannas have succeeded to hardwood forest due to fire suppression.

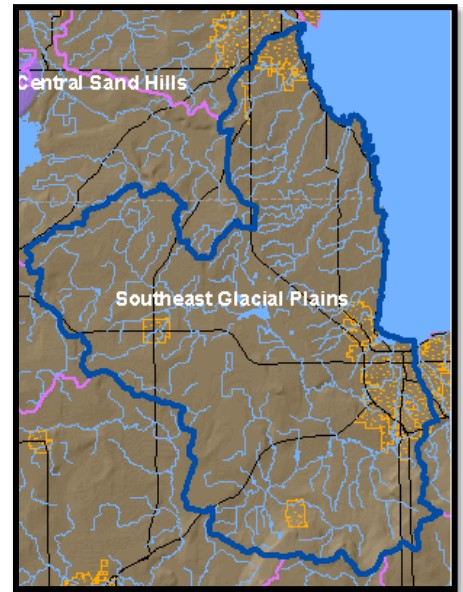


Figure 3: Ecological Landscapes in the Fond du Lac River watershed.

### Study Summary

This project was designed to evaluate the effectiveness of BMPs installed in three HUC 12 watersheds in the Fond Du Lac River (HUC 10-0403020302) watershed following the implementation of a Nonpoint Source Priority Watershed Project that began in 1997. This TWA project was designed to determine if the goals of the Priority Watershed Project to protect and improve the watershed water quality were met. The study involved collecting repeatable biological, inorganic chemistry and habitat surveys provide valuable information for future comparison.

### Management Recommendations

- DNR should work with landowners and county partners in the watershed to encourage restoration of stream banks and reduction of erosion.
- DNR should work with partners and landowners to maximize buffers and protected areas along streams with steep slopes due to the nature of the steep slopes in the creek watersheds involved in this project.
- Promote use of high quality vegetative buffers as the type of vegetation in buffers is critical in reducing sediment and nutrients reaching creeks described in the project area. For example, a combination of forest and native grass buffers may have better nutrient reduction success than the use of strictly grassed buffers.

## **Ecological, Aquatic Resources**

### Outstanding and Exceptional Resource Waters

Wisconsin has designated many of the state's highest quality waters as Outstanding Resource Waters (ORWs) or Exceptional Resource Waters (ERWs). Waters designated as ORW or ERW are surface waters which provide outstanding recreational opportunities, support valuable fisheries and wildlife habitat, have good water quality, and are not significantly impacted by human activities. ORW and ERW status identifies waters that the State of Wisconsin has determined warrant additional protection from the

effects of pollution. Two waters in the watershed are exceptional resource waters, Parsons Creek and East Trib. to Parsons Cr.

Table 1: Watershed Outstanding/Exceptional Resource Waters in the Fond du Lac River watershed (UF03).

Waterbody Name	WBIC	ORW/ERW	Start Mile	End Mile
Parsons Creek	136000	ERW	3.49	5.68
East Trib. to Parsons Creek	136200	ERW	0.01	1.89

### Trout Waters

DNR uses three categories to classify the different types of trout streams throughout Wisconsin. These are evident in Wisconsin Trout Stream Maps, which provides a comprehensive list of trout streams and a set of trout stream maps covering the majority of the state. Efforts have been made to list all trout streams in the State of Wisconsin, but it is recognized that this listing is not exhaustive. Trout waters in this watershed are listed in Table 2.

High quality trout waters (Class I) that have sufficient natural reproduction to sustain populations of wild trout, at or near carry capacity. Consequently, streams in this category require no stocking of hatchery trout. These streams or stream sections are often small and may contain small or slow-growing trout, especially in the headwaters. Class II streams may have some natural reproduction, but not enough to utilize available food and space. Therefore, stocking is required to maintain a desirable sport fishery. These streams have good survival and carryover of adult trout, often producing some fish larger than average size. Class III are marginal trout habitat with no natural reproduction occurring. They require annual stocking of trout to provide trout fishing. Generally, there is no carryover of trout from one year to the next.

Table 2: Trout Waters in the Fond du Lac River watershed (UF03).

Waterbody Name	WBIC	Start Mile	End Mile	Trout Class
Parsons Creek	136000	2.58	3.49	CLASS II
Parsons Creek	136000	3.49	5.68	CLASS II
Byron Creek	137400	1.67	7.26	CLASS II
East Trib. to Parsons Creek	136200	0.01	1.89	CLASS I

### Impaired Waters

Every two years, Section 303(d) of the Clean Water Act requires states to publish a list of all waters that do not meet water quality standards. The list, also known as the Impaired Waters List, is updated to reflect waters that are newly added or removed based on new information. Impaired waters in this watershed are impaired for historical discharges, mine tailings, and runoff issues (Table 3).

A number of rivers and streams in the watershed are currently on Wisconsin's impaired waters list as required by section 303(d) of the federal Clean Water Act. A majority of these are listed for low dissolved oxygen and degraded habitat due to nonpoint source pollution impairment. The Fond du Lac River has elevated levels of polychlorinated biphenyl (PCBs) which results in contaminated fish tissue and chronic aquatic toxicity. A Total Maximum Daily Load (TMDL) has been developed for Parsons Creek and its unnamed east tributary. This TMDL was approved by EPA in 2007 but some additional refinements need to be done with regards to waste load allocations.

Table 3: Impaired waters in Fond du Lac River watershed (UF03).

Waterbody Name	WBIC	Start Mile	End Mile	Pollutant	Impairment	Sources	303 Status
Anderson Creek	133300	0	7.26	Sediment/Total Suspended Solids	Degraded Habitat	Non-point Source (Rural or Urban)	TMDL Development
Anderson Creek	133300	0	7.26	Total Phosphorus	Degraded Biological Community	Non-point Source (Rural or Urban)	303d Listed
Byron Creek	137400	0	1.66	Sediment/Total Suspended Solids	Degraded Habitat	NA	TMDL Development
Byron Creek	137400	1.67	7.26	Sediment/Total Suspended Solids	Low DO, Elevated Water Temperature, Degraded Habitat	NA	TMDL Development
East Branch Fondulac River	135900	0	14.5	Total Phosphorus	Impairment Unknown	Non-point Source (Rural or Urban)	TMDL Development
Fond Du Lac River	133700	0	1.56	PCBs	Contaminated Fish Tissue	Contaminated Sediments, Non-point Source (Rural or Urban)	303d Listed
Fond Du Lac River	133700	0	1.56	Total Phosphorus	Water Quality Use Restrictions	Contaminated Sediments, Non-point Source (Rural or Urban)	TMDL Development
Fond Du Lac River	133700	0	1.56	Unspecified Metals	Chronic Aquatic Toxicity	Contaminated Sediments, Non-point Source (Rural or Urban)	303d Listed
Lake Winnebago	131100			Mercury	Contaminated Fish Tissue	Contaminated Sediments, Atmospheric Deposition - Toxics	Pollutant Removed
Lake Winnebago	131100			Total Phosphorus	Low DO, Eutrophication, Water Quality Use Restrictions, Excess Algal Growth	Contaminated Sediments, Atmospheric Deposition - Toxics	TMDL Development
Lake Winnebago	131100			PCBs	Contaminated Fish Tissue	Contaminated Sediments, Atmospheric Deposition - Toxics	303d Listed
Lake Winnebago	131100			Sediment/Total Suspended Solids	Turbidity	Contaminated Sediments, Atmospheric Deposition - Toxics	TMDL Development
Mosher Creek	133500	0	3	Sediment/Total Suspended Solids	Degraded Habitat	Non-point Source (Rural or Urban)	TMDL Development



Local Name	WBIC	Start Mile	End Mile	Pollutant	Impairment	Sources	303 Status
Parsons Creek	136000	0	2.58	Sediment/Total Suspended Solids	Degraded Habitat	NA	TMDL Approved
Parsons Creek	136000	0	2.58	Total Phosphorus	Degraded Habitat	NA	TMDL Approved
Sevenmile Creek	136800	0	11	Sediment/Total Suspended Solids	Degraded Habitat	Impacts from Hydrostructure Flow Regulation, Non-point Source (Rural or Urban), Loss of Riparian Habitat	TMDL Development
East Trib. to Parsons Cr	136200	0.01	1.89	Sediment/Total Suspended Solids	Degraded Habitat	NA	TMDL Approved
East Trib. to Parsons Cr	136200	0.01	1.89	Elevated Water Temperature	Low DO	NA	TMDL Approved
Van Dyne Creek	132600	1	9.11	Sediment/Total Suspended Solids	Degraded Habitat	NA	TMDL Development
West Branch Fond Du Lac River	134000	0	26	Total Phosphorus	Water Quality Use Restrictions	Non-point Source (Rural or Urban)	303d Listed
West Branch Fond Du Lac River	134000	0	26	Unknown Pollutant	Elevated Water Temperature	Non-point Source (Rural or Urban)	303d Listed

## Monitoring Project Discussion

### Purpose of Project

The purpose of this study was to monitor the status of portions of the Fond Du Lac Watershed. This assessment was conducted to evaluate water quality improvements made in the Fond Du Lac River Watershed from best management practices installed in the watershed from 1997 through 2008 as part of the Fond Du Lac River Priority Watershed Project [TWA HUC 10: 0403020302].

A secondary goal of this project was to determine Wisconsin Administrative Code ch. NR 102 (NR 102) phosphorus water quality criteria exceedances and degraded biological community and habitat impairments for USEPA Clean Water Act Section 303d (CWA 303d) listing purposes for the creeks in this area of the HUC 10 watershed.

The collected data helps determine whether streams are achieving their attainable use to update the state's Clean Water Act Section 305(b) data, identify waters that are not meeting their designated and attainable uses (Section 303(d)), and assess the overall health of the watersheds as required by Sections 305(b) and 208 of the Clean Water Act. The data, used in conjunction with observations about watershed health, are also used to guide planning for improvements where needed. The following were

completed in this study:

- The watershed was monitored with a baseline survey including biological, chemical, and physical parameters.
- The watershed was monitored to understand its Clean Water Act attainment status and the presence of and sources of any water quality impairments.
- The streams were monitored to determine the effectiveness of best management practices (BMPs) since their installation in the 1990s.
- The waters monitored in this plan are the subject of this watershed-based water quality plan.

### Methods, Equipment and Quality Assurance

Collection of total phosphorus, aquatic macroinvertebrates, fish community, quantitative habitat, and continuous temperature data collection used standard DNR data collection methods and samples were sent to certified laboratories in the state. No specific in-field duplicates, replicates or blanks were collected for the study; however, quality assurance sampling procedures were used in the collection and preservation of samples for all parameters.

#### **Total Phosphorus**

Total phosphorus (TP) data was collected using the standard DNR grab sampling method. All TP samples were shipped to Wisconsin State Laboratory of Hygiene (WISLOH) for analysis. The WISLOH entered all sample analysis data into the Surface Water Integrated Monitoring System (SWIMS) database.

#### **Macroinvertebrates**

All sites were sampled using the DNR Guidelines for Collecting Macroinvertebrate Samples from Wadable Streams (2000). A D-shaped kicknet with 600 micron mesh was used at all sites by standing upstream from the net and placing it firmly on the stream bed while digging into the substrate with the heel or toe to free the macroinvertebrates from the substrate. Riffles were targeted at each of the sites, but if none were present then overhanging vegetation, woody debris, or other vegetation would be sampled. This is done by jabbing the net into the vegetation to free the invertebrates.

For a representative sample of the aquatic macroinvertebrate community, a minimum of 100 aquatic macroinvertebrates collected in each sample was targeted. The aquatic macroinvertebrates were preserved in a 70-80% ethanol solution inside quart "Mason" jars. If necessary, multiple "Mason" jars were used per sample depending upon how much sediment and organic material was collected with the aquatic macroinvertebrates. Within the next 24 hours, the samples were re-preserved with another 70-80% ethanol solution. Samples were taken to the University of Wisconsin-Stevens Point Aquatic Entomology Laboratory (UWSP AEL) for lowest possible taxonomic identification.

#### **Fish Assemblage and Quantitative Habitat**

All sites were surveyed following the DNR *Guidelines for Evaluating Habitat of Wadable Streams* (2002). The fisheries assemblage was determined by a quantitative survey involving electroshocking a section of stream with a minimum station length of 35 times the mean stream width (Lyons, 1992). All fish were collected, identified, and counted. All gamefish were measured for length. At each site, qualitative notes on average stream width and depth, riparian buffers and land use, evidence of sedimentation, fish cover and potential management options were also recorded.

Each quantitative habitat survey station length was 35 times the mean stream width of the survey station. Following the determination of station length, the station was divided into 12 transects. At each transect, substrate, sedimentation, erosion, water depth, and riparian land use data were collected. DNR staff entered the quantitative habitat data into the DNR Fisheries and Habitat Management Database.

### Site Selection and Study Design

This watershed's 2014 and 2015 studies involved collection of water chemistry, macroinvertebrates, fish assemblage, and qualitative habitat, at sites in the targeted HUC 12 (Figure 4).

### **Total Phosphorus and Total Suspended Solids**

During the growing season of 2015, inorganic chemistry (TP and TSS) monitoring was conducted at 9 locations, once per month, May through October (Table 4). In 2015, phosphorus data was collected 6 times during the growing season from the pour point of the sub watershed. Data was collected during the field season of the 2015 calendar year and was entered into the Fish Database and SWIMS. Updated streams narratives and watershed reports are entered into SWIMS and WATERS.

### **Macroinvertebrates**

Each of the six locations listed in Table 5 were sampled for aquatic macroinvertebrates in October 2015 (Figure 5).

### **Habitat Surveys**

Qualitative habitat surveys were conducted at each of the 7 locations from August through September 2015 (Table 6).

### **Fish Assemblage**

Between July and September 2015, wadable fish surveys were conducted at 7 sites (Table 7) (all quantitative habitat sites). The wadable fish surveys were conducted following the WDNR *Guidelines for Assessing Fish Communities of Wadable Streams in Wisconsin* (2001). All 7 sites were surveyed in July and September 2015 during the guidance-recommended summer time survey period.

Stream flow and water chemistry was recorded at each site prior to conducting the fish survey. As in the quantitative habitat survey station lengths, the fish survey stations were a minimum of 35 times the mean stream width. A 12 Volt, 18 Amp Hour battery-powered backpack shocker was used for sites based upon the smaller stream width and depth. An otter sled stream shocker with a 4000 Peak Watt generator was used for 1 of 6 sites with appropriate stream width and/or depth (White Creek). Catch per effort sampling procedures were used for this project (no particular species was targeted, all captured). A single upstream pass was made using 0.125 inch mesh nets to collect the fish. At the end of the station, captured fish were identified and counted and all game fish were measured for length. Once all data was collected, the fish were returned to the creek. Fish data was entered into the FMDB.

### **Continuous Temperature**

Temperature devices were deployed at 7 locations from June to September (Table 8).

