

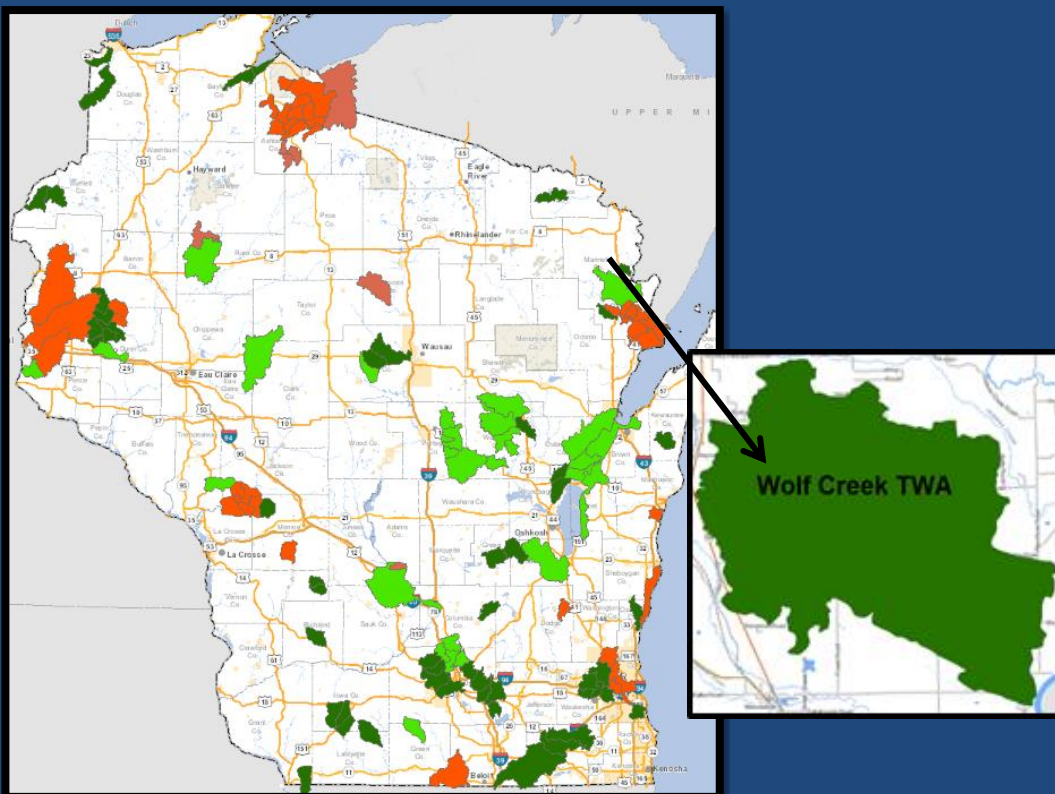


Wolf Creek at Keating Drive
Photo by Andy Hudak, DNR

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

WOLF CREEK TWA WQM PLAN 2017

*Wausaukee and Lower
Menominee Rivers (GB13)
HUC: 040301080904, Monitored in 2014*



EGAD # 3200-2017-23
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 Programs. The plan reflects Water Quality Bureau and Water Resources Monitoring Strategy 2015-2020 goals and priorities 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 Green Bay Basin 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 - Acting

1/29/2018

 Date



 Greg Searle, Water Quality Bureau Field Operations Director

2/6/18

 Date



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2/6/18

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Basin/Watershed Partners

- Marinette County Land Conservation Department

Report Acknowledgements

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List of Abbreviations

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.

FIBI: 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. DNR'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 Wolf Creek watershed is a 15.71 square mile, HUC-12 sub-watershed that lies in the Wausaukee and Lower Menomonee River watershed in Marinette County. Soils and topography in the Wolf Creek sub-watershed are unique in that the entire area is fairly isolated with glacial deposits forming distinctive breaks in the upper watershed surrounding the lakes and then dropping into poorly drained organic soils immediately adjacent to the lakes and streams. Wetlands are extensive throughout the watershed along the stream and lake corridors with minimal fragmentation.



Figure 1: Wolf Creek Watershed.

The watershed is fairly simple with one main stream, Wolf Creek, which is an 11.0-mile-long tributary to the Menomonee River which connects and drains approximately 10 lakes in the upper portion of the watershed. A connection exists between Wolf Creek and Holmes Creek that is artificial and likely served the logging industry in the late 1800's when saw logs were floated down small streams to the Menomonee River where they were floated down to sawmills. This connection reduced the distance logs had to be floated down to the Menomonee River by 2.5 miles. Logging still appears to be very active in the watershed for the income and the localized economy.

Population, Land Use, Site Characteristics

Wolf Creek is located in the Wausaukee and Lower Menomonee Rivers watershed which is 187.05 mi². Land use in the watershed is primarily wetland (42%), forest (31%) and a mix of agricultural (12%) and other uses (14%). This watershed has 204.27 stream miles, 5,835.97 lake acres and 33,470.94 wetland acres.

Land use in the watershed Wolf Creek watershed is primarily upland forest, lowland swamp and bogs, and open water with agriculture making up only about 1% of the total land use. What agriculture does exist are a few small beef cattle herds with land in hay and row crops.

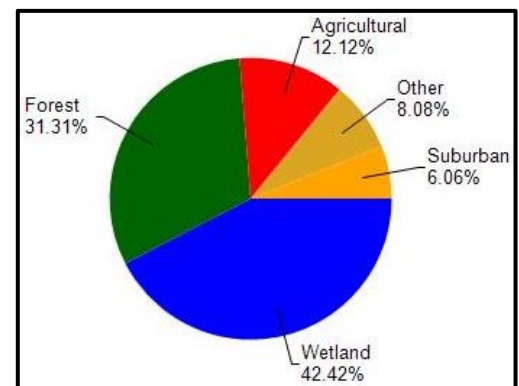


Figure 2: Land use in the Wausaukee and Lower Rivers watershed.

Ecological Landscapes

The Wausaukee and Lower Menomonee Rivers Watershed is located in two ecological landscapes: Northern Lake Michigan Coastal and the Northeast Sands. The Northern Lake Michigan Coastal Ecological Landscape is located in northeastern Wisconsin and includes Green Bay and the northern part of the Door Peninsula. Its landforms consist of the Niagara escarpment, a prominent dolomite outcropping along the east side of Green Bay, a lacustrine plain along the west side of Green Bay, and ground moraine elsewhere. Low sand dunes and beach ridges that support Great Lakes endemics and many other rare species are found along the Great Lakes shoreline. The influence of Lake Michigan moderates extreme temperatures.