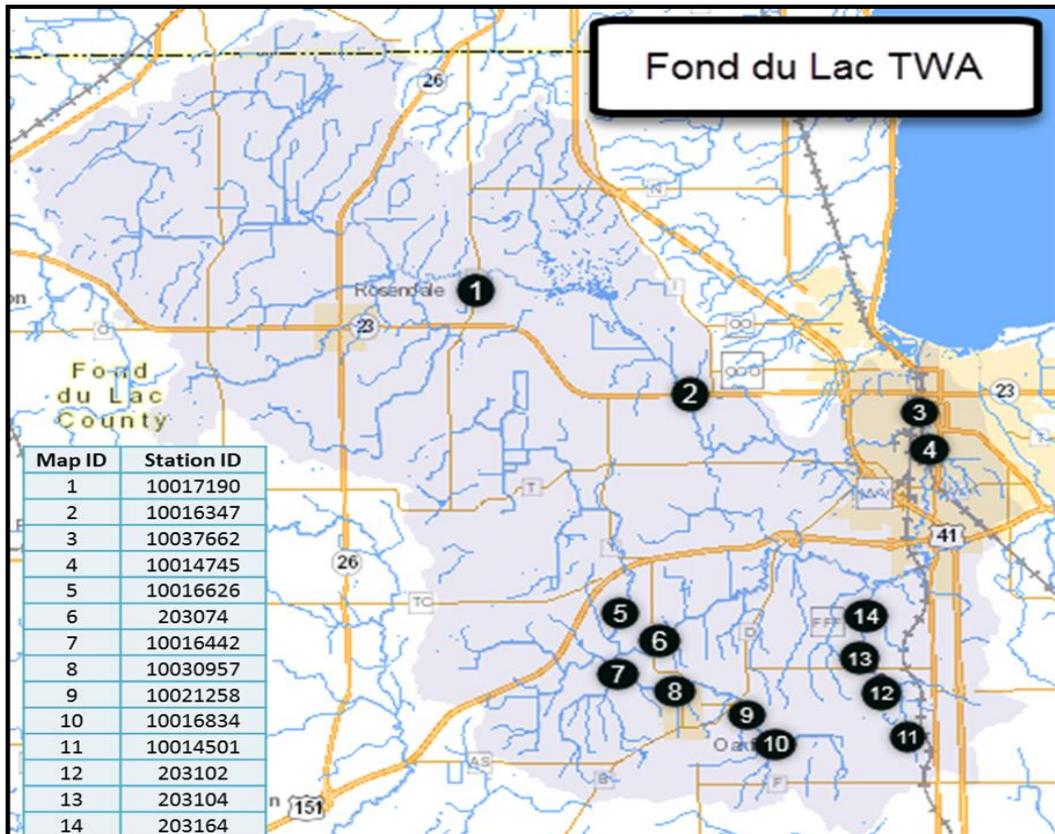


Figure 4: Monitoring Stations for Fond du Lac TWA Project.

Table 4: Total Phosphorus and Total Suspended Solids Monitoring Sites Sampled May Through October 2015.

SWIMS Station ID	Site Name	Surface Water WBIC
203074	Fond Du Lac River East Branch - Cth Y	135900
203104	Parsons Creek - 100 Feet Above Cth B	136000
10014745	East Branch Fond Du Lac River Immediately Below 12 St.	135900
10016347	West Br. Fond Du Lac River - Highway 23	134000
10016442	Campground Creek - Above Thill Road	137400
10016626	Sevenmile Creek - 40 M Upstream Of Vielbig Road	136800

Table 5: Aquatic Macroinvertebrate Monitoring Sites Sampled in October 2015.

SWIMS Station ID	Site Name	Surface Water WBIC
203074	Fond Du Lac River East Branch - Cth Y	135900
203164	Parsons Creek At Lost Arrow Road	136000
10016442	Campground Creek - Above Thill Road	137400
10016626	Sevenmile Creek - 40 M Upstream Of Vielbig Road	136800
10021258	Campground Cr. Above Millpond Rd.	137400

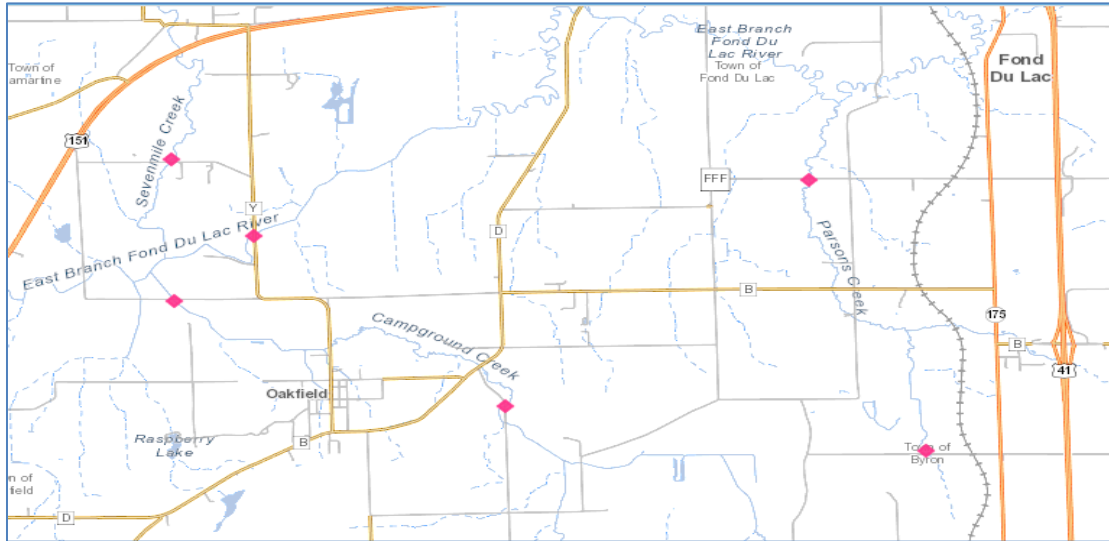


Figure 5: Macroinvertebrate Monitoring Sites for Fond du Lac TWA Project

Table 6: Qualitative Habitat Survey Locations Conducted August through September 2015.

SWIMS Station ID	Site Name	Surface Water WBIC
203164	Parsons Creek at Lost Arrow Rd	136000
10014501	Parsons Creek at Church Rd	136000
10021258	Campground Creek Above Millpond Rd	137400
10016442	Campground Creek Above Thill Rd	137400
10030857	Campground Creek DS Cth Y	137400
10016626	Sevenmile Creek at Vielbig Rd	136800
10017190	West Branch of the Fond Du Lac River at Cth C	134000
203074	East Branch of the Fond Du Lac River at Cth Y	135900

Table 7: Wadable Fish Survey Locations Conducted between July and September 2015.

SWIMS Station ID	Site Name	Surface Water WBIC
203164	Parsons Creek at Lost Arrow Rd	136000
10014501	Parsons Creek at Church Rd	136000
203102	Parsons Creek Upstream Hickory Rd	136000
10021258	Campground Creek Above Millpond Rd	137400
10016442	Campground Creek Above Thill Rd	137400
10030857	Campground Creek DS Cth Y	137400
10016626	Sevenmile Creek at Vielbig Rd	136800
10017190	West Branch of the Fond Du Lac River at Cth C	134000
203074	East Branch of the Fond Du Lac River at Cth Y	135900

Table 8: Temperature Monitoring Locations Conducted between May and October 2015 and 2016.

SWIMS Station ID	Site Name	Surface Water WBIC
203074	East Branch of the Fond Du Lac River at Cth Y	135900
203102	Parsons Creek Upstream Hickory Rd	136000
10021258	Campground Creek Above Millpond Rd	137400
10016442	Campground Creek Above Thill Rd	137400
10016626	Sevenmile Creek at Vielbig Rd	136800
10016347	West Branch of the Fond Du Lac River at Hwy 23	134000
10017190	West Branch of the Fond Du Lac River at Cth C	134000

## Project Results

### *Total Phosphorus*

The 2015 TP sample analysis results in the Fond Du Lac River Watershed ranged from 0.043 mg/L in Parsons Creek in October to 0.752 mg/L in the West Branch of the Fond Du Lac River in July (Table 9, Figure 6). All 9 locations in this project had an average TP concentration (mg/L) exceeding the Wisconsin Administrative Code ch. NR 102.06(3)(b) water quality criteria (WQC) for the Fond Du Lac River and its tributaries at 0.075 mg/L (Table 9, Figure 6). The average TP concentrations for the 9 sites in this project ranged from 0.0826 mg/L in Parsons Creek at County Hwy B to 0.49 mg/L in Sevenmile Creek at Vielbig Road (Table 9, Figure 6).

Table 9: Total Phosphorus Concentrations (mg/L) and Averages.

Month of sampling event	Fond Du Lac River East Branch - Cth Y	Parsons Creek - Above Cth B	East Branch Fond Du Lac Below 12 St.	West Br. Fond Du Lac River Highway 23	Campground Creek - Above Thill Road	Sevenmile Creek Upstream Of Vielbig	W. Br. Fond Du Lac R.- Cth C	Campground Above Millpond	West Branch Fond Du Lac on Forest
May	0.219	0.123	0.277	0.2	0.176	0.335	0.153	0.136	0.37
June	0.404	0.138	0.366	0.329	0.32	0.596	0.215	0.212	0.37
July	0.313	0.0712	0.273	0.752	0.244	0.743	0.247	0.159	0.647
August	0.202	0.048	0.175	0.256	0.291	0.43	0.194	0.0905	0.369
September	0.301	0.0722	0.257	0.234	0.209	0.506	0.255	0.118	0.232
October	0.199	0.0433	0.115	0.121	0.22	0.331	0.153	0.0791	0.256
Average	0.273	0.0826	0.2438	0.3153	0.2433	0.4902	0.2028	0.1324	0.374

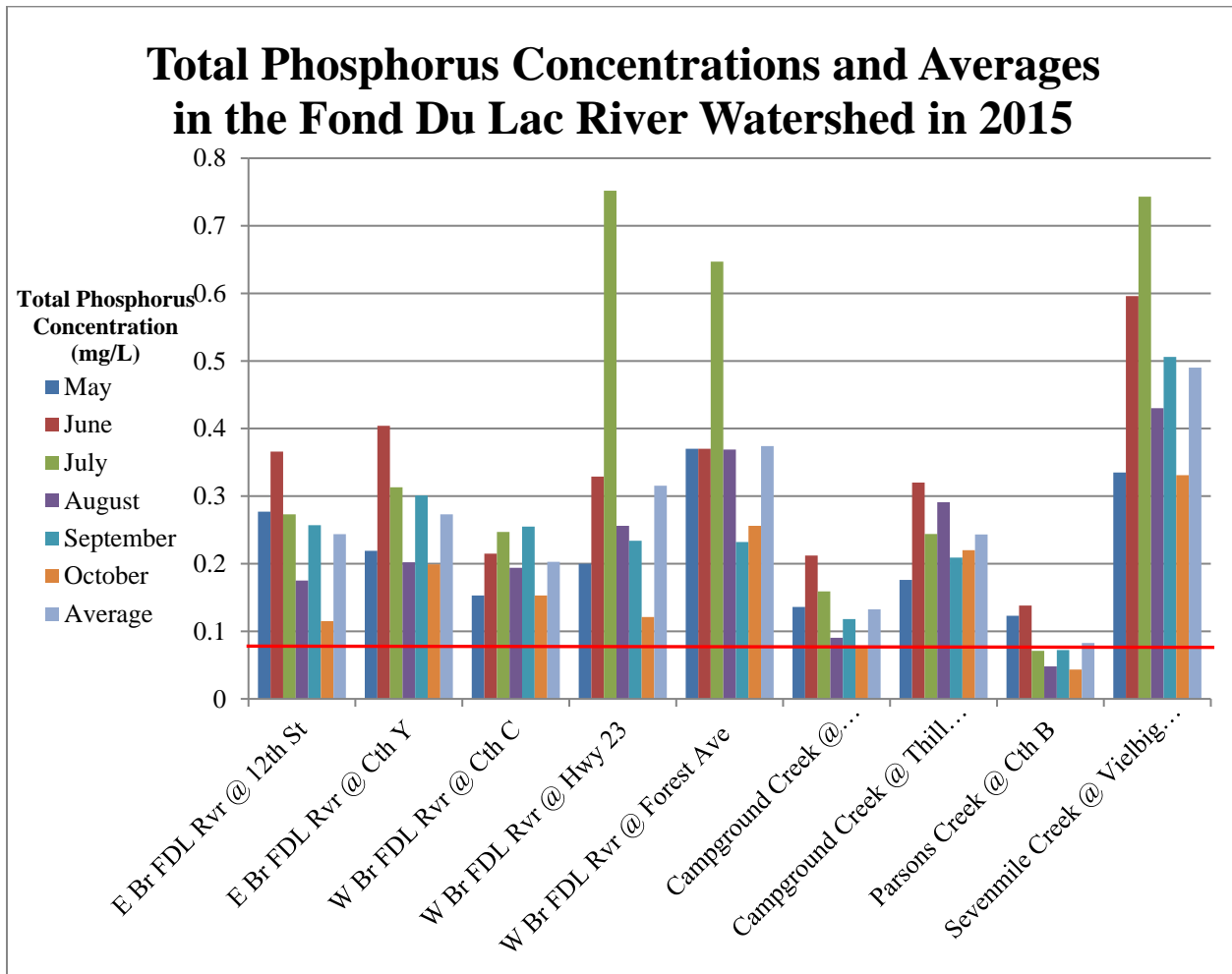


Figure 6: Total Phosphorus Concentrations and Averages of Samples Collected in the Fond Du Lac River Watershed in 2015 (with 0.075 mg/L WQC red line).

### *Total Suspended Solids*

Total Suspended Solids (TSS) analysis was conducted on samples collected at 9 Fond Du Lac River Watershed locations during the same sampling events as TP in 2015. TSS samples were collected once per month from May through October (Table 10, Figure 7). Wisconsin does not have a water quality standard for TSS; however, this data provides useful information about the watershed, background information for future comparison, and additional support for adding these waterbodies to the USEPA Clean Water Act Section 303d Impaired Waters List (CWA 303d list) for habitat degradation.

The TSS concentration of the Fond Du Lac River and its tributaries ranged from No Detection (ND)—which is <2.0 mg/L—at multiple locations to 461.0 mg/L in July in Parsons Creek at County Hwy B (Table 10, Figure 7). In July, Parsons Creek was very turbid; therefore, the high TSS concentration was not surprising. The average TSS concentrations of the Fond Du Lac River Watershed samples ranged from 5.5 mg/L in the West Branch of the Fond Du Lac River at Hwy 23 to 88.9 mg/L in Parsons Creek at County Hwy B (Table 10, Figure 7).