Soils are very diverse; in some areas, lacustrine sands are found overlying clays or bedrock within only a few feet of the surface. In the Door Peninsula, soils are typically stony loamy sands to loams. Poorly drained sands are common in the lake plain or in depressions between dunes and beach ridges. On the western side of Green Bay, the ground moraine is composed mostly of moderately well drained, rocky sandy loams, interspersed with lacustrine sands and clays, and peat and muck also common. Historic vegetation included maple-basswood-beech forest, hemlock-hardwood forest, northern white cedar swamp, hardwood-conifer swamp, wet meadows, and coastal marshes. Conifer dominated upland forests that resemble the boreal forest were present along Lake Michigan; they contain a significant component of white spruce and balsam fir. Cliffs, sinkholes, and dolomite ledges are associated with the Niagara Escarpment. Current vegetation consists of more than 60% non-forested land, most of which is in agricultural crops, with smaller amounts of grassland, wetland, shrubland, and urbanized areas. Forested lands are dominated by maple-basswood, with smaller amounts of lowland hardwoods, aspen-birch, and lowland conifers. High quality areas of exposed alkaline bedrock beach occur on the northern Door Peninsula, providing habitat for many rare plants. Several islands lie off the Door Peninsula and these also provide critical habitat for rare species and colonially nesting birds.

The Northeast Sands Ecological Landscape occupies a relatively narrow, vertical band of land in northeast Wisconsin. This landscape formed in glacial outwash sand plains (some of them pitted), and has steep outcropping Precambrian bedrock knolls of basalt, rhyolite, or granite. Sandy ground moraines and end moraines are also interspersed in the landscape. Historically, extensive oak/Jack Pine Barrens and jack pine forests were found in the outwash sand portions of this Ecological Landscape. Moraines supported forests of hardwoods, red pine, and white pine. Outwash plains often contained pitted depressions, resulting in numerous wetlands and kettle lakes. Most of this Ecological Landscape is still forested; aspen predominates, followed by northern hardwoods. Jack pine remains on the outwash plains along with northern pin oak. There are several important occurrences of jack pine/oak barren communities. A small percentage of this Ecological Landscape contains spruce-fir-cedar forest and lowland hardwood forest. The Brazeau Swamp is one of the best representations of large cedar swamp forests in northern Wisconsin.

Study Summary

Wolf Creek was selected for Targeted Watershed Assessment evaluation monitoring in 2014. Based on current surveys, water quality of the streams in the watershed are in overall good to excellent condition.



Figure 3: Ecological Landscapes in the Wausaukee and Lower Rivers watershed.

Current land use practices in the region do not appear to be causing adverse impacts to water quality conditions. Total Phosphorous (TP) concentrations at the pour point would suggest that nutrients are in balance and excess phosphorous is not a problem. Habitat is likely the limiting factor for the streams potential. Potential threats to water quality continue to be poor logging practices and new nutrient source inputs from development or agriculture.

The protection of the riparian corridors and landscape of the streams and lakes in this watershed should be the highest priority for management actions. Sustainable forest and woodlot management should be the standards and forestry best management practices to protect water quality should be strictly followed. Land divisions and new development in the riparian areas of lakes and streams should be done only after careful consideration. Proper site placement and planning should occur to protect shoreline cutting and clearing for home development. Location of new septic systems should only occur on suitable sites where poor filtration or high groundwater tables are not present.

Management Recommendations

- Protection of riparian corridors along streams and lakes in this watershed is a high priority.
- Land managers should follow and promote the use of forestry best management practices to protect water quality.
- Land divisions and new development in the riparian areas of lakes and streams should be conducted only after careful consideration of how to reduce impacts such as short and long-term erosion.
- Proper site placement and planning to protect shoreline cutting and clearing for home development is needed.
- Site selection for new septic systems should be conducted with care on suitable sites where poor filtration or high groundwater tables are not present.

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.

Table 1: Outstanding and Exceptional Resource Waters- Wausaukee and Lower Menominee Rivers Watershed.

Water Name	WBIC	ORW/ERW	Start Mile	End Mile
Cedarville Creek	615500	ORW	3.24	7.65
Coldwater Brook	612300	ORW	0	2
Heubler Creek	612700	ERW	0	2
Holmes Creek	615400	ORW	1.69	11.27
Little Wausaukee River	611500	ORW	0	9
Cedar Creek	611900	ORW	0	0.58
Wausaukee River	611400	ORW	5.55	27.31

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 Wausaukee and Lower Menominee Rivers watershed

Waterbody Name	WBIC	Start Mile	End Mile	Trout Class
Wausaukee River	611400	0	5.55	CLASS II
Little Wausaukee River	611500	0	9	CLASS I
Coldwater Brook	612300	0	2	CLASS I
Heubler Creek	612700	0	2	CLASS I
Holmes Creek	615400	0	1.69	CLASS II
Cedarville Creek	615500	3.24	7.65	CLASS I
Creek 30-10	583300	0	4.74	CLASS III
Wausaukee River	611400	27.32	29.01	CLASS II
Cedar Creek	611900	0	0.58	CLASS II
Creek 33-12 T35n R19e	612900	0	1.54	CLASS I
Creek 6-15	613400	0	1.68	CLASS I
Creek 6-7a	613600	0	2.28	CLASS II
Holmes Creek	615400	1.69	11.27	CLASS I
Creek 31-1	615650	0	4.01	CLASS I
Creek 22-2	616150	0	0.87	CLASS I
Creek 35-12	615600	0	0.21	CLASS I
Wausaukee River	611400	5.55	27.31	CLASS I
Little Wausaukee Creek (Extension)	611500	9	11	CLASS I
Creek 8-5	613200	0	2.63	CLASS II

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).

Table 3: Impaired waters in the Wausaukee and Lower Menominee Rivers watershed

Local Name	WBIC	Start Mile	End Mile	Pollutant	Impairment	Sources	303 Status
Green Bay (Wi - Menominee Aoc)	70	0	6.43	PCBs PAHs Arsenic	Contaminated Sediment	Contaminated Sediments, Atmospheric Deposition - Toxics	303d Listed
Menominee River	609000	0	3.45	Arsenic PAHs	Contaminated Sediment	Contaminated Sediments, Atmospheric Deposition - Toxics	303d Listed
Menominee River	609000	0	3.45	PCBs Mercury	Contaminated Fish Tissue	Contaminated Sediments, Atmospheric Deposition - Toxics	303d Listed
Menominee River	609000	3.45	43.02	PCBs	Contaminated Fish Tissue	Contaminated Sediments, Atmospheric Deposition - Toxics	303d Listed
Menominee River	609000	43.21	87.8	PCBs	Contaminated Fish Tissue	Contaminated Sediments, Atmospheric Deposition - Toxics	303d Listed

Monitoring Project Discussion

Purpose of Project

The purpose of the Wolf Creek Targeted Watershed Assessment in the larger Wausaukee and Lower Menominee Rivers watershed (GB13) was designed to collect evaluation data by monitoring five stations on Wolf Creek and one station on Holmes Creek to gather baseline information for watershed planning and Clean Water Act Reporting.

Site Selection and Study Design

Site Selection

Sites were selected so data would not be biased toward stream order, location, or natural community; however, sites may have been targeted based access, limited or outdated data for that particular stream reach. Sample stations were established to limit outside influences and set-up using DNR field procedures manuals of 35 times the mean stream width (Modified from Simonson, et al. 1994). Stations were no less than the minimum of 100 meters and no more than the maximum of 400 meters.

Table 4: Monitoring stations in the Wolf Creek TWA

Waterbody	Station ID	WBIC	Location	Order
Wolf Creek	10041789	613900	Downstream Pike River Road	2
Wolf Creek	10042952	613900	Downstream Lubke Road	2
Wolf Creek	10042718	613900	Upstream Keating Road	2
Wolf Creek	10042953	613900	Upstream Island Lake Road	2
Wolf Creek	10042719	613900	Upstream Narragon Rod	2
Holmes Creek	10042954	615400	Upstream Pike River Road	3

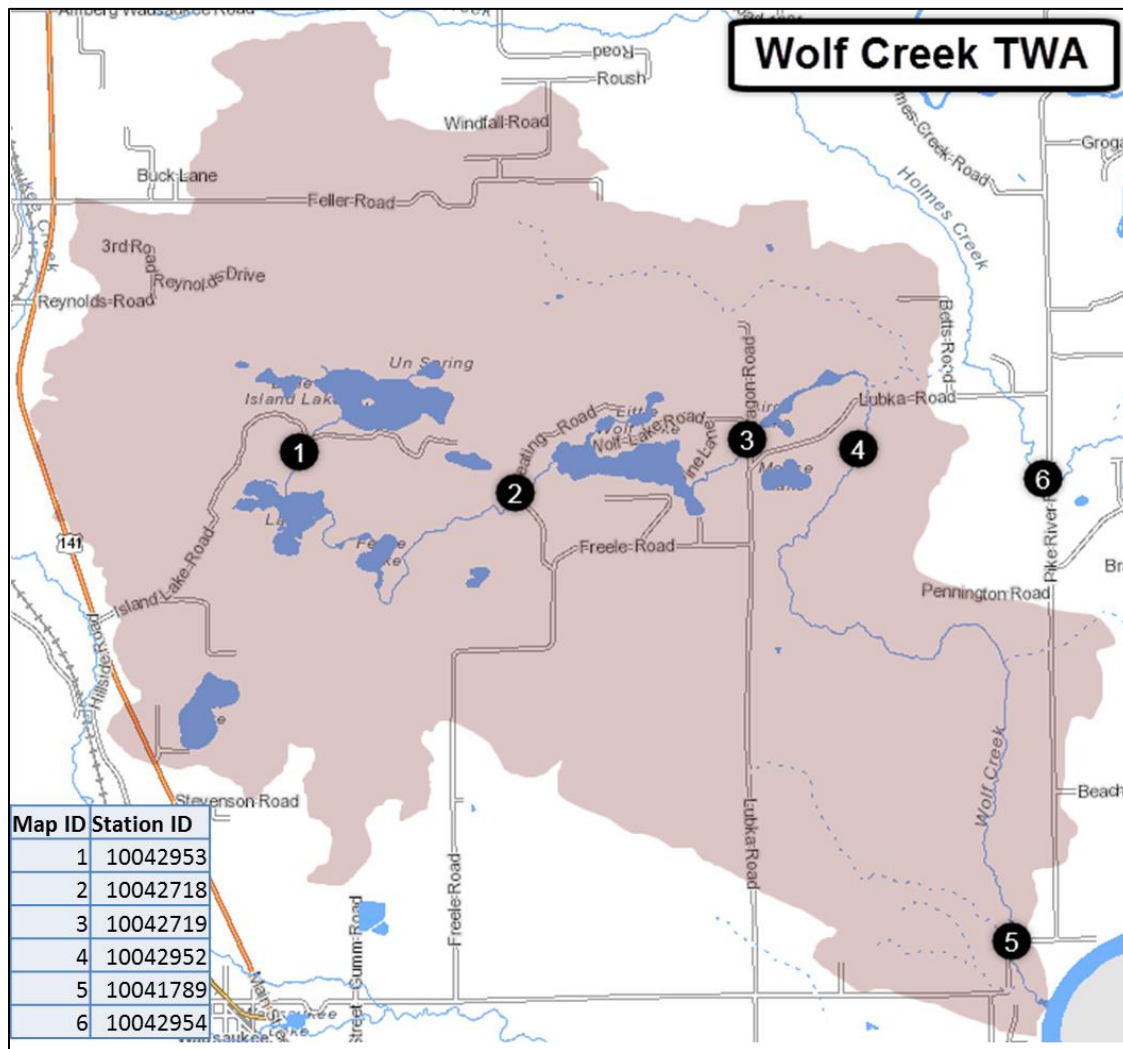


Figure 4: Map of the monitoring stations in the Wolf Creek TWA

Methods, Equipment and Quality Assurance

Water quality monitoring was conducted at 6 wadeable sites throughout the watershed in the spring, summer, and fall of 2014. During each field visit, basic water quality parameters including air temperature, water temperature, conductivity, dissolved oxygen, dissolved oxygen percent, pH, flow, and water clarity were collected. Total Phosphorous samples were collected by a citizen volunteer once per month throughout the growing season from May to October. A continuous temperature HOBO was installed at this site and collected continuous water temperature reading between May and October.

Continuous Water Temperature Monitoring

An Onset Hobo water temperature data logger was placed within the sample station used for fish and habitat survey at the station nearest the pour point on Pike River Road. Temperature readings were collected every 15 minutes from May to October. Temperature data will be used to determine relative thermal regimes for the sample station and to ascertain average daily summer time maximum temperatures.

Fish Surveys

Fish surveys were completed through the identified sample station. A direct current electrofishing backpack shocker or tow behind stream shocker was used to collect all fish possible through an upstream pass through the sample station. Typically, the back-pack units were used on the small streams up to 3 meters with a single probe and the stream shockers were used with a generator and 2 probes on the remainder of sites over 3 meters. All fish were collected, identified, and counted. All gamefish were measured. All other DNR sampling protocols were used to assess the fish community for purposes of calculating the index of biotic integrity.

Habitat Surveys

At the established pour point station, a quantitative habitat evaluation was completed. A total of 12 transects were located equidistant throughout the station to sample representative available habitat. Quantitative habitat metrics were collected such as average stream width and depths, depths of fines, substrate, embeddedness of substrate, macrophyte or algal growth, canopy cover, riparian buffers, land use, stream bank erosion, and fish cover. The station length was established at a distance 35 times the mean stream width. The remaining stations had qualitative habitat assessments completed which utilizes a condensed protocol but obtains the same habitat metrics as quantitative habitat protocols.