Table 10: Total Suspended Solids Concentrations and Averages of Samples Collected (ND = No Detection) (Limit of Detection 2.0 mg/L Used for Average Concentration Calculation)

Month of Sampling Event	E Br FDL Rvr @ 12th St (mg/L)	E Br FDL Rvr @ Cth Y (mg/L)	W Br FDL Rvr @ Cth C (mg/L)	W Br FDL Rvr @ Hwy 23 (mg/L)	W Br FDL Rvr @ Forest Ave (mg/L)	Campground Creek @ Millpond Rd. (mg/L)	Campground Creek @ Thill Rd. (mg/L)	Parsons Creek @ Cth B (mg/L)	Sevenmile Creek @ Vielbig Rd. (mg/L)
May	88.5	19	7	9.8	6.8	24.3	22.4	18.8	11.2
June	42.8	27	6	ND	10	17.8	53.2	35	16
July	13.4	14.2	10	7	80	13.6	12.3	461	17
August	13.8	9.2	8.6	3.4	27.6	ND	7.6	9.2	21.2
September	2	8.6	17.2	8.6	3.4	11.4	8.75	6.8	11.2
October	3.2	4	10.6	ND	ND	5.6	3.6	2.4	ND
Average	27.3	13.7	9.9	5.5	21.6	12.5	18.0	88.9	13.1

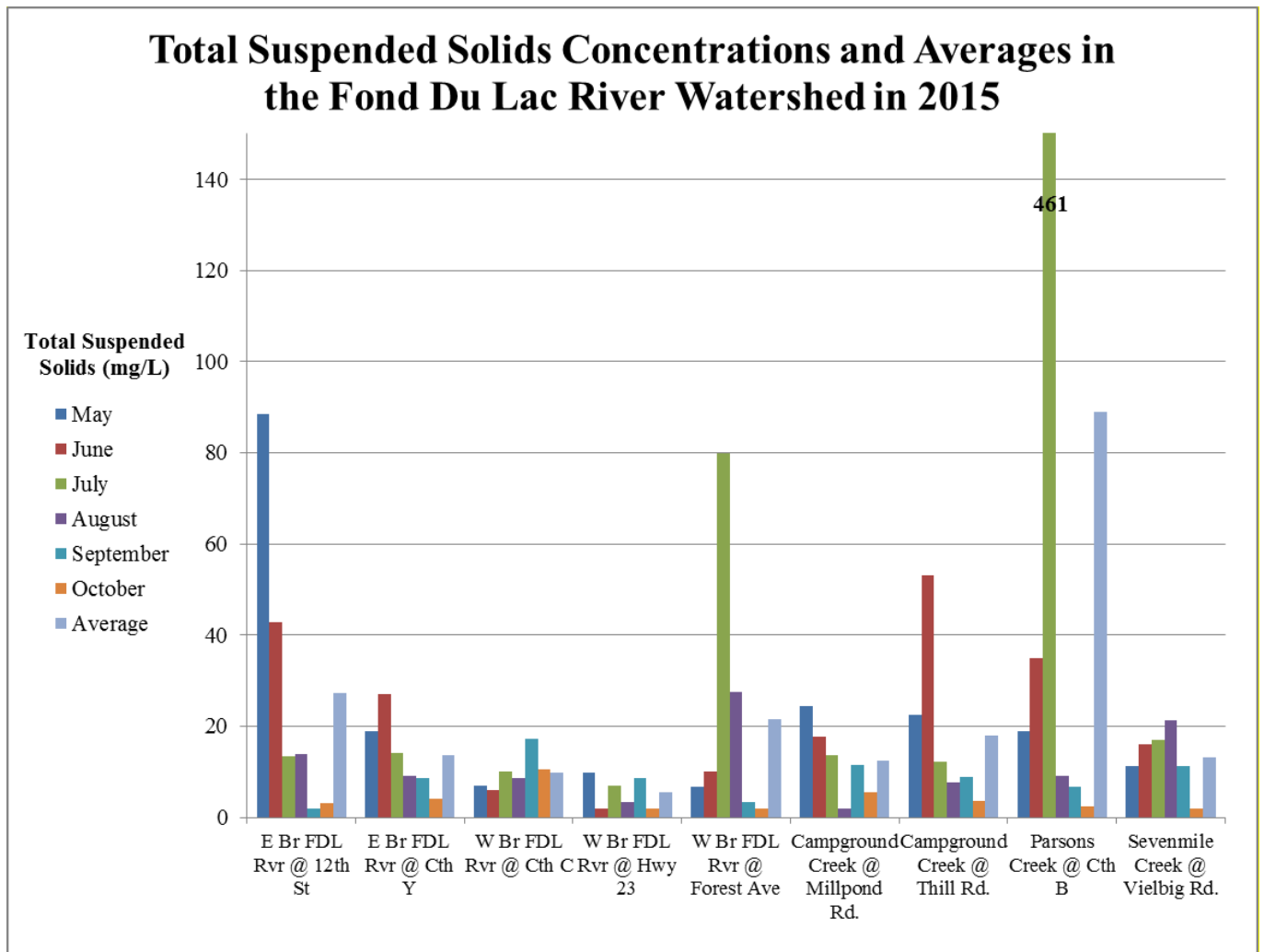


Figure 7: Total Suspended Solids Concentrations and Averages (mg/L) of Samples Collected.



### Macroinvertebrates

In October 2015, each of the 6 streams in Table 2 was sampled for aquatic macroinvertebrate communities. Some aquatic macroinvertebrate species are tolerant of environmental degradation, while some species are moderately tolerant, and some others are intolerant. Based upon the representative macroinvertebrate sample collected and their associated tolerance to environmental degradation, an Index of Biotic Integrity (MIBI) was calculated to indicate the water quality condition of the stream (Table 11, Figure 8, and Figure 9).

Table 11: Aquatic Macroinvertebrate Index of Biotic Integrity Scores and Water Quality Condition Category.

SWIMS Station ID	Stream Name and Location	Macroinvertebrate IBI Score	Condition Category
203164	Parsons Creek At Lost Arrow Road	4.56956	Fair
203074	Fond Du Lac River East Branch - Cth Y	3.68366	Fair
10016442	Campground Creek - Above Thill Road	5.0575	Good
10021258	Campground Cr. Above Millpond Rd.	5.0454	Good
10016626	Sevenmile Creek - 40 M Upstream Of Vielbig Road	3.44961	Fair
10014501	Parsons Creek At Church Rd	2.43458	Poor

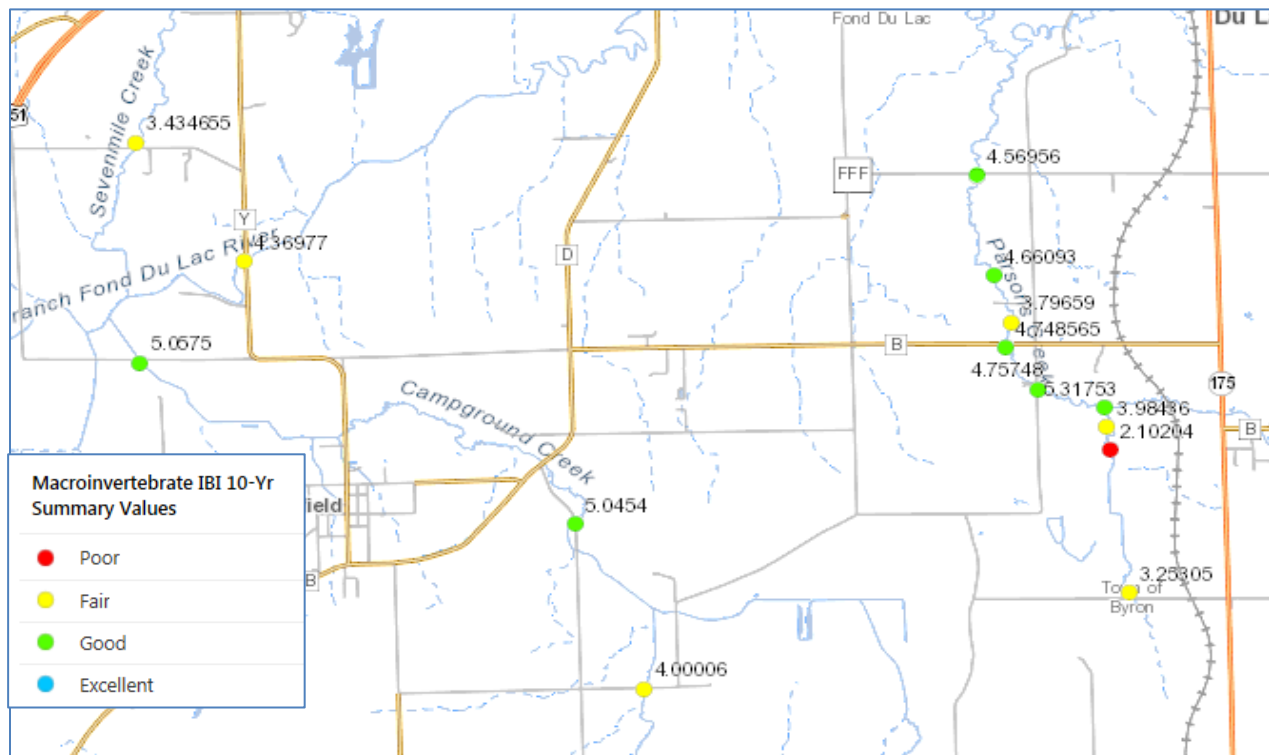


Figure 8: Macroinvertebrate Monitoring Values for Fond Du Lac TWA and Previous Data Collections.

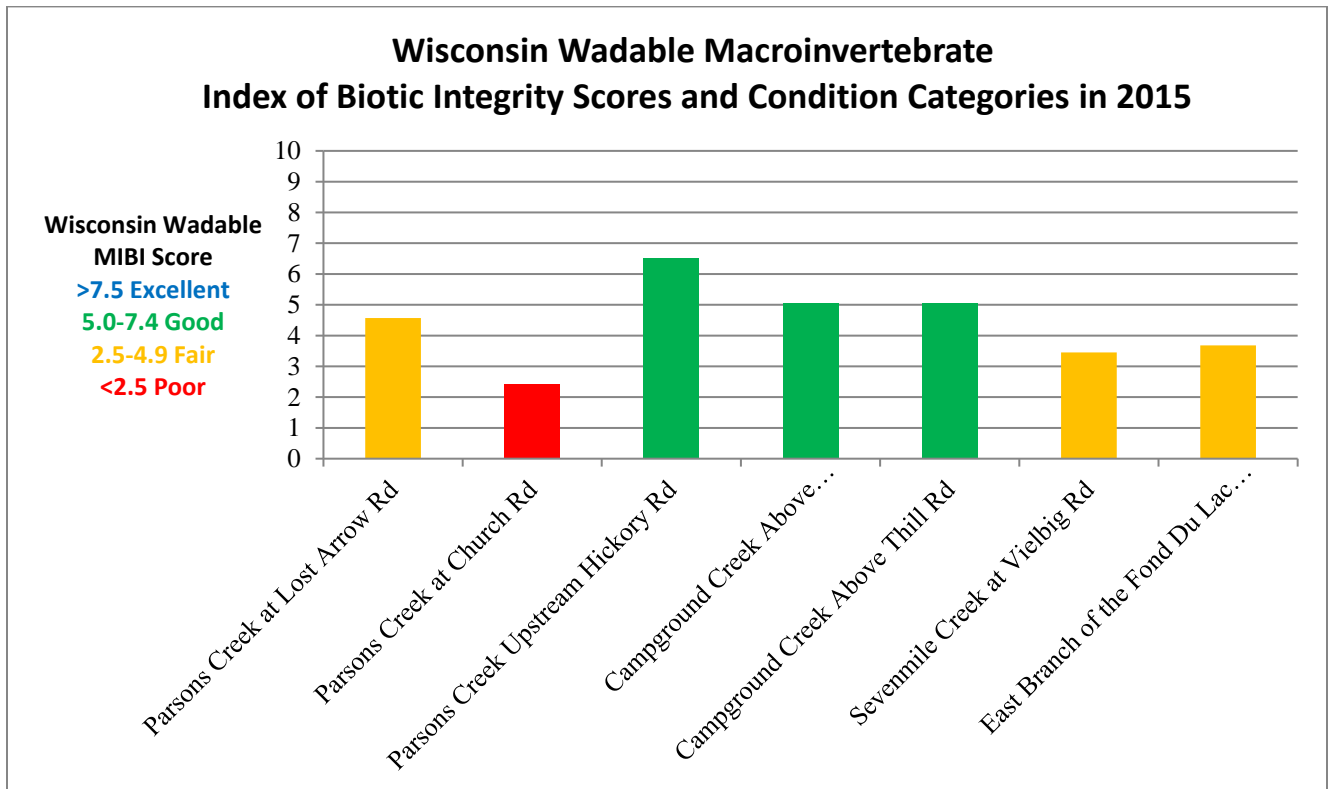


Figure 9: MIBI scores and condition categories in the Fond Du Lac River in 2015.

In May of 1996, aquatic macroinvertebrate samples were collected at 13 locations in the Fond Du Lac River Watershed. The samples were collected following the same kicknet protocol used during the 2015 surveys; therefore, the MIBI scores from 1996 can be compared to the MIBI scores from 2015.

Of the 13 1996 surveys, 5 were close enough in location for comparison with the 2015 surveys (Table 12, Figure 10). In addition, Campground Creek near Thill Rd was sampled in 2001 and compared with the MIBI results from the 2015 survey (Table 12, Figure 10). Two of the 6 MIBI scores decreased or indicated lower water quality Condition Category (Table 12, Figure 10). Parsons Creek at Hobbs Woods County Park (upstream Hickory Rd) and Sevenmile Creek at Vielbig Rd had MIBI scores that increased and indicated a higher water quality Condition Category (Table 12, Figure 10). Two of the 6 MIBI scores were similar and remained in the same Condition Category (Table 12, Figure 10).

The largest difference between a historical MIBI score and the 2015 MIBI score was a 3.56 increase in Parsons Creek at Hobbs Woods County Park (Table 12, Figure 10) indicating improvement. The largest decrease from historical MIBI scores to 2015 MIBI scores was reported at the East Branch of the Fond Du Lac River at County Hwy Y (Table 12, Figure 10), indicating a decline in condition.

Table 12: Comparison of Historic MIBI and HBI Scores to 2015 MIBI and HBI Scores at 6 Locations in the Fond Du Lac River Watershed.

Stream Name and Location	Historic MIBI Score	2015 MIBI Score	Historic HBI Score	2015 HBI Score
Parsons Creek at Church Rd	4.14	2.43	4.23	4.56
Parsons Creek Upstream Hickory Rd	2.95	6.51	4.58	3.42
Parsons Creek at Lost Arrow Rd	4.6	4.57	5.27	4.77
Sevenmile Creek at Vielbig Rd	0.55	3.45	6.46	5.4
E Br Fond Du Lac River at Cth Y	5.62	3.68	5.87	7.46
Campground Creek at Thill Rd	5.59	5.06	5.5	5.92

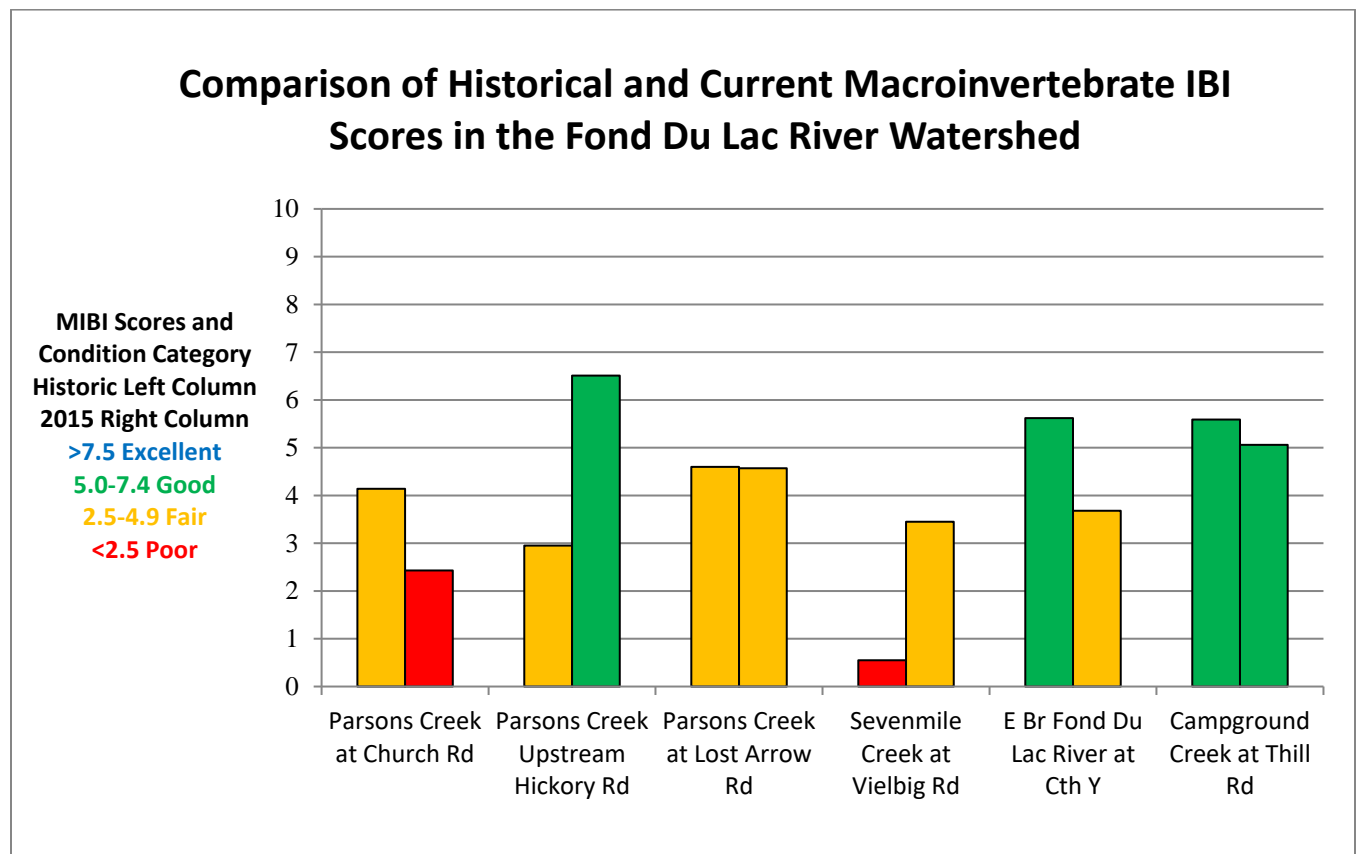


Figure 10: Comparison of the historic MIBI score (left column) and the 2015 MIBI score (right column)