Macroinvertebrate Sampling

Macroinvertebrate samples were obtained by kick sampling a collection using a D-frame net at all 6 sites in the watershed in fall. These samples were sent to the University of Wisconsin-Stevens Point for taxonomic classification, analysis, and computation of a Macroinvertebrate (M-IBI) and other usable metrics.

Project Results

Results for the fisheries and habitat surveys are summarized in Table 5 and 6. The natural communities model (Lyons, 2008) indicates that the streams in the Wolf Creek in the upper watershed is a cool-warm headwater and then transitions into a cool-warm mainstem downstream of Lubke Road.

Holmes Creek is modeled as a cool-warm mainstem. Based on the natural community verification draft guidance (Lyons 2014), Wolf Creek trends towards a warmwater stream with headwater characteristics present at the upstream station and the remainder of the stream would be considered mainstem based on fish assemblages observed. Holmes Creek was confirmed as a cool-warm mainstem. Based on the verified natural community, the applicable FIBI was applied to achieve a score and rating.

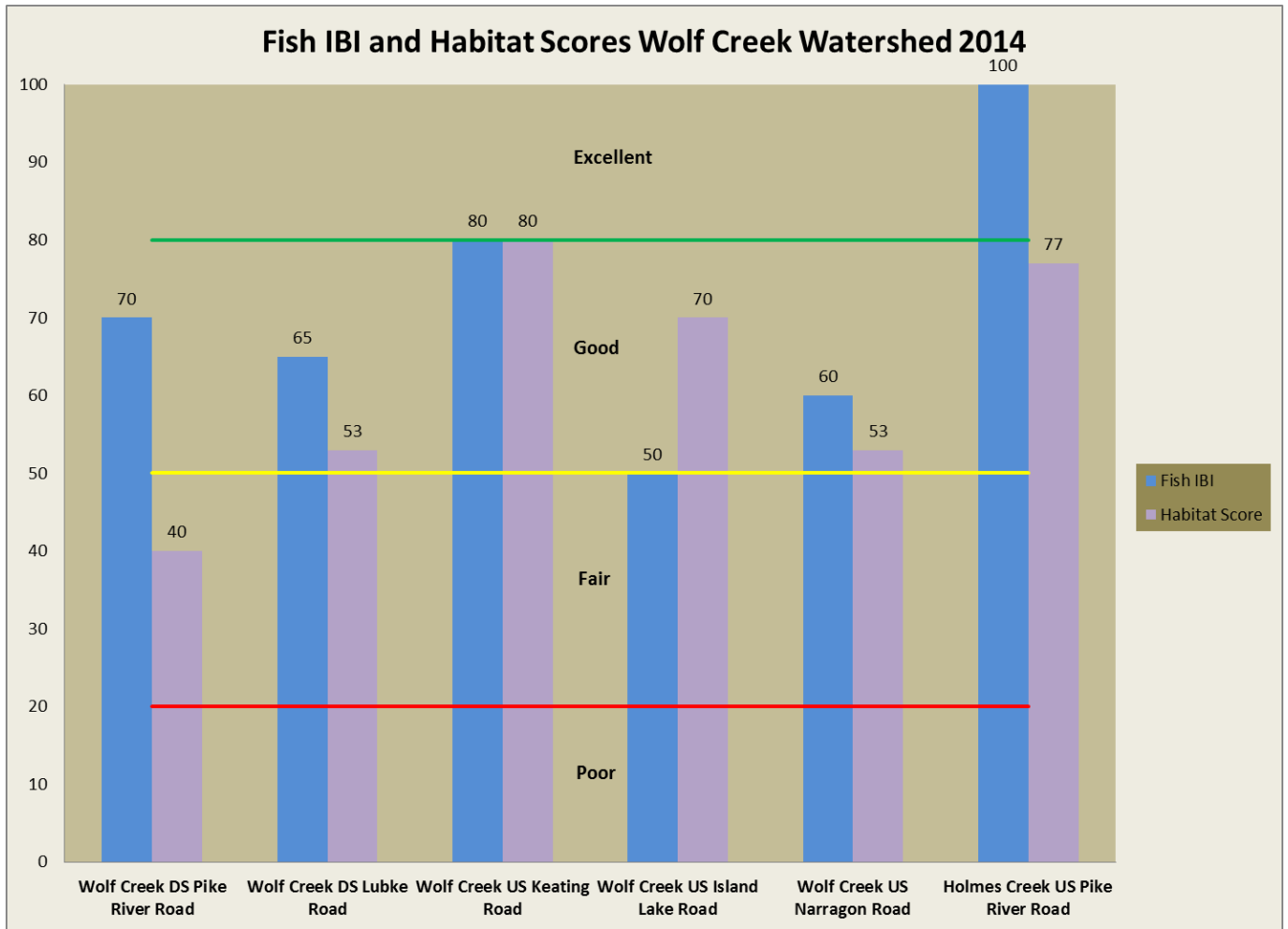


Figure 5: Fish IBI and Habitat Scores for Wolf Creek Watershed Survey 2014.

Macroinvertebrate samples were collected at all sites and evaluated with the Hilsenhoff Biotic indices (HBI) (Hilsenhoff, 1987), Family level Biotic Indices (FBI) (Hilsenhoff 1988) and the Macroinvertebrate index of biotic integrity (MIBI) (Weigel, 2003). Results were consistently good to excellent for all sites sampled (Table 6).

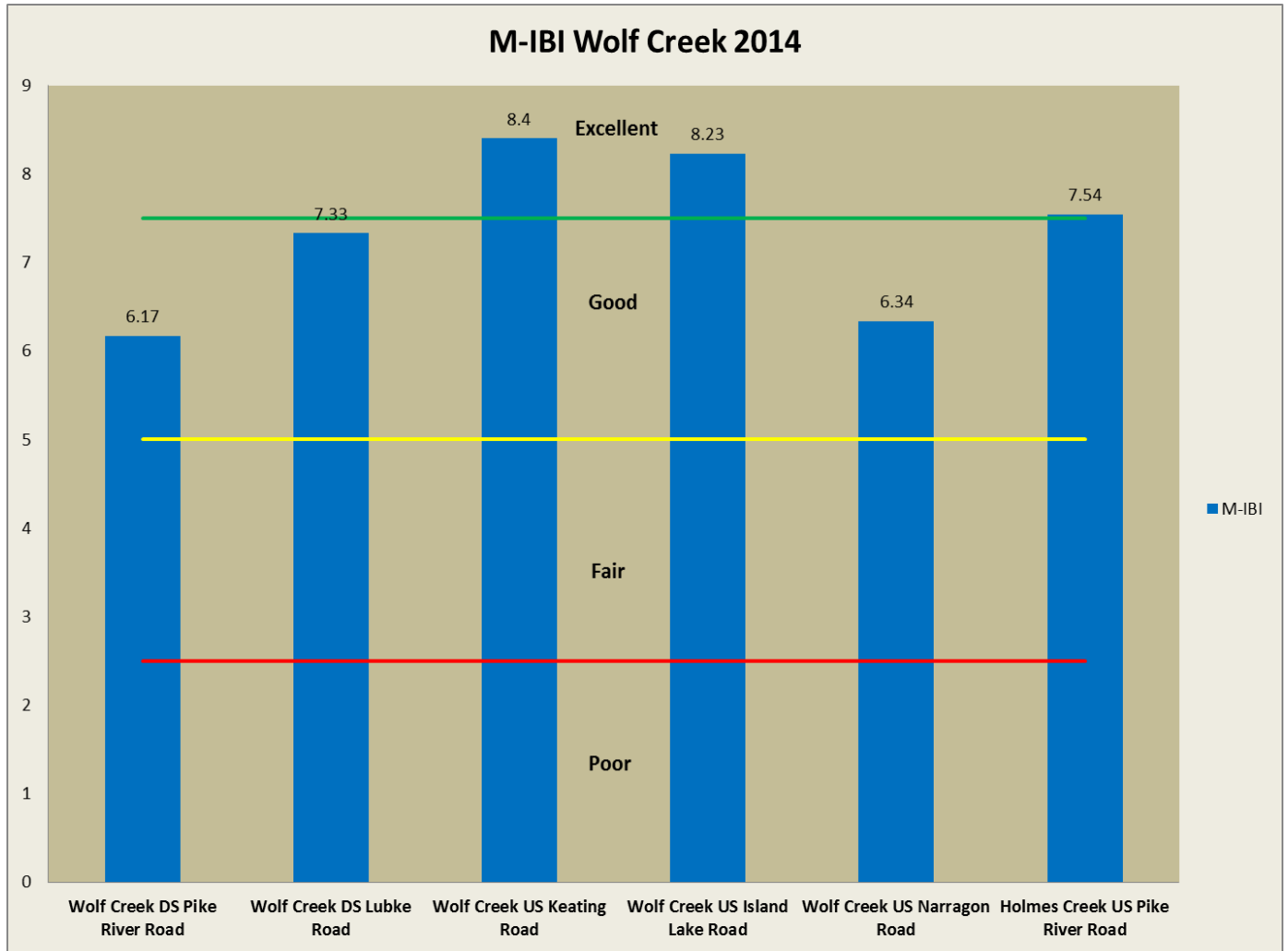


Figure 6: Macroinvertebrate IBI Scores for Wolf Creek Watershed Survey 2014

Total Phosphorous samples were collected once per month at the site furthest downstream within the watershed at Pike River Road also known as the pour point. Total Phosphorous concentration fell well below the state standard of 0.075 mg/l.

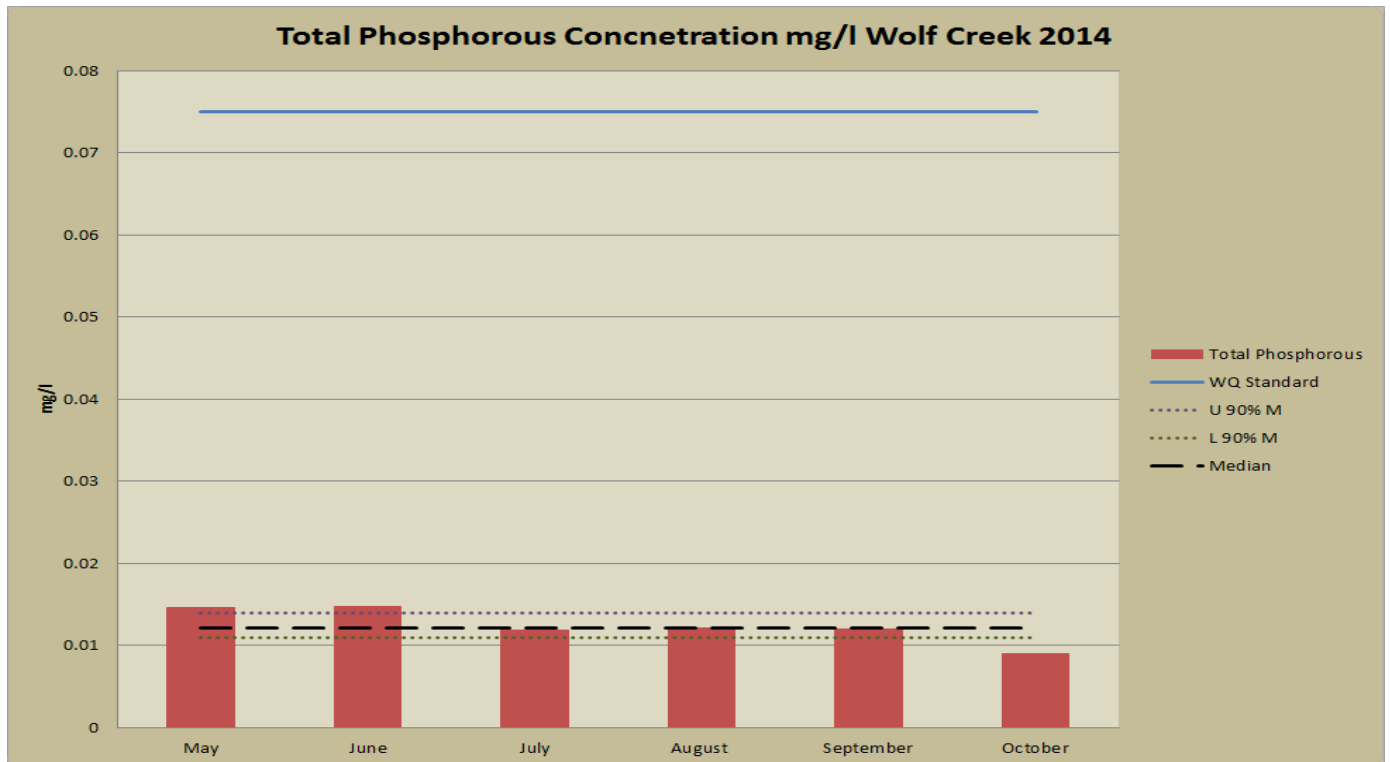


Figure 7: Total Phosphorous results from growing season samples 2014.



Table 5: Fish IBI and Habitat Assessments for the Wolf Creek, 2014.