In the 1997 Nonpoint Source Control Plan, the 1996 macroinvertebrate sample results were evaluated using the Hilsenhoff's Biotic Index (HBI) score which refers to William H. Hilsenhoff's 1987 "An improved biotic index of organic stream pollution". One of the basic differences between understanding the HBI scores versus the MIBI scores is that the higher the MIBI the better condition while the higher the HBI the poorer the condition. One of the fundamental differences between the HBI and MIBI is that the HBI focuses more on impacts to the macroinvertebrate community from organic pollution and increased nutrients while the MIBI also ties in impacts from habitat degradation. The historical HBI scores and

water quality Condition Category at the locations listed in Table 12 were compared to the 2015 HBI scores for additional reference (Figure 11). The largest difference between the 1996 and 2015 HBI scores was an increase of 1.59 at the East Branch of the Fond Du Lac River at County Hwy Y (Table 12, Figure 11). The largest improvement to water quality or decrease in HBI score from 1996 to 2015 was recorded in Parsons Creek upstream Hickory Rd (Table 12, Figure 11).

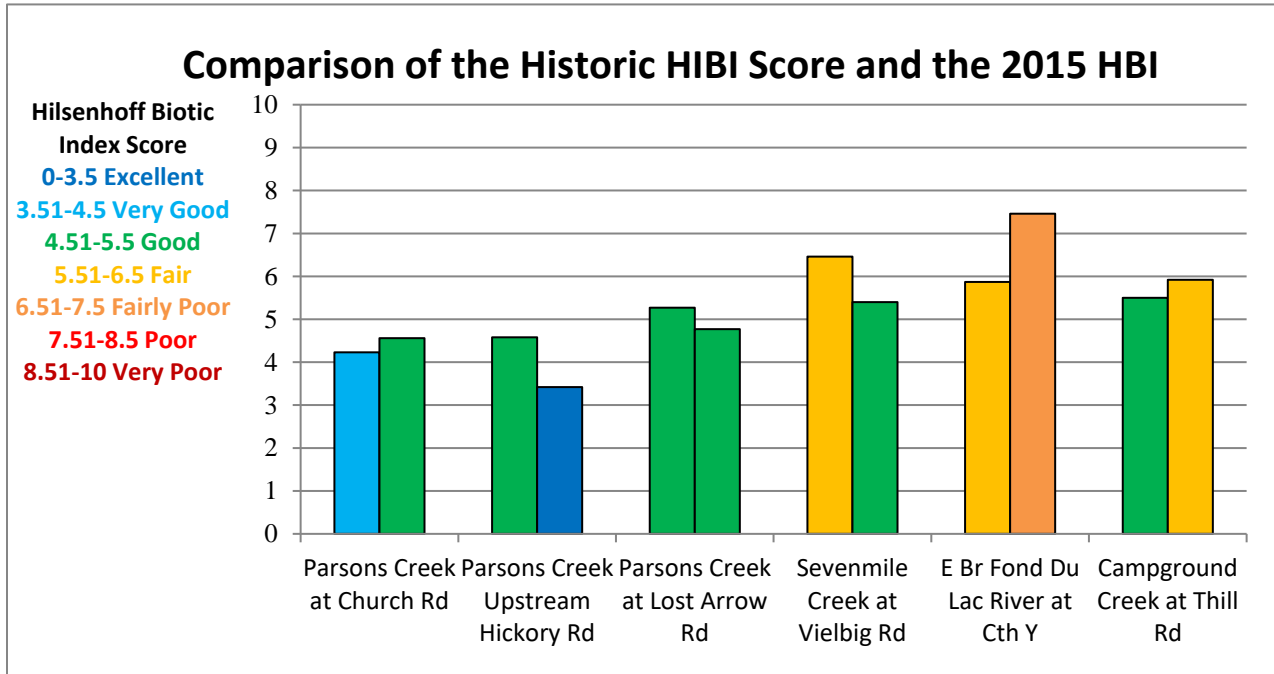


Figure 11: Comparison of the historic HBI score (left column) and the 2015 HBI score (right column).

### Qualitative Habitat Surveys

Between August and September 2015 qualitative habitat surveys were conducted at the 7 locations. Quantitative habitat assessments evaluate a representative stream reach (35 X Mean Stream Width) for the quantity and quality of habitat for game fish and compare the habitat to reference streams in Wisconsin. Based upon the assessment data collected during the 2015 surveys, a habitat rating was calculated (Table 13, Figure 12).

Table 13: Qualitative Habitat Survey Scores and Rating Conditions for 9 Creeks in the Fond du Lac River Watershed in 2015.

SWIMS Station ID	Site Name	Qualitative Habitat Score	Condition Category
203074	E Br FDL Rvr @ Cty Y	30	Fair
10017190	W Br FDL Rvr @ Cty C	45	Fair
10021258	Campground Cr @ Milllpond Rd	25	Fair
10030857	Campground Cr @ Cty Y	73	Good
10016442	Campground Cr @ Thill Rd	15	Poor
10016626	Sevenmile Cr @ Vielbig Rd	25	Fair
203102	Parsons Cr @ Hickory Rd	72	Good
203164	Parsons Cr @ Lost Arrow Rd	47	Fair
10014501	Parsons Cr @ Church Rd	40	Fair

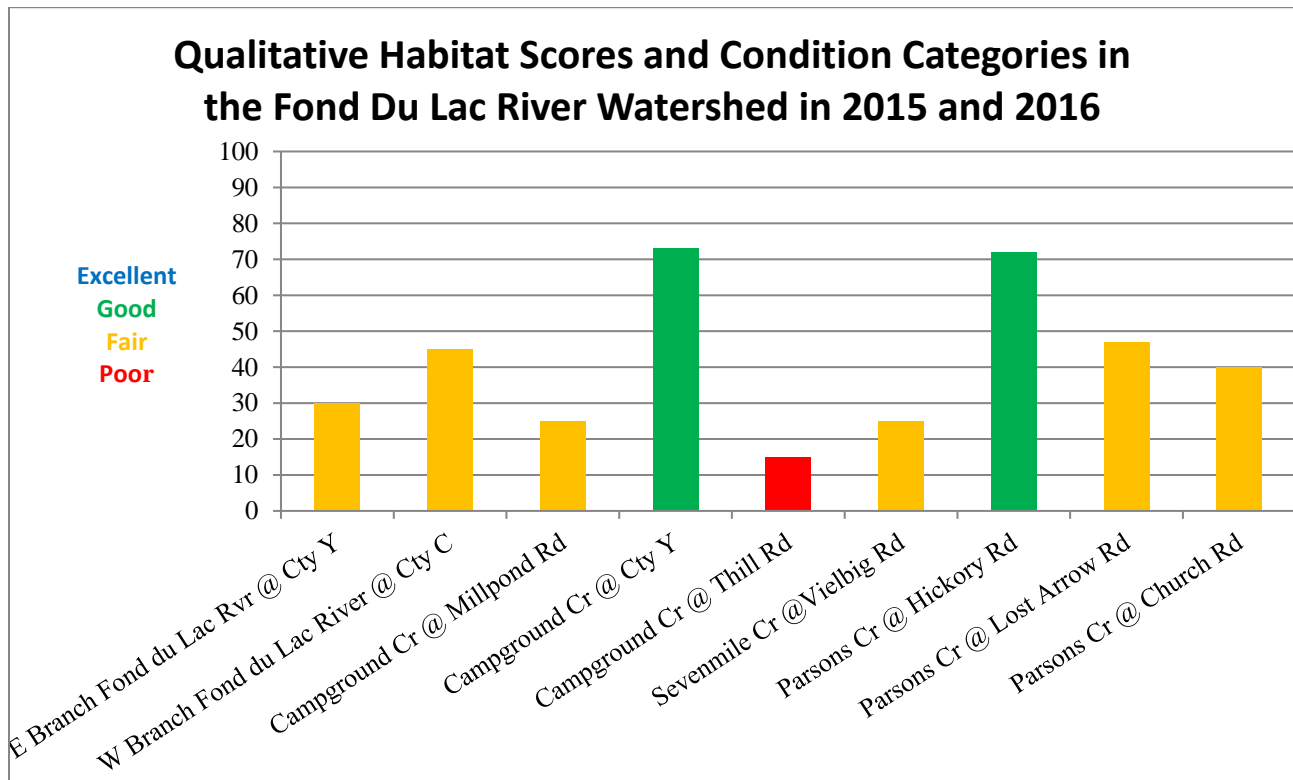


Figure 12: Qualitative habitat scores and condition categories in the Fond Du Lac River watershed in 2015 and 2016.

### *Fish Index of Biotic Integrity Surveys*

In July 2015, 8 locations in the Fond Du Lac River Watershed were surveyed for representative fish communities. The West Branch of the Fond Du Lac River at County Hwy C was also surveyed in September 2016. Some fish species are tolerant of environmental degradation, while some species are moderately tolerant, and some others are intolerant. Based upon the representative fish collected during the survey and their associated tolerance to environmental degradation, an Index of Biotic Integrity (FIBI) was calculated to indicate the water quality of each creek or river (Table 14, Figure 13). The FIBI scores ranged from 10 in Parsons Creek at Church Rd to 90 in Parsons Creek at Hickory and Lost Arrow Rd (Table 14, Figure 13). The Condition Category for the 9 sites ranged from Poor to Excellent. Two of the 9 survey locations demonstrated a Condition Category of Excellent, while 5 of the 9 locations demonstrated a Condition Category of Good. One site each had a Condition Category of Fair and Poor.

Each fish community surveyed was used to verify or update the modeled Natural Community for that stream segment. Each of the streams' Natural Community was verified or changed based upon the fish caught in the survey (and any historical known surveys in that stream segment). Verifying or changing the modeled Natural Community was important since the Natural Community determines what FIBI scoring scale was used to determine the water quality of that stream segment. The results of the calculated FIBI calculations displayed in Table 14 and Figure 13 are based upon the verified or changed Natural Community.

Table 14: Wisconsin Wadable Fish Index of Biotic Integrity Scores and Condition Categories for 9 Creeks in the Fond du Lac River Watershed in 2015

SWIMS Station ID	Site Name	Fish IBI Score	Condition Category	Natural Community
203074	E Br FDL Rvr @ Cty Y	60	Good	Cool-Warm Mainstem
10017190	W Br FDL Rvr @ Cty C	80	Excellent	Cool-Warm Mainstem
10021258	Campground Cr @ Millpond Rd	70	Good	Cool-Warm Headwater
10030857	Campground Cr @ Cty Y	80	Good	Cool-Warm Headwater
10016442	Campground Cr @ Thill Rd	60	Good	Cool-Warm Mainstem
10016626	Sevenmile Cr @ Vielbig Rd	60	Fair	Cool-Warm Headwater
203102	Parsons Cr @ Hickory Rd	90	Good	Cool-Cold Headwater
203164	Parsons Cr @ Lost Arrow Rd	70	Excellent	Cool-Warm Mainstem
10014501	Parsons Cr @ Church Rd	10	Poor	Coldwater

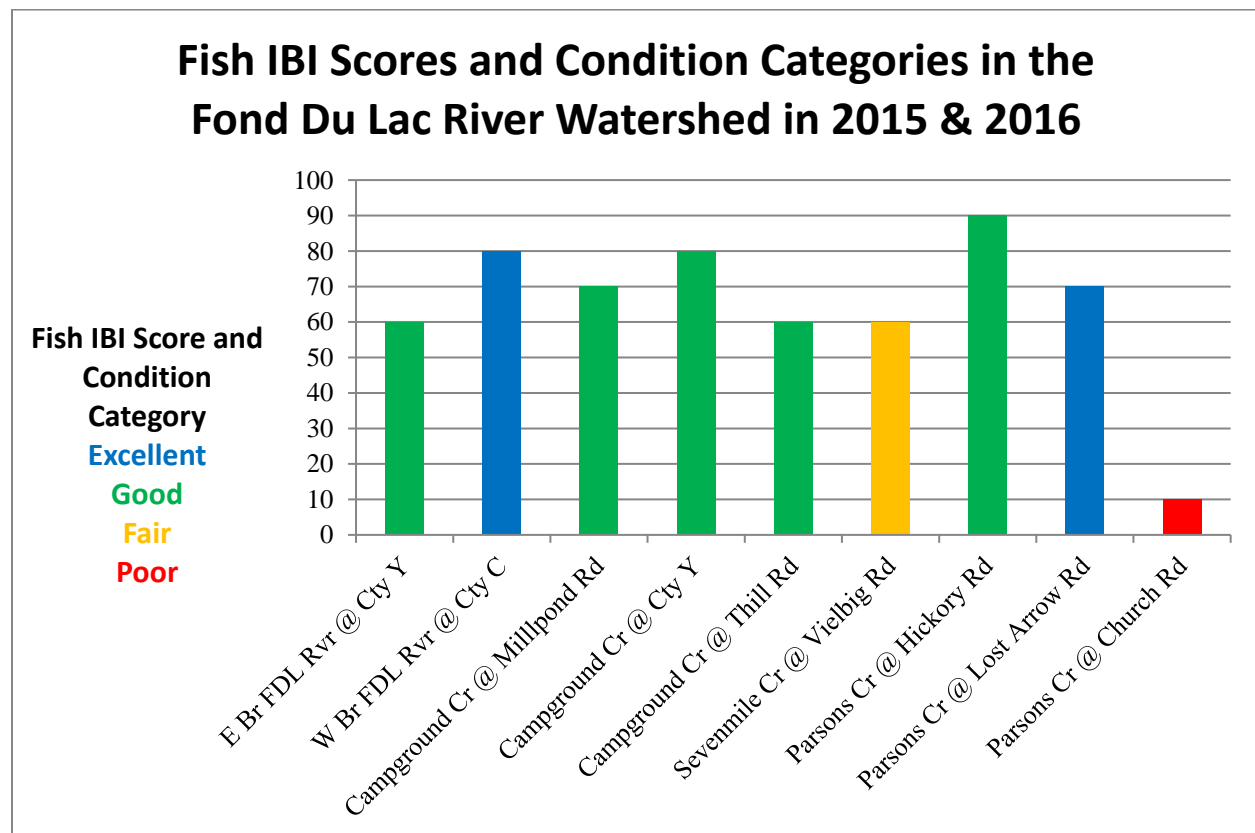


Figure 13: Fish IBI scores and condition categories in the Fond Du Lac River watershed in 2015 and 2016.