2014 Stream - Site	Wolf Creek DS Pike River Road	Holmes Creek US Pike River Road	Wolf Creek DS Lubke Road	Wolf Creek US Keating Road	Wolf Creek Island Lake Road	Wolf Creek Narragon Road
Stream Order	2	3	2	2	2	2
Mean Stream Width	5	4	10	3	2	14
Station Length	175	140	350	100	100	400
Modeled Natural Community	CWMS	CWMS	CWMS	CWHW	CWHW	CWHW
Verified Natural Community	WMS	CWMS	WMS	WMS	WHW	WMS
FISH SPECIES						
Common Shiner	687	74	218	29		27
Creek Chub	21	3	5	1		
Hornyhead Chub	28		189	5		4
Bluntnose Minnow	19	2	5	1	33	4
Northern Hog Sucker	4					
Rock Bass	1		19	1		11
2014 Stream - Site	Wolf Creek DS Pike River Road	Holmes Creek US Pike River	Wolf Creek DS Lubke	Wolf Creek US Keating	Wolf Creek Island Lake	Wolf Creek Narragon Road
White Sucker	6	13	8	9		4
Tadpole Madtom	2		3			1
Lamprey (Ammocoete)	3	1				
Johnny Darter	1			1		
Rosyface/Carmine Shiner	140					
Central Mudminnow		10	29	6	6	16
Bluegill			5	4	5	20
Yellow Perch			2			1
Banded Killifish			1			8
Yellow Bullhead			19	3		3
Iowa Darter			9	8	12	45
Mimic Shiner		6				
Western Blacknose Dace		2				
Blacksided Darter		1				
Smallmouth Bass	3	5				
Mottled Sculpin		11		1		
Brook Trout		11				
Largemouth Bass	2		3	1		17
Fathead Minnow			2			
Brook Stickleback			1			
Pumpkinseed			1			
Bluegill x Pumpkinseed Hybrid			3			
Weed Shiner			3			
Northern Pike			2			
Green Sunfish					1	
Total # Fish Sampled	917	139	527	70	57	161
Total # Species	11	12	20	13	5	14
IBI SCORE						
Coldwater	-	-	-	-	-	-
Coolwater (CC)	-	-	-	-	-	-
Coolwater (CW)	E (90)	E (100)	E (100)	-	-	-
Warmwater	E (70)	-	E (65)	E (80)	-	G (60)
Small Stream	-	-	-	E (90)	G (50)	G (80)
HABITAT						
Rating (Score)	F (40)	E (77)	F (53)	E (80)	G (70)	F (53)

CWMS= Cool-Warm Mainstem
 CWHW= Cool-Warm Headwater
 CCMS= Cool-Cold Mainstem
 CCHW= Cool-Cold Headwater
 WMS= Warm Mainstem
 WHW= Warm Headwater

E= Excellent
 G= Good
 F= Fair
 P= Poor

Green value represents verified natural community score

CW= Coldwater

Table 6: Macroinvertebrate Ratings in the Wolf Creek 2014

2014 Stream - Site	Wolf Creek	DS Pike River Road	Holmes Creek	US Pike River Road	Wolf Creek	DS Lubke Road	Wolf Creek	US Keating Road	Wolf Creek	Island Lake Road	Wolf Creek	Narragon Road
Stream Order	2		3		2		2		2		2	
Mean Stream Width	5		4		10		3		2		14	
Station Length	175		140		350		100		100		400	
Modeled Natural Community	CWMS		CWMS		CWMS		CWHW		CWHW		CWHW	
Verified Natural Community	WMS		CWMS		WMS		WMS		WMS		WMS	
HBI Rating ¹	E		E		G		G		G		F	
HBI Score ¹	2.91		2.89		5.2		4.64		4.87		6.2	
FBI Rating ¹	E		E		G		G		G		F	
FBI Score ¹	3.14		3.24		4.54		4.96		4.62		5.64	
MIBI Rating ²	G		E		G		E		E		G	
MIBI Score ²	6.17		7.54		7.33		8.4		8.23		6.34	

- 1) E= Excellent (0-3.5)
 VG= Very Good (3.51-4.50)
 G= Good (4.51-5.50)
 F= Fair (5.51-6.50)
 F= Fairly Poor (6.51-7.50)
 P= Poor (7.51-8.50)
 VP= Very Poor (8.51-10)

- 2) E= Excellent (7.5-10)
 G= Good (5.0- 7.49)
 F= Fair (2.51- 4.99)
 P= Poor (0- 2.5)



Wolf Creek Headwaters, Andy Hudak

Discussion

Wolf Creek was selected for evaluation monitoring in 2014 which includes biological, chemical and physical data collection. Based on current surveys water quality of the streams in the Wolf Creek watershed are in overall good to excellent condition. Current land use practices in the region do not appear to be causing adverse impacts to water quality conditions. TP concentrations at the pour point suggest nutrients are in balance and excess phosphorous is not a problem. Habitat is likely the limiting factor for the streams potential.

Stream habitat varies greatly between the station at Pike River Road and the four other stations upstream. The upstream site had good habitat for being a small stream. Pools were lacking but woody cover for fish and riffle sequences were present. The mid-reach stations are dominated by excessive fines, coarse woody debris, and at times, dense macrophyte growth. Both submergent and emergent species are contained within the channel thalweg and margins and no non-native exotic species were observed. The excessive fines, likely from legacy impacts of logging, and beaver activity, support the macrophyte growth but also bury coarse woody debris and harder substrate such as gravel and cobble.

These stations serve as connections between the lakes and often times appear more lacustrine than riverine in nature based on the macrophyte growth. The station located at Pike River Road was relatively wide and shallow which lead to the lack of pools and limited cover for fish. This station is also extensively dominated by sands however rocky riffles were common and the riffle to riffle ratio was good which provided suitable habitat for a large bio-mass of non-game species.

Potential threats to water quality continue to be poor logging practices and new nutrient source inputs from development or agriculture. The protection of the riparian corridors and landscape of the streams and lakes in this watershed should be the highest priority. Sustainable forest and woodlot management should be the standards and forestry best management practices to protect water quality should be strictly followed. Land divisions and new development in the riparian areas of lakes and streams should be done only after careful consideration. Proper site placement and planning should occur to protect shoreline cutting and clearing for home development. Location of new septic systems should only occur on suitable sites where poor filtration or high groundwater tables are not present.

Holmes Creek is a class I Brook Trout stream that lies outside of the Wolf Creek Watershed; however historic logging practices provided a direct connection between Wolf Creek and Holmes Creek. It is unclear how the connection currently affects either stream; however, Holmes Creek currently does not appear to have any significant water quality issues or concerns. Legacy sediment impacts from logging are still apparent in the stream and habitat will continue to be a limiting factor. Maintaining intact riparian areas and promoting sustainable forestry practices employing best management practices for water quality, will continue to provide adequate protection to the stream and maintain current habitat ecological function.

Management Actions

Management Goals

- Protection of riparian corridors along streams and lakes in this watershed is a high priority.
- Forestry best management practices should be followed to protect water quality.
- Land divisions and new development in the riparian areas of lakes and streams should be done only after careful consideration.
- Proper site placement and planning to protect shoreline cutting and clearing for home development is needed. Additionally, location of new septic systems should only occur on suitable sites where poor filtration or high groundwater tables are not present.

Monitoring and Assessment Recommendations

- Wolf Creek downstream of Pike River Road is modeled as a cool warm mainstem natural community; recent data indicates this is a warm mainstem stream.
- Wolf Creek downstream of Lubke Road is modeled as a cool warm mainstem natural community; based on recent data this is a warm mainstem stream.
- Wolf Creek upstream of Keating Road is modeled as a cool warm headwater natural community; recent data indicates this is a warm mainstem stream.
- Wolf Creek at Island Lake Road is modeled as a cool warm headwater natural community; recent data indicates this is a warm headwater stream.
- Wolf Creek at Narragon Road is modeled as a cool warm headwater natural community; based on recent data this is a warm mainstem stream.

Management Recommendations for DNR

- DNR should seek partners and funds through pass through grants (river and lake planning and protection grants) and other available opportunities to help ensure protection of riparian corridors of stream and lakes in this watershed.
- DNR should continue to follow forestry best management practices to protect water quality and promote the use of best management practices to the private foresters in the watershed.

Management Recommendations for External Partners

- Maintain intact riparian areas and promote sustainable forestry practices by employing best management practices for water quality, to provide adequate protection to the stream and maintain current habitat ecological function.

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.
- WDNR. 1980. Surface Water Resources of Green County. By D. Bush, R. Cornelius, D. Engel, C. Brynildson. Wisconsin Department of Natural Resources. Madison, WI.
- WDNR. 2003. The State of the Sugar and Pecatonica River Basins. Wisconsin Department of Natural Resources.
- WDNR. 2013. Wisconsin 2014 Consolidated Assessment and Listing Methodology (WisCALM). Clean Water Act Section 305(b), 314, and 303(d) Integrated Reporting. Wisconsin Department of Natural Resources. Bureau of Water Quality Program Guidance. September 2013.
- WDNR. 2015. An Assessment of Water Quality in the Lower Middle and Lower Sugar River Watershed (HUC 0709000406). 2013. Project SCR_20_CMP13. February 2015. By James Amrhein, Water Quality Biologist – South District. <http://prodoasint.dnr.wi.gov/wadrs/viewWatershedDetail.do?id=924722>
- 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.

Appendix B: Stream Narratives

Grand Rapids Flowage (Imp), WBIC: 610700

This is a hard water drainage lake (impoundment) on the Menominee River having slightly alkaline, light brown water of moderate transparency. Grand Rapids Flowage is a 306.90-acre lake in Marinette County and is managed for fishing and swimming. This water is not considered impaired; however, considerable monitoring has taken place through FERC licensed partners and by DNR staff and volunteers for aquatic invasive species. Data collection was conducted in 2010, 2015 primarily.

In historical reports, the flowage's littoral zone was documented as 85 percent sand and 15 percent silt. In the 1975 inventory the shoreline was primarily upland (97 percent), consisting of mixed hardwoods and conifers, with the remainder a shrub wetland. At that time, the fish species inhabiting this lake included northern pike, walleye, largemouth bass, bluegill, rock bass, black crappie and perch. Waterfowl make moderate use of this flowage, especially on their spring and fall migrations.

Public access is of the navigable water type via the inlet and a boat landing is maintained by the Wisconsin Public Service Corporation for public use. The dam maintains a head of 29 feet and is operated by the Wisconsin Public Service Corporation.

Heubler Creek, WBIC: 612700

Heubler Creek in the Wausaukee and Lower Menominee Rivers Watershed is a 1.85-mile river that falls in Marinette County. This river is outstanding/exceptional resource water (ORW/ERW) under NR102 and is a Class I Trout Water. This river is supporting its fish and aquatic life use.

Cedarville Creek, WBIC: 615500

Cedarville Creek, in the Wausaukee and Lower Menominee Rivers Watershed, is a 4.42-mile river that falls in Marinette County. This river is an outstanding/exceptional resource water under NR102 as well as a Class I Trout Water under the Fisheries Program. This river is managed for fishing and swimming and is not considered impaired.

Menominee River, WBIC: 609000

The Menominee River originates just north of this watershed near Florence, WI, at the confluence of the Brule River (GB18) and Michigan's Michigamme River. The Menominee flows southerly for 118 miles before joining the waters of Green Bay. Hydroelectric development has been extensive along the Menominee River. This water and its harbor are listed as an Area of Concern under a federal/state program that identifies the most degraded waters in the Great Lakes. Under this program, beneficial use impairments include restricted dredging, restricted fish consumption, degraded fish and wildlife habitat, degraded fish populations, degraded communities of bottom-dwelling organisms, and total and partial body contact restrictions. Toxic pollutants in the sediments are a major concern in the lower Menominee River.

Over the years, the presence of dams has resulted in 37 percent of the river mileage to impoundments, primarily in areas of higher gradient. More than 70 percent of river with a gradient greater than four feet per mile has been flooded by dam development (1993 WDNR). These high gradient reaches are the most productive in terms of aquatic insects and are important for fish spawning habitat. Losses of high gradient rapids in this watershed include: the Pemene Rapids, which drops 20 feet in two miles; the Chalk Hill Rapids, which drops eight feet in a half mile; and White Rapids, which drops 41 feet in four

miles. A total of 6.75 miles of high gradient river, important as sport fish spawning areas, has been lost. Horse Race and Sturgeon Falls rapids have also suffered losses.

In the past, this river has exhibited habitat degradation due to peaking in hydroelectric operations. Lake sturgeon, walleye, largemouth bass, smallmouth bass, northern pike, muskellunge, yellow perch, panfish, suckers, bullhead, carp and forage species are found in the Menominee River.

Green Bay (GI Shoreline), WBIC: 70

Green Bay is by far the most important surface water resource in Brown County in terms of recreational potential. The bay served as a natural starting point for early settlement and transportation to the interior of Wisconsin via the Fox River. The Fox River is a determinant of the water quality in lower Green Bay since the bottom materials of the lower bay consist of very loose, flocculent sediment. As a result, the water clarity changes significantly over short periods from the resuspension of the sediment. Chemically Green Bay is a hard water alkaline basin which has a total alkalinity of 143 mg/l. Green Bay receives a large nutrient load from industrial, municipal, and agricultural sources (2011).