In July and August 1996, fish surveys were conducted at 13 locations in the Fond Du Lac River Watershed. The current FIBI protocol (WDNR 2001) was followed during the surveys; thus, the FIBI scores from 1996 can be compared with the FIBI surveys conducted in 2015 as part of this project. Just as in 2015, the 1996 FIBI surveys were used to verify the Natural Community of the river or creek. The 1996 FIBI scores and Condition Categories were based upon the verified or updated Natural Community, whichever was appropriate. Each of the Natural Communities verified or changed in 2015 did not need to be adjusted based upon the 1996 FIBI surveys. Seven of the 13 locations surveyed in 1996 were close enough for comparison to the 2015 surveys (Table 15, Figure 14). Five of the 7 2015 FIBI scores were similar or increased when compared to the 1996 FIBI scores (Table 15, Figure 14). Campground and Sevenmile Creeks decreased in FIBI score and Condition Category from 1996 to 2015 (Table 15, Figure 14).

Table 15: Historical and Current Fish Index of Biotic Integrity Scores and Condition Categories in the Fond Du Lac River Watershed.

Monitoring Location	1996 FIBI Score	2015 FIBI Score	1996 Condition Category	2015 Condition Category
E Br FDL Rvr @ Cty Y	40	60	Fair	Good
W Br FDL Rvr @ Estabrook Rd	35	42	Fair	Fair
Campground Cr @ Cty Y	100	80	Excellent	Good
Sevenmile Cr @ Vielbig Rd	60	50	Good	Fair
Parsons Cr @ Hickory Rd	80	90	Good	Good
Parsons Cr @ Lost Arrow Rd	70	70	Excellent	Excellent
Parsons Cr @ Church Rd	0	10	Poor	Poor

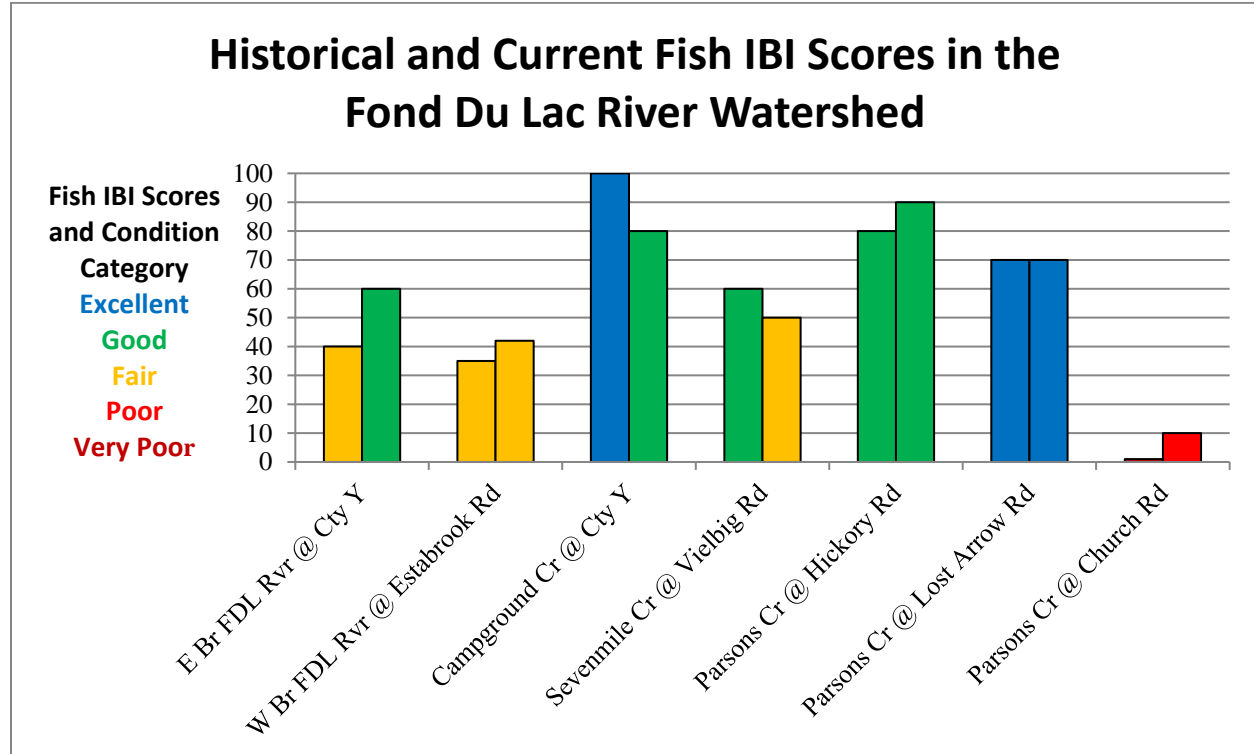


Figure 14: Comparison of the historic 1996 FBI score (left column) and the 2015 FBI score (right column).

### Water Temperature Surveys

Temperature data was collected from May through October 2015 at 5 locations in the Fond Du Lac River Watershed (Table 16, Figure 15). In addition, the West Branch of the Fond Du Lac River at County Hwy C and Seven Mile Creek at Vielbig Rd were monitored in May through October 2016. Monthly average temperatures were reported for months with complete data only. The water level in the East Branch of the Fond Du Lac River at County Hwy Y became too low in July 2015; therefore, only the average temperatures for June, August, and September 2015 were reported (Table 16, Figure 15). The temperatures at the sites monitored in 2015 and 2016 during the time of deployment ranged from 43.6F on 10/27/2015 to 89.0F on 8/15/2015 in the West Branch of the Fond Du Lac River at Hwy 23. The average monthly temperatures ranged from 57.6F in Parsons Creek at Hickory Rd in June to 72.8F in the West Branch of the Fond Du Lac River at Hwy 23 in August (Table 16, Figure 15). The Maximum Daily Averages (MDM) ranged from 65.0F in Parsons Creek at Hickory Rd to 81.3F in the West Branch of the Fond Du Lac River at Hwy 23 (Table 16, Figure 15).

Table 16: Monthly average and maximum daily mean temperatures in the Fond Du Lac River watershed in 2015 and 2016.

	<b>E. Branch Fond du Lac River @ Y</b>	<b>W Br Fond Du Lac River @ Cty C</b>	<b>W. Branch Fond du Lac River @ 23</b>	<b>Seven Mile Creek at Vielbig Rd</b>	<b>Campground Creek @ Millpond Rd.</b>	<b>Campground Creek @ Thill Rd.</b>	<b>Parsons Creek @ Hickory</b>
June	66.2		66.812		64.436	65.66	57.56
July		74.8	71.6	71.3	66.65	70.268	58.514
August	69.71	75	72.806	71.1	65.066	68.72	59.09
September	66.74	66.5	67.964	64.5	64.022	66.326	59.252
Maximum Daily Mean	78.206	79.9	81.266	75.9	71.654	76.478	64.994



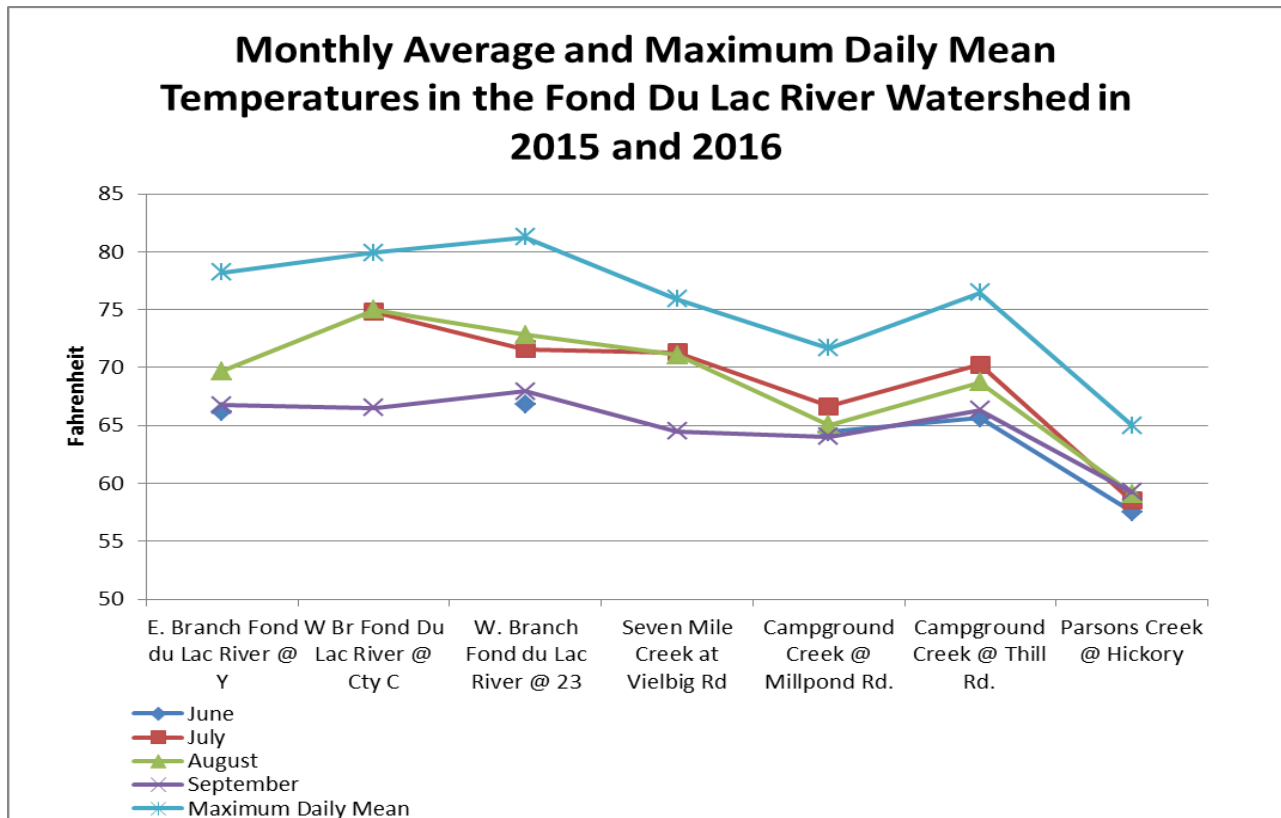


Figure 15: Monthly average temperature and maximum daily mean temperatures in Fond Du Lac River in 2015 and 2016.

## Discussion

### *Natural Community Analysis*

Most of the streams in this watershed are modeled to be coldwater or cool-cold headwater cool-warm headwater (Lyons, 2008). The department has recently developed a draft method to determine whether or not the modeled natural community is accurate based on the fishery assemblage and climate conditions (Lyons, 2013). Natural community validation work indicated that the following streams were verified:

- Parsons Creek Upstream of Hwy B as Cool-Cold Headwater
- Campground Creek Upstream of Hwy Y Updated to Cool-Warm Headwater
- Campground Creek Downstream of Hwy Y Updated to Cool-Warm Mainstem
- Sevenmile Creek Updated to Cool-Warm Headwater
- East Branch of the Fond du Lac River Upstream of County D Updated to Cool-Warm Mainstem
- East Branch of the Fond du Lac River Downstream of County D Updated to Warm Mainstem Continuously to the Confluence with West Branch of the Fond du Lac River
- Parsons Creek Downstream of Hwy B Updated to Cool-Warm Mainstem

### *Total Phosphorus*

The inorganic chemistry data collected during this project established that instream TP concentrations were above reference conditions; therefore, an impairment assessment was conducted to evaluate if NR 102 WQC were being met or if the creeks should be placed on the CWA 303d Impaired Waters List

(Table 18). The requirements to demonstrate if WQC for TP were being met, clearly exceeded, or overwhelmingly exceeded were accomplished through this project. WisCALM 2018 requires that a minimum of 6 monthly samples for TP from May through October occur within two years to have sufficient data to calculate the LCL. The LCL is what determines if the creek was meeting, clearly exceeding, or overwhelmingly exceeding the water quality standard.

If the lower 90% confidence limit (LCL) is less than 0.075 mg/L TP, then that stream or river segment (assessment unit) is considered to meet the WQC. Conversely, if the LCL for a sample dataset exceeds the WQC for TP, then that stream or river segment is considered to be exceeding the criterion. The LCLs were calculated for each complete set of TP samples (Table 17). Eight of the 9 streams' and rivers' LCLs exceeded the WQC for TP, while 1 met (Parsons Creek at B) (Table 17, Figure 16). If a stream or river LCL is more than 2X the WQC or  $\geq 0.15$  mg/L TP, then that waterbody is determined to overwhelmingly exceed the WQC (WisCALM 2014). Seven of the 9 LCLs overwhelmingly exceeded the WQC (Table 17, Figure 16).

Table 17: Total Phosphorus Lower 90% Confidence Limits in the Fond Du Lac River Watershed in 2015.

Location	TP Lower 90% Confidence Limit	Exceedance Level
E Br Fond Du Lac River at 12th St	0.191	Overwhelmingly Exceeds
E Br Fond Du Lac River at Cth Y	0.224	Overwhelmingly Exceeds
W Br Fond Du Lac River at Cth C	0.176	Overwhelmingly Exceeds
W Br Fond Du Lac River at Hwy 23	0.213	Overwhelmingly Exceeds
W Br Fond Du Lac River at Forest Ave	0.285	Overwhelmingly Exceeds
Campground Creek at Millpond Rd	0.103	Exceeds
Campground Creek at Thill Rd	0.211	Overwhelmingly Exceeds
Parsons Creek at Cth B	0.059	Meets
Sevenmile Creek at Vielbig Rd	0.394	Overwhelmingly Exceeds

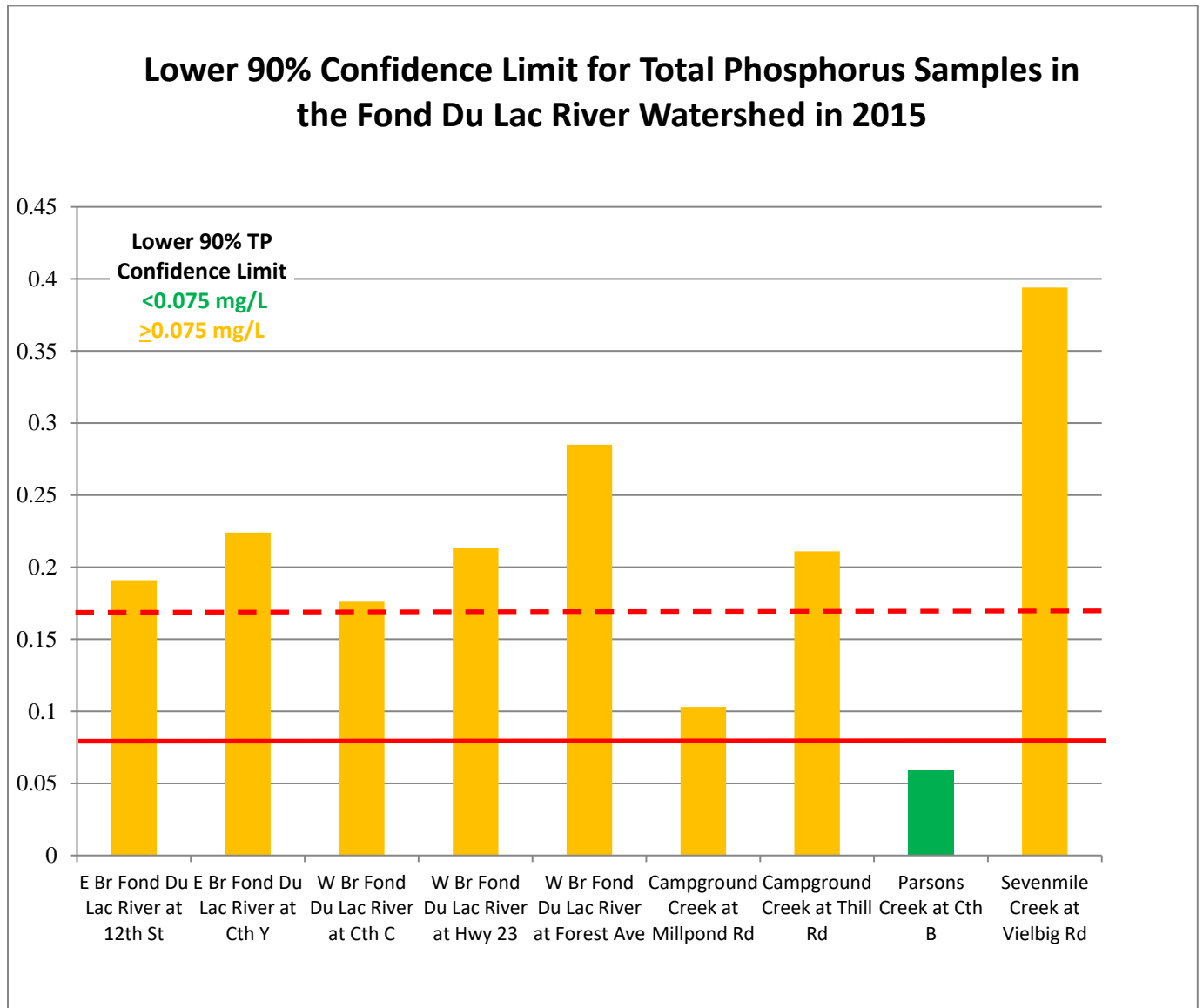


Figure 16: Total Phosphorus Lower 90% Confidence Limits in the Fond Du Lac River Watershed in 2015. Solid red line indicates the NR 102 WQC for Total Phosphorus for the Fond Du Lac River and its Tributaries. Dashed red line indicates an Overwhelming Exceedance of NR 102 WQC for Total Phosphorus.

To complete the CWA 303d impairment assessment, WisCALM 2014—Table 4 was referenced to determine impairment status and the associated pollutant (Table 18). Seven of the 9 locations in this project overwhelmingly exceeded the TP WQC. All of the East and West Branches of the Fond Du Lac River sample dataset LCLs overwhelmingly exceeded the WQC and verified their need to be listed on the CWA 303d IWL. Most of the East Branch of the Fond Du Lac River was added to the CWA 303d list in 2014. The monitoring data from 2015 indicate that the remaining portion in the upper East Branch of the Fond Du Lac River should be recommended for the 2018 CWA 303d list (Table 17). The West Branch of the Fond Du Lac River was recommended for the 2016 CWA 303d list. Sevenmile Creeks' TP LCL overwhelmingly exceeded the WQC and should be recommended for the 2018 CWA 303d list. Campground Creek at Millpond Rd exceeded the TP WQC, but did not overwhelmingly exceed.

According to impairment assessment protocol (WisCALM 2014), biological monitoring was needed to determine which CWA 303d listing was necessary for Campground Creek at Millpond Rd (Table 15-16). Biological confirmation is considered to be at least a FIBI or MIBI score or both in the Poor Condition Category (WisCALM 2014). The 2015 MIBI and FIBI scored in the Good condition category for Campground Creek at Millpond Rd (Figure 9 & 12). The Good IBI scores indicate that Campground Creek should be CWA 303d listed due to pollutant TP, but without bioconfirmation (Category 5P) (Table 18-19).

Table 18: Assessment of Phosphorus and Biology in Combination to Determine Impairment Status and Pollutant (WisCALM 2018).

	Biological Response Indicators	Overall Assessment Result & EPA Listing Category	Pollutant
Meets TP Criteria	None indicate impairment	Not Impaired (Fully Supporting) <b>Category 2</b>	NA
	One or more indicate impairment	Impaired—Biology Only (Not Supporting) <b>Category 5A</b>	Unknown
Exceeds TP Criteria (not an overwhelming exceedance)	One or more indicate impairment	Impaired—TP & Bioconfirmation (Not Supporting) <b>Category 5A</b>	TP
	None indicate impairment	Impaired—Exceeds TP but has insufficient or conflicting biological data (Not Supporting) <b>Category 5P</b>	TP
Exceeds TP Criteria by an Overwhelming Amount	None needed	Impaired—TP Only (i.e. Overwhelming exceedance (Not Supporting) <b>Category 5A</b>	TP

Table 19: 2018 Impaired Waters Listing Cycle 303d Pollutant and Listing Category Recommendations for Streams and Rivers in the Fond Du Lac River Watershed.

Stream/River	Pollutant	Listing Category
East Branch Fond Du Lac River	TP Overwhelmingly Exceeds	5A
West Branch Fond Du Lac River	TP Overwhelmingly Exceeds	5A
Campground Creek at Thill Rd	TP Overwhelmingly Exceeds	5A
Campground Creek at Millpond Rd	TP Exceeds-No Bioconfirmation	5P
Sevenmile Creek	TP Overwhelmingly Exceeds	5A
Parsons Creek at Church Rd	TSS-Habitat Degradation-Bioconfirmation	5A

### Habitat Degradation

Habitat degradation by sedimentation is also a common driver of fish and aquatic life use impairments due to the nature of the land use in the SWTP. Sediment (specifically TSS) is the pollutant that must be addressed to attain the designated use. Fine sediment covers the creek substrate and fills in pools, reducing the suitable habitat for fish and macroinvertebrate communities. Filling-in of pools reduces the amount of available cover for juvenile and adult fish. Sedimentation of riffle areas reduces the reproductive success of fish by reducing the exposed gravel substrate necessary for appropriate spawning conditions. Suspended sediment also increases turbidity, reducing light penetration necessary for photosynthesis in aquatic plants. Increased turbidity also reduces the feeding efficiency of visual

predators and filter feeders, and lowers the respiratory capacity of aquatic invertebrates by clogging their gill surfaces.

To conduct an impairment assessment of each of these creeks based upon habitat degradation by sedimentation, biological and qualitative habitat surveys were conducted in 2015.

Historical FIBI and the 2015 FIBI and MIBI results from Parsons Creek at Church Road indicated a Poor Condition Category; however, the TP LCL met the WQC. Therefore, habitat degradation was evaluated as a fish and aquatic life use impairment by reviewing the habitat assessment conducted in 2015. The limited pool areas, extensive fine sediments covering the stream substrate, and lack of cover for fish lowered the qualitative habitat score to the Fair Condition Category (Table 13, Figure 12). Parsons Creek at Church Road undergoes occasional summer time low flows which limits available habitat as well for both game and forage fish species. Based upon professional opinion, the Poor IBI scores, and lower quality habitat, the segment of Parsons Creek at Church Road is recommended for the CWA 303d list for degraded habitat (Table 19).

### *Sediment and Phosphorus Sources*

- Limited buffer protection along the stream corridors
- Eroding streambanks
- Cropland erosion
- Agricultural Tile Drainage for Crop Production
- Urban development

Recommended buffer widths vary significantly in published research (there is no one-size-fits all), but the majority of research recommends vegetative buffers >35', with 35' being on the lower end of recommended buffer widths. In general, as the land slope along a creek increases, the riparian buffer width recommendation increases.

## **Management Actions**

### Management Priorities

- DNR should work with landowners and county partners in the watershed to encourage restoration of stream banks and reduction of erosion is a high priority.
- DNR should work with partners and landowners to maximize buffers.
- Promote the use of high quality vegetative buffers as the type of vegetation in buffers is critical in reducing sediment and nutrients reaching creeks described in the project area. For example, a combination of forest and native grass buffers may have better nutrient reduction success than the use of strictly grassed buffers.
- Area stakeholders should capitalize on the efforts of the Wisconsin DNR, Fond du Lac County LCD, and NRCS in the subwatersheds by applying for grants and other funding to implement best management practices (BMPs) such as stream bank restoration, sediment basins, vegetative buffers, and related where needed. These actions will significantly improve water quality in the Fond du Lac River Watershed.

### Monitoring and Assessment Recommendations

- Further monitor waters with evidence of degradation in order to develop a clear understanding of overall water conditions, pollutant loads, and reduction goals.

### Management Recommendations for DNR

- Identify opportunities for wetland restoration and reestablishment.
- Identify and reduce sediment and nutrient loads from agricultural and urban sources.
- Implement the Upper-Fox Wolf River TMDL with specific measures and monitoring on key waters.
- Work with external partners on opportunities to compete for River Planning and Protection Grants to improve water quality.

### Management Recommendations for External Partners

- Prevent the spread of aquatic invasive species in the watershed.
- Prioritize highest sources of pollutants.
- Educate and work with land owners to reduce phosphorus and sediment runoff.
- Work with farmers to implement cover crops to reduce cropland erosion during late fall and spring.



## Appendix A: References

Hilsenhoff, William L. 1987. An Improved Biotic Index of Organic Stream Pollution. *The Great Lakes Entomologist*. 20: 31-39.

Lyons, John. 1992. Using the Index of Biotic Integrity (IBI) to Measure Environmental Quality in Warmwater Streams of Wisconsin. United States Department of Agriculture. General Technical Report NC-149.

Lyons, John. 2006. A Fish-based Index of Biotic Integrity to Assess Intermittent Headwater Streams in Wisconsin, USA. *Environmental Monitoring and Assessment* 122: 239-258.

Lyons, John. 2008. Using the Wisconsin Stream Model to Estimate the Potential Natural Community of Wisconsin Streams (DRAFT). Wisconsin Department of Natural Resources Fish and Aquatic Life Research Section. November, 2008.

Lyons, John. T. Zorn, J. Stewart, P Seelbach, K Wehrly, and L. Wang. 2009. Defining and Characterizing Coolwater Streams and Their Fish Assemblages in Michigan and Wisconsin, USA. *North American Journal of Fisheries Management*. 29:1130-1151.

Lyons, John. 2012. Development and Validation of Two Fish-based Indices of Biotic Integrity for Assessing Perennial Coolwater Streams In Wisconsin, USA. *Ecological Indicators* 23 (2012) 402-412.

Lyons, John. 2013. Methodology for Using Field Data to Identify and Correct Wisconsin Stream “Natural Community” Misclassifications. Version 4. May 16, 2013. IN DRAFT.

Simonson, Timothy D., J. Lyons, and P.D. Kanehl. 1994. Guidelines for Evaluating Fish Habitat in Wisconsin Streams. U.S. Department of Agriculture. Forest Service. General Technical Report NC-164.

USGS (United States Geological Survey) (Robertson, D.M. et. al.). 2006. Nutrient Concentrations and Their Relations to the Biotic Integrity of Wadeable Streams in Wisconsin.

WDNR (Wisconsin Department of Natural Resources). 2014. Total Phosphorus Sampling Methods: Water Action Volunteers Manual 2014.

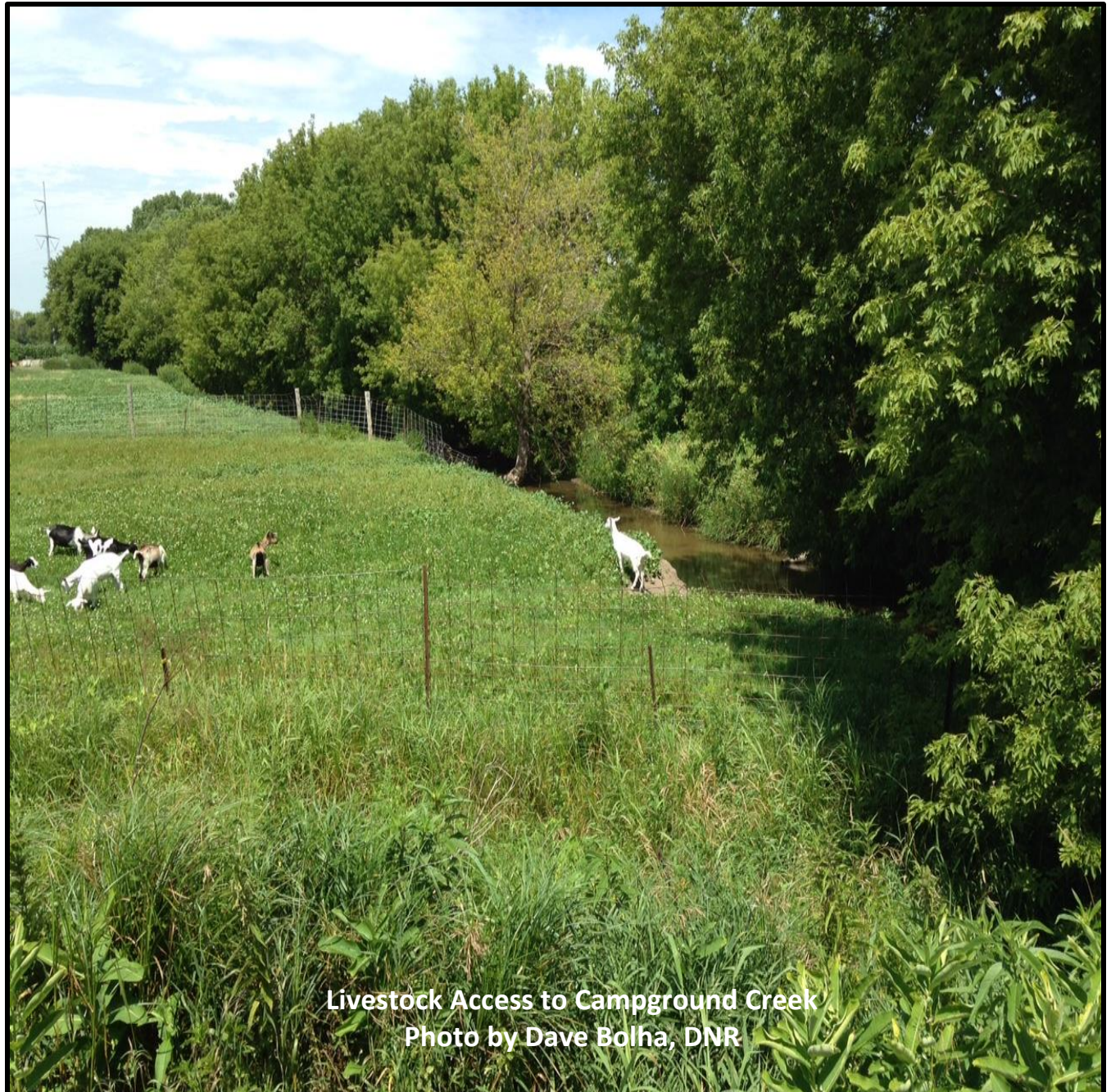
WDNR (Wisconsin Department of Natural Resources). 2000. Guidelines for Collection Macroinvertebrate Samples from Wadeable Streams.

WDNR (Wisconsin Department of Natural Resources). 2002. Guidelines for Evaluating Habitat of Wadeable Streams.

WDNR (Wisconsin Department of Natural Resources). 2001. Guidelines for Assessing Fish Communities of Wadeable Streams in Wisconsin.

WDNR (Wisconsin Department of Natural Resources). 2018. Wisconsin Consolidated Assessment and Listing Methodology Guidance Document. Clean Water Act Section 305(b), 314, and 303(d) Integrated Reporting. Wisconsin Department of Natural Resources. Bureau of Water Quality Program Guidance. September, 2018.

Weigel, Brian. 2003. Development of Stream Macroinvertebrate Models That Predict Watershed and Local Stressors in Wisconsin. *Journal of the North American Benthological Society*. 22(1): 123-142.



Livestock Access to Campground Creek  
Photo by Dave Bolha, DNR



## Appendix B: Waterbody Narratives

### **Sevenmile Creek, WBIC: 136800**

Sevenmile Creek is a tributary to the East Branch of the Fond du Lac River. The stream is listed as impaired by degraded habitat caused by total suspended solids/sediment.

### **Lake Winnebago, WBIC: 131100**

Major water quality concerns for Lake Winnebago are rural and urban nonpoint source pollution delivered from the immediate drainage area and from the Upper Fox and Wolf River Basins. Point source pollution, particularly from the Fond du Lac and Oshkosh areas is also a concern. A major concern is the impact on local water quality of dredged side channels on the lake.

Lateral channels along the shores of the Winnebago pool lakes were constructed prior to the creation of regulations which now prohibit such projects. Water quality concerns raised on the potential negative impacts of these channels and the receiving lakes include: creation of direct nonpoint source pollution conduits to the lakes from upland areas; increased nuisance vegetation and algae; destruction or alteration of adjacent wetlands; increased human disturbance of potential critical habitat areas; development and related destruction of adjacent upland habitat; creation of carp spawning areas; and, local planning and zoning issues.

In the Winnebago comprehensive Management Plan the trophic status of Lake Winnebago is described. The trophic status of a lake is a measure of nutrients and how they impact chlorophyll production and water transparency. A preliminary report on the monitoring described above was prepared in 1990 and 1995 show that algae are responsible for the high chlorophyll production. Associated with a certain type of algae (blue-greens) are toxins. These toxins are a special concern for Lake Winnebago because of the four municipalities (Appleton, Menasha, Neenah, and Oshkosh) that draw their water supply from the Lake. About 100,000 people depend on Lake Winnebago for drinking water (McLennan, 1994).

The lake is currently listed as impaired for phosphorus and total suspended solids. The Upper Fox-Wolf River Total Maximum Daily Load (TMDL) is currently being developed to allocate the non-point and point sources of phosphorus and total suspended solids to Lake Winnebago and its contributing surface waters. In addition, a comprehensive Lake Management Plan for Lake Winnebago and the Pool Lakes (Butte des Morts, Winneconne, and Poygan) to improve the overall water quality and recreational uses of the lakes. Both the TMDL and Lake Management Plan are projected to be developed by 2018 or 2019.

### **Winnebago Pool Lakes**

The Winnebago Pool Lakes composed of Lakes Winnebago, Butte des Morts, Winneconne, and Poygan, drain 16,654 square kilometers and compose 17% of Wisconsin's surface water area. Major watersheds include the Wolf River to the north and the Upper Fox River to the south with the system emptying from Lake Winnebago via the Lower Fox River to the southwestern end of Green Bay on Lake Michigan. The Lakes lie in the vegetation tension zone between the Northern Forest and the Prairie-Forest floristic provinces (Curtis, 1971), and the watershed transects three US ecoregions, the Southeastern Wisconsin Till Plain, the North Central Hardwood Forests, and the Northern Lakes and Forests. Consequently, land use ranges from mixed hardwood forest in the north to partially specialized dairying with some generalized farming southward.

The Lake Winnebago System is within 120 km of over 2 million people, and is central to many, often conflicting, resource uses, including outdoor recreation such as fishing and boating, wastewater assimilation for 59 industries and 24 municipal wastewater treatment plants, and as a principal water

supply for over 100,000 people in Oshkosh, Neenah-Menasha and Appleton as well as numerous small communities in the watershed (East Central Wisconsin Regional Planning Commission [ECWRPC], 1989).

The Lake Winnebago System provides over one million user days during the peak month of recreation for boaters and anglers from Wisconsin and other states, most notably nearby Illinois. The dam system and water level control program, representing the largest flood control storage reservoir in Wisconsin, provide flood protection for residents and shoreland development within 17 jurisdictions. Water levels in the Upper Lake Winnebago Pool Lakes have been controlled through dam outflows by the Corps of Engineers since the late 1800's; principally to assist commercial navigation and downstream industrial uses of waste assimilation and power generation (WDNR, 1989).

(Impaired Waters) Lake Winnebago was placed on the impaired waters list in 1998 for total phosphorus, sediment/total suspended solids, and PCBs. The 2016 assessments showed continued impairment by phosphorus; total phosphorus sample data overwhelmingly exceed 2016 WisCALM listing thresholds for the Recreation use and exceeded Fish and Aquatic Life use, however, chlorophyll data only exceeds REC thresholds. Based on the most updated information, no change in existing impaired waters listing is needed.

#### **Campground Creek, WBIC: 137400**

Campground (Byron) Creek rises from several springs at the base of the Niagara escarpment in southeast Fond du Lac County (Weber et al., 1969). It is considered a Class II trout stream from Fond du Lac County Highway Y to a point near its headwaters, approximately 3.3 miles upstream (WDNR, 1980). The stream has a good gradient through this reach. The stream flattens from about mile 0.6 through a main wetland complex just downstream from its origin area (Reif, 2010). The Creek can be considered cold water to that 0.6 mile point and has potential to sustain a brook trout population. The man-made ponds in the large wetland as well as man-made diversions in the wetland degrade it to the point that it warms to near 30 Deg. C in the summer and also results in periodic anoxic conditions that cause fish kills. Much work needs to be done on this wetland problem to restore the trout migration capabilities (Reif, 2010).

The gradient flattens and the stream is dominated by a warm water forage fishery downstream of County Highway Y. The municipal wastewater treatment facility and Seneca Foods discharge to it below County Highway Y. Nonpoint sources of pollution, particularly bank erosion due to cattle grazing, are the main water quality problem in the trout waters reach. Sedimentation from farm tillage practices is also a problem in the downstream reach. Runoff due to excessive spray irrigation by a canning company near Oakfield has occasionally reached the stream and caused water quality problems. There are also some unnamed tributaries to the creek which have intensive agricultural operations on land adjacent to them. Some of these operations may be affecting water quality in Campground Creek (WDNR SCRFiles, 1996). There is one cold water spring-fed tributary (WBIC 137600) that feeds into Campground Creek below the main wetland and is potentially capable of sustaining a trout population (Reif, 2010). Trout have been documented in this tributary in the past (Hacker, 1956).

#### **Mosher Creek, WBIC: 133500**

Mosher Creek is a small tributary to Lake Winnebago that passes through North Fond du Lac. The northern part of the Fond du Lac River watershed is generally flatter and streams there are dependent on runoff and seepage sources. These creeks, including Van Dyne Creek, Anderson Creek, and Mosher Creek, are often intermittent in nature. The entire three mile length of the stream is listed on the state's 303(d) impaired water's list for total suspended solids/sediment.

**East Branch Fond Du Lac River, WBIC: 135900**

The East Branch of the Fond du Lac River begins in south central Fond du Lac County and flows northeasterly to its junction with the West Branch in the City of Fond du Lac. There is intense agriculture throughout much of the watershed. Runoff from plowed fields and barnyards and erosion of heavily grazed and exposed stream banks along the East Branch and its tributaries are adding tons of sediment and nutrients to the river and to Lake Winnebago. Critical soil erosion rate from agricultural lands has been estimated as being 6 tons per acre per year. The East Branch is the largest single sediment contributor to Lake Winnebago (Bruch, 1988).

East Branch Fond Du Lac River (135900), from its mouth to about a half mile east of Unnamed Stream (136400), was placed on the impaired waters list for total phosphorus in 2014. The 2016 assessments showed continued impairment by phosphorus; total phosphorus sample data exceed 2016 WisCALM listing criteria for the Fish and Aquatic Life use, however, available biological data do not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the "poor" condition category). This water was also assessed for temperature and sample data did not exceed 2016 WisCALM listing criteria for the Fish and Aquatic Life use. Based on the most updated information, no change in existing impaired waters listing is needed.

**Rosendale Tributary, WBIC: 134900**

A stream reclassification study of the Tributary to the West Branch of the Fond du Lac River, called the Rosendale Tributary (WBIC 134900) to the West Branch of the Fond du Lac River (or Rosendale Tributary for short), was conducted from the summer of 2001 through the fall of 2004. Other general observations were made in 2005. The Rosendale Wastewater Treatment Facility was considering going into Facility's Planning and it was apparent that current stream classification data with modern protocols were not available and were needed. Past stream classifications were reported by Weisensel and Mazanet (1975) and Sesing and Dreher (1993).

Weisensel classified the Tributary as noncontinuous, intermediate aquatic life which is the coded classification in Wisconsin Administrative Code NR 104. Sesing and Dreher classified the Tributary as a continuous flowing Warm Water Forage Fishery (WWFF). This study confirms the continuous WWFF classification under the current coded classification scheme for the lower reaches near the WWTF. It also expands the classifications for the entire watershed and establishes the classification under the newly adopted (but not yet codified) 2004 classifications (WDNR 2004) which will change the lower part of the Rosendale Tributary from Hill Rd. below HWY 23 downstream to Diverse Fish and Aquatic Life-Cool Water (DFAL-CW). Also, data collected determined the potential for increased water quality and needed protection in the section below HWY 23. General upstream above Rosendale non-point source concerns as well as urban runoff concerns were addressed. (Mike Reif, 2006)

**Raspberry Lake, WBIC: 138000**

Raspberry Lake is small is a 8.62 acre artificial lake created by a dike. The lake and surrounding land is owned by the Mammoth Springs Canning Company of Oakfield and is leased by the Oakfield Sportsman's Club for public use. The fishery consists of largemouth bass, bluegills, perch and bullheads. Winterkill has been a problem. An unimproved boat launching and parking area is provided, but no motors are allowed. Over 20 acres of marsh adjoin the lake and ducks are frequent visitors, bur hunting is not permitted (1969).

**Parsons Creek, WBIC: 136000**

Parsons Creek (WBIC 136000) is a small cold to coolwater tributary to the East Branch of the Fond du Lac River. The stream, originating along the Niagara escarpment, is designated as Class I trout water for 1.9

miles of its length and is an Exceptional Resource Water. An additional 2.4 miles of the stream is classified as Class II trout waters (DNR, 1980). The segment upstream from Hickory Road flows from some main springs down through a wetland complex and a small county park (Hobbs Woods) and appears to have good water quality though heavily impacted by habitat modifications (Reif, 2009). Downstream from Hickory Road, Parsons Creek was, at one time, heavily impacted by agricultural practices, particularly barnyard runoff and excessive grazing along the streams banks. These impacts were addressed as part of a Priority Watershed project of the late 1990s and early 2000s. The headwaters of Parsons Creek are still impacted from sedimentation and streambank erosion.

**Fond Du Lac River WBIC: 133700**

The Fond du Lac River (WBIC 133700) is formed by the juncture of the East and West Branches of the Fond du Lac River in the City of Fond du Lac. It flows approximately two miles to Lake Winnebago. It is a completely urban waterway whose pollutant load includes the urban and rural loading of the East and West Branches. There are a number of industries either along the river or nearby which contribute stormwater runoff. Fond du Lac River water was used as background control water during bioassay monitoring done at the Galloway West Company (currently Saputo Cheese USA, Inc.) facility in Fond du Lac. Organisms in the control water failed the chronic toxicity test indicated there may be some problem with water quality in the river. Additional monitoring will be done to try to determine if this failure of the chronic toxicity test was an anomaly or if nonpoint sources of pollution are causing the problem (WDNR SCR-Files, 1996).

Fond du Lac River (133700) was added to the impaired waters list in 1998 for contamination by unspecified metals and PCBs. In 2012 the river was also listed for total phosphorus. The 2016 assessments showed continued impairment by phosphorus; total phosphorus sample data overwhelmingly exceed 2016 WisCALM listing thresholds for the Fish and Aquatic Life use, however, no biological data (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scores) were available to assess biological impairment. Based on the most updated information, no change in existing impaired waters listing is needed.

**Van Dyne Creek WBIC: 132600**

Van Dyne Creek, a turbid, hard water stream, is intermittent except for the lower one-half mile which is a small bayou off Lake Winnebago. The portion that contains water is in reality a deep marsh supporting such plants as arrowhead, cattail, and white water lily with pickerel weed very common. Mallards and bluewing teal nest in this area. Migrant waterfowl known to use the area include goldeneye, bufflehead, shoveler, mallard, bluewing teal, greenwing teal, wood ducks, scaup, canvasback, redhead and coot. Fish species present include brown bullhead, bluegill, northern pike, walleye, white bass and crappie. The intermittent portion consists of a channel averaging about 16 feet wide. Some ditching has been done. The channel carries large volumes of runoff during spring thaws and during periods of heavy precipitation. One federal highway, one county highway, and two town roads provide public access.

**Anderson Creek WBIC: 133300**

Anderson Creek originates near the town of Eldorado in Fond Du Lac County and flows East until emptying into Lake Winnebago near North Fond du Lac. The entire length of the stream is listed as impaired by total suspended solids/sediment.

(Impaired Waters) Anderson Creek (133300) was assessed during the 2016 listing cycle; total phosphorus sample data overwhelmingly exceed 2016 WisCALM listing criteria for the Fish and Aquatic

Life use and biological impairment was observed (i.e. at least one macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the poor condition category).

**Supple Marsh WBIC: 133600**

Supple Marsh, in the Fond du Lac River Watershed, is a 107.38 acre lake that falls in Fond du Lac County. This lake is managed for fishing and swimming and is currently not considered impaired.

**West Branch Fond Du Lac River WBIC: 134000**

The West Branch of the Fond du Lac River begins in northwest Fond du Lac County and flows generally southeast to its confluence with the East Branch. The West Branch has four distinct segments. The first segment is the upper headwater segment, including all its tributaries upstream from Eldorado Marsh. The second segment is contained within Eldorado Marsh. The third segment is downstream from Eldorado Marsh to the City of Fond du Lac, while the fourth segment is in the City of Fond du Lac. The segment upstream from Eldorado Marsh has a relatively low gradient. There are numerous small wetland complexes and areas of drained wetlands. Many of the unnamed tributaries and drainage ways have been ditched or straightened. There are areas of very intensive farming, including the state's largest concentrated animal feeding operation (CAFO), but there are also large areas of farmland which have been set aside as part of the Conservation Reserve Program (CRP). The seemingly large CRP lands in the sub-watershed of this segment act as buffers to the stream in many areas. Water quality is good enough to allow wild rice to be present in the stream channel at least one location upstream from Eldorado Marsh (WDNR SCR-Files, 1996). All the CRP land also reduces the amount of sediment and nutrients that would otherwise find their way into Eldorado Marsh. There is a dam on the river at the Community of Eldorado. Ownership of the dam is unclear according to DNR records. As a result, it is unknown how the dam is being managed or ought to be managed.

The Eldorado Marsh segment of the river is within the boundaries of the Eldorado State Wildlife Area. There is a water control structure that is used to manipulate water levels and control flow out of the marsh. The marsh acts as a sediment and nutrient sink, where much of the incoming sediment is deposited. The segment of the river from State Highway 23 at the south edge of the wildlife area downstream to U.S. Highway 41 has a steeper gradient and possesses a series of runs and riffles. In stream habitat looks very good and perhaps may be capable of supporting a smallmouth bass fishery (WDNR SCR-Files, 1996).

There is not as much intensive agriculture in this segment and there is rural, low-density residential development along portions of the river that may be offering even more buffer from agricultural nonpoint source impacts. Macroinvertebrate monitoring indicates fair to good water quality conditions (Sorge, 1996). The segment from U.S. Highway 41 downstream to its confluence with the East Branch is an urban stream. There are urban nonpoint sources of pollution, which affect the water quality of the stream.

(Impaired Waters) West Branch Fond Du Lac River (134000) was assessed during the 2016 listing cycle; total phosphorus sample data overwhelmingly exceed 2016 WisCALM listing thresholds for the Fish and Aquatic Life use, however, available biological data do not indicate impairment (i.e. no macroinvertebrate or fish Index of Biotic Integrity (IBI) scored in the "poor" condition category). Temperature data exceeded 2016 WisCALM listing thresholds for the Fish and Aquatic Life use.

## Appendix C: Monitored Waters

WBIC	Waterbody Name	Station ID	Station Name	Earliest Fieldwork Date	Latest Fieldwork Date
135900	East Branch Fond Du Lac	10029782	East Branch Fond du Lac River Morris Court 200 yds east	04/29/2006	04/19/2017
134000	West Branch Fond Du Lac	10031557	West Branch of Fond du Lac at Estabrook Park	06/08/2010	04/19/2017
136000	Parsons Creek	203102	Parsons Creek Upstream Hickory Rd	05/07/1996	04/19/2017
5562446	Unnamed	10019486	Lake Winnebago -- Fond Du Lac - Lakeside Park Harbor & Marina	07/17/2005	10/16/2016
134000	West Branch Fond Du Lac	10017190	W. Br. Fond Du Lac R.-Cth C In Eldorado. 20 Ft. Above Bridge And 50 Ft. Below Dam.	05/13/1980	09/20/2016
131100	Lake Winnebago	10019318	Lake Winnebago -- Oshkosh - Fugleburg Park	06/14/2006	09/16/2016
5562445	Unnamed	10044232	Lakeside Park Bridge to Parking Lot	08/29/2015	09/10/2016
132300	Unnamed	10042915	Lake Winnebago Willow Harbor at Hwy 45 (West/North)	09/13/2014	09/10/2016
5562445	Unnamed	10044048	Lakeside Park at North Park Ave	08/29/2015	09/10/2016
131100	Lake Winnebago	10042909	Van Dyne Creek at Hwy 45	09/13/2014	09/10/2016
5562445	Unnamed	10042880	Unnamed Channel by Lakeside Park Pavilion	09/13/2014	09/10/2016
131100	Lake Winnebago	10019312	Lake Winnebago -- Fond Du Lac - Lakeside West Park - Supple Marsh	04/29/2007	09/10/2016
131100	Lake Winnebago	10019326	Lake Winnebago -- Black Wolf - Nagy Park Landing Hwy 45 Fish Survey	06/15/2006	09/03/2016
131100	Lake Winnebago	713435	Lake Winnebago -- Oshkosh - 24th Street Access	06/07/2007	08/28/2016
136800	Sevenmile Creek	10016626	Sevenmile Creek - 40 M Upstream Of Vielbig Road	05/08/1996	06/17/2016
133600	Supple Marsh	10042859	Fond du Lac River at Howard Litscher Dr	09/13/2014	11/24/2015
3000540	Unnamed	10042906	Unnamed Stream at Sth 45 by Supple Marsh Lk	09/13/2014	11/24/2015
135900	East Branch Fond Du Lac	203074	Fond Du Lac River East Br - Cth Y	05/14/1980	10/27/2015
134000	West Branch Fond Du Lac	10016347	West Br. Fond Du Lac River - Highway 23	10/13/1998	10/27/2015
137400	Campground Creek	10021258	Campground Cr. Above Milpond Rd.	08/08/2007	10/27/2015
136000	Parsons Creek	203104	Parsons Creek - 100 Feet Above Cth B	10/30/1997	10/27/2015

WBIC	Waterbody Name	Station ID	Station Name	Earliest Fieldwork Date	Latest Fieldwork Date
137400	Campground Creek	10016442	Campground Creek - Above Thill Road	10/30/2001	10/27/2015
135900	East Branch Fond Du Lac	10014745	East Branch Fond Du Lac River Immediately Below 12 St.	05/14/1980	10/27/2015
134000	West Branch Fond Du Lac	10037662	West Branch Fond Du Lac River on Forest Ave	07/11/2012	10/27/2015
136000	Parsons Creek	203164	Parsons Creek At Lost Arrow Road	05/07/1996	10/07/2015
136000	Parsons Creek	10014501	Parsons Creek At Church Rd	05/07/1996	10/07/2015
133500	Mosher Creek	10030711	Mosher Creek at Wisconsin Ave.	04/28/2010	10/07/2015
5564720	Unnamed	100810	Unnamed - WBIC 5564720	08/28/2008	09/26/2015
5561765	Unnamed	10032872	Unnamed	06/28/2009	09/26/2015
136700	Unnamed	10002469	Unnamed Lake (T15 R16E S35)	07/27/1999	09/26/2015
5562446	Unnamed	100099	Unnamed - WBIC 5562446	08/28/2008	09/01/2015
5562445	Unnamed	10041690	Lake Winnebago - Lakeside Park Boat Ramp	08/29/2015	08/29/2015
5562445	Unnamed	10042882	Unnamed Channel by Lakeside Park Harborview	09/13/2014	08/29/2015
5562445	Unnamed	10042881	Unnamed Channel by Lakeside Park Lighthouse	09/13/2014	08/29/2015
5562445	Unnamed	10042883	Unnamed Channel by Lakeside Park at Promen Dr Interior	09/13/2014	08/29/2015
133900	Unnamed	10042861	Unnamed Trib to Fond du Lac R at N Seymour St	09/13/2014	08/29/2015
133800	Unnamed	10042860	Fond du Lac River at N Hickory St	09/13/2014	08/29/2015
5562445	Unnamed	10044233	Lakeside Park Bridge from Parking Lot to Baseball Diamonds	08/29/2015	08/29/2015
137400	Campground Creek	10030857	Campground Creek at Hwy Y	07/31/2015	07/31/2015
137400	Campground Creek	10016834	Campground Creek - 10 M Upstream Of River Road	05/07/1996	06/16/2015
133700	Fond Du Lac River	10022877	Fond Du Lac River At W. Arndt St. USGS Site ID 04083545	04/01/2008	01/01/2015
133300	Anderson Creek	10030712	Anderson Creek at Minnesota Ave.	04/28/2010	01/01/2015
132300	Unnamed	10037726	Seaplane West off Koelpin Road	07/10/2012	01/01/2015
132200	Unnamed	10037736	Unnamed (Paukotuk-Candlish Creek)-upstream Fisk Ave	07/10/2012	01/01/2015
132400	Unnamed	10042914	Lake Winnebago Willow Harbor at Hwy 45 (East/South)	09/13/2014	09/13/2014
133700	Fond Du Lac River	203055	Fond Du Lac River - A Sth 45 Fonddulac	09/13/2014	09/13/2014

WBIC	Waterbody Name	Station ID	Station Name	Earliest Fieldwork	Latest Fieldwork
132200	Unnamed	10042898	Unnamed Trib to Lk Winnebago at Oshkosh Golf Course	09/13/2014	09/13/2014
132400	Unnamed	10037663	Seaplane East on Black Wolf Ave	07/10/2012	07/08/2014
5562400	Unnamed	101170	Unnamed - WBIC 5562400	08/28/2008	08/03/2013
5562445	Unnamed	10021164	Lake Winnebago -- Fond Du Lac - Lakeside Park - Channel Off Harbor View	06/17/2007	05/26/2013
136000	Parsons Creek	10020686	Parsons Creek At Hickory Rd And Cth B	05/09/2005	10/08/2012
134900	Unnamed	10022641	Trib To West Branch Fond Du Lac River At Snowmobile Bridge In Taylor Park Rosendale	04/17/2004	10/03/2012
5562339	Unnamed	100301	Unnamed - WBIC 5562339	08/28/2008	09/01/2012
138000	Raspberry Lake	10002470	Raspberry Lake	07/27/1999	07/31/2012
132200	Unnamed	10033829	Unnamed Creek upstream Fisk Ave	06/30/2011	09/14/2011
5562155	Unnamed	10041388	Unnamed Open Water	07/29/2011	08/06/2011
5562141	Unnamed	101322	Unnamed - WBIC 5562141	08/28/2008	07/29/2011
5561579	Unnamed	10033003	Unnamed	06/28/2009	07/29/2011
5588089, 5028682	Unnamed, Unnamed	10035175	Unnamed - Area of Open Water	07/17/2010	07/29/2011
136200	Unnamed	10014498	East Tributary To Parsons Cr. At Confluence	04/12/2006	11/16/2010
136000	Parsons Creek	10014500	Parsons Creek-At Walk Bridge At Upstream End Of Hobbs Woods	05/01/2006	11/16/2010
137400	Campground Creek	10021259	Campground Cr. At Oakfield Conservation Club Culvert	08/08/2007	09/15/2010
5559587	Unnamed	100095	Unnamed - WBIC 5559587	08/28/2008	09/12/2010
5562330	Unnamed	10036719	Unnamed Lake	07/17/2010	09/12/2010
5587900, 5026653	Unnamed,	10036739	Unnamed - Area of Open Water	09/12/2010	09/12/2010
134500, 5026580, 5587920	Unnamed, Unnamed, Unnamed	10036676	Unnamed - Area of Open Water - Area of Open Water	07/10/2010	07/10/2010
5028701	Unnamed	10020687	Campground Creek (Trib To) At Cth F	05/09/2005	05/05/2010
136800	Sevenmile Creek	10016794	Sevenmile Creek - 30 M Downstream Of Cth Y In Thetown Of Lamartine	05/08/1996	10/30/2008
136000	Parsons Creek	10029541	Parsons Creek-last luncker below CTH B	10/02/2008	10/02/2008
136000	Parsons Creek	10014499	Parsons Creek Upstream Of Cth B	10/28/1999	10/02/2008
133600	Supple Marsh	10028934	Supples Marsh North-Lk Winnebago	07/26/2007	06/18/2008
133600	Supple Marsh	10028935	Supples Marsh Middle-Lk Winnebago	07/26/2007	06/18/2008
132600	Van Dyne Creek	203137	Van Dyne Creek at Lincoln Rd Near Van Dyne WI	05/21/2001	01/07/2008
137600	Unnamed	10016933	Trib To Campground Creek - 15 M Upstream Of River Rd	05/07/1996	08/16/2007



Appendix D: Watershed Report<sup>i</sup>

WBIC	Waterbody Name	Start Mile	End Mile or Acres	Current Use	Attainable Use	Supporting Attainable Use	Designated Use	Impairments	Sources	Assessment	Impaired Water Status
131100	Lake Winnebago	0	131, 871	Shallow Lowland	FAL	Not Supporting	WWFF	Low DO, Eutrophication, Turbidity	NA	Monitored	TMDL Development, 303d Listed
132200	Paukotuk-Candlish Creek	0	7.92	FAL	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
132600	Van Dyne Creek	0	1	FAL	WWSF	Not Assessed	Default FAL	NA	NA	None	NA
132600	Van Dyne Creek	1	9.11	LFF	LFF	Not Supporting	Default FAL	Degraded Habitat	Non-Point Source	Monitored	TMDL Development
133300	Anderson Creek	0	7.26	LFF	LFF	Not Supporting	FAL Warmwater	Degraded Biological Community, Habitat	Non-Point Source	Monitored	TMDL Development, 303d Listed
133500	Mosher Creek	0	3	LFF	LFF	Not Supporting	Default FAL	Degraded Habitat	Non-Point Source	Monitored	TMDL Development
133500	Mosher Creek	0	0.2	FAL	WWSF	Not Assessed	Default FAL	NA	NA	No Assessment	NA
133600	Supple Marsh	0	107.38	FAL	FAL	Not Assessed	Default FAL	NA	NA	Not Assessed	NA
133700	Fond Du Lac River	0	1.56	WWSF	WWSF	Not Supporting	Default FAL	Chronic Toxicity, Water Use Restrictions	Contaminated Sediments, Non-Point Source	Monitored	TMDL Development, 303d Listed
134000	West Branch Fond Du Lac River	0	26	FAL	WWSF	Not Supporting	Default FAL	Elevated Water Temperature, Water Use Restrictions	Non-Point Source	Monitored	303d Listed

WBIC	Waterbody Name	Start Mile	End Mile or Acres	Current Use	Attainable Use	Supporting Attainable Use	Designated Use	Impairment	Sources	Assessment	Impaired Water Status
134900	Rosendale Tributary	0	6.1	FAL	FAL	Not Assessed	Default FAL	NA	NA	None	NA
135900	East Branch Fond du lac River	0	14.5	FAL	WWSF	Not Supporting	Default FAL	Impairment Unknown	Non-Point Source	Monitored	TMDL Development
135900	East Branch Fond Du Lac River	14.5	22.81	FAL	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
136000	Parsons Creek	0	2.58	Cold	Cold	Not Supporting	Cold	Degraded Habitat	Non-Point Source	Monitored	TMDL Approved
136000	Parsons Creek	2.58	3.49	Cold (Class II Trout)	Cold (Class II Trout)	Fully Supporting	Cold	NA	NA	Monitored	NA
136000	Parsons Creek	3.49	5.68	Cold (Class II Trout)	Cold (Class I Trout)	Fully Supporting	Cold	NA	NA	Monitored	NA
136200	East Trib. to Parsons Cr	0.01	1.89	Cold (Class I Trout)	Cold (Class I Trout)	Not Supporting	Cold	Low DO, Degraded Habitat	NA	Monitored	TMDL Approved
36800	Sevenmile Creek	0	11	LFF	LFF	Not Supporting	Default FAL	Degraded Habitat	Flow Regulation Non-Point Source, Loss of Riparian Habitat	Monitored	TMDL Development
137400	Byron Creek	0	1.66	WWFF	Cold	Not Supporting	FAL Coldwater	Degraded Habitat	NA	Monitored	TMDL Development

WBIC	Waterbody Name	Start Mile	End Mile or Acres	Current Use	Attainable Use	Supporting Attainable Use	Designated Use	Impairments	Sources	Assessment	Impaired Water Status
137400	Byron Creek	1.67	7.26	WWFF	Cold (Class II Trout)	Not Supporting	Cold	Low DO, Elevated Water Temperature Degraded Habitat	NA	Monitored	TMDL Development
138000	Raspberry Lake	0	8.62	Small	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
5562445	Lake Winnebago - Channel Off Harbor View	0	12.78	FAL	FAL	Not Assessed	Default FAL	NA	NA	Not Assessed	NA

<sup>ii</sup> The watershed assessment table reflects the condition of waters in the study area watershed. This table data is stored in the Water Assessment Tracking and Electronic Reporting System (WATERS) and is updated on an ongoing basis via monitoring data and assessment calculations. The following definitions apply:

- Current Use – current condition of water based on monitoring data.
- Attainable Use – “ecological potential” of water based on water type, natural community, lack of human-induced disturbances.
- Supporting Attainable Use – decision on whether the water’s current condition is supporting its designated use under “water quality standards”.
- Designated Use – the water’s classified use under NR102, Wisconsin Water Quality Standards, for Fish and Aquatic Life.
- Impairments – documented impacts on water condition due to pollution sources or changes in hydro-geomorphological changes.
- Assessment – field indicates what type of data or information supports the decisions in the table (current, attainable, and supporting attainable).
- Impaired Water Status – This column indicates the status of the impaired water for TMDL development.