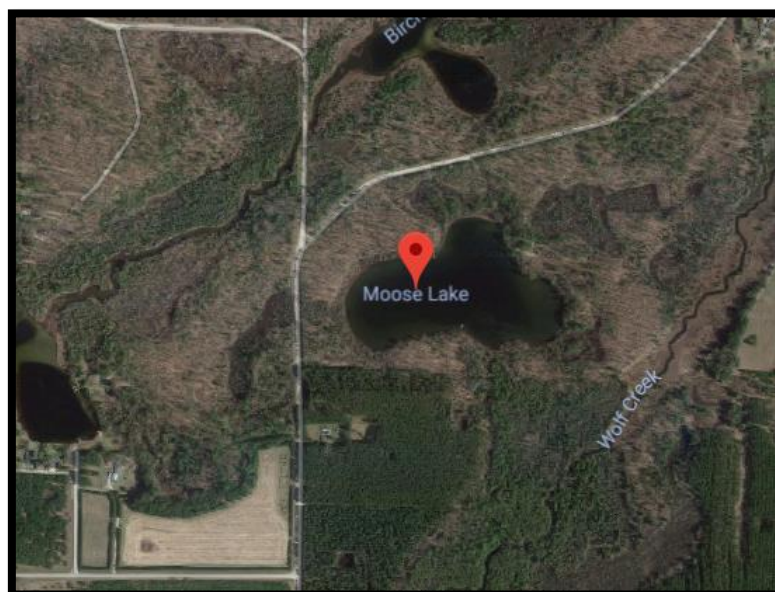
In 1972, nutrient levels consistently exceed 0.1 milligrams per liter (mg/L) of nitrogen and .02 mg/L of phosphorus, enough to create bloom conditions. Today, heavy algae blooms are common and have caused oxygen depletion in some sections of the bay creating isolated fish kills during the summer months.

A fishery of carp, northern pike, drum, suckers, white bass, bullheads, catfish, and an abundant of perch was present, but today conditions in the area of Brown County have gotten so bad that only carp dominate the scene for in shore waters. Even the perch, which is noted for being able to tolerate very poor water quality, has been eliminated as a permanent feature of the fishery and furnishes a seasonal sport fishery near the mouths of oxygen bearing streams. The commercial catch for all of Green Bay has vacillated, declining from 15,768,000 pounds (61.7 percent of the total Lake Michigan catch) in 1949 to 6,636,000 pounds (31.6 percent of the total Lake Michigan catch) in 1963. In 1971 the yield jumped to 17,242,000 pounds primarily as a result of increased alewife harvest. Alewife now dominates the commercial catch. In the more stable years of the fishery yields to the commercial fishery for the Bay as a whole ranged between 10.4 and 19.6 pounds per acre (DNR 1972).

Public access is available from several road endings, public hunting grounds, public access sites with boat ramps, and navigable water from the Suamico and Fox Rivers, and Duck Creek. There are also parks and waysides providing walk-in access. A 26-foot deep navigation channel 300-500 feet wide cuts through the south end of the bay and affords access of large ships to the city of Green Bay.

Moose Lake, WBIC: 589200

Moose Lake is 16.22 acre lake that falls in Marinette County. This lake is a medium hard water seepage lake with slightly alkaline, clear water of very high transparency having a littoral zone composed of 90 percent muck and 10



percent sand. The shoreline is primarily upland (90 percent) consisting of mixed hardwoods and conifers, with limited areas of coniferous bog wetland. The known fish population consists of largemouth bass and bluegill. Waterfowl make limited use of this lake. Two dwellings are located on the shoreline.

Mccall Lake, WBIC: 611300

Mccall Lake is a 20.74-acre hard water drainage lake., Mccall Lake is a slightly acid, medium brown water of moderate transparency and had a littoral zone composed 90 percent muck and 10 percent sand. The shoreline was 95 percent upland, consisting of mixed hardwoods and conifers, and 5 percent wetland primarily of bog. The fish population consisted of northern pike, largemouth bass, bluegill, pumpkinseed and perch.

Heubler Lake, WBIC: 612800

Heubler Lake is a 2.64-acre medium hard water spring pond. Historically, Heubler Lake is a slightly acid, clear water of moderate transparency with a littoral zone composed of 80 percent silt and 20 percent sand. The shoreline was 80 percent upland consisting of mixed hardwoods and conifers, and 20 percent wetland of shrub bog. Forage species are the only known fish present. Seventy percent of the lake is less than three feet in depth. Waterfowl make limited use of this lake. Submergent vegetation occupies 60 percent of the basin. There is no public access. No dwellings are located on the shoreline.

Upper Scott Flowage, WBIC: 609400

Upper Scott Flowage is a 124.48-acre hard water drainage lake (impoundment) on the Menominee River. Historically, Upper Scott Flowage had slightly acid, light brown water and a littoral zone composed of sand (50 percent), gravel (10 percent) and muck (30 percent) and lesser amounts of silt and rubble. The shoreline was primarily upland, consisting of mixed hardwoods, with a small area of shrub bog wetland. The known fish population consisted of northern pike, walleye, largemouth bass, smallmouth bass, lake sturgeon and panfish.

Wolf Creek, WBIC: 613900

Wolf Creek, in the Wausaukee and Lower Menominee Rivers Watershed, is a 10.47-mile river that falls in Marinette County. Wolf Creek was assessed during the 2018 listing cycle; new biological (macroinvertebrate Index of Biotic Integrity (IBI) scores) sample data were clearly below 2018 WisCALM listing thresholds for the Fish and Aquatic Life use. Based on current surveys, it appears water quality of Wolf Creek is overall good to excellent conditions. This water is meeting this designated use and is not considered impaired.

Little McCall Lake, WBIC: 587600

Little McCall Lake is an 8.85 medium hard water seepage lake. Historically, Little McCall Lake was slightly acid with high transparency and a littoral zone composed of 65 percent sand, 25 percent silt and 10 percent muck. The shoreline was primarily upland (97 percent) consisting of hardwoods and conifers with the remainder a shrub bog wetland. The fish population includes northern pike, largemouth bass, bluegill, pumpkinseed, black crappie and perch.

Mud Lake, WBIC: 589500

Mud Lake is an 18.19-acre medium hard water seepage lake. Historically, Mud Lake was slightly acid, light brown water of moderate transparency. The littoral zone is composed of 60 percent sand, 19 percent silt, 20 percent muck and 1 percent rubble. The shoreline was primarily upland (95 percent), consisting of hardwoods, conifers and cleared land. Information is lacking on the fish population; however, due to the shallowness of the lake, winterkill is likely.

Poch De Noch Lake, WBIC: 610900

Poch De Noch Lake is a 30.69-acre medium hard water drainage lake. The lake occupies a meander scar on the Menominee River. Historically, Poch de Noch Lake was slightly acid with light brown water of moderate transparency and a littoral zone composed of 50 percent sand, 30 percent muck and 20 percent detritus. The shoreline was upland composed of hardwoods. Fish species reported to inhabit this lake are northern pike, walleye, largemouth bass, bluegill, pumpkinseed, perch and yellow bullhead. Waterfowl make limited use of this lake. The lake level had fluctuated with the level of the Menominee River about 5 feet.

University Creek, WBIC: 583500

University Creek, in the Wausaukee and Lower Menominee Rivers Watershed, is a 1.77-mile river that falls in Marinette County. This river is managed for fishing and swimming and is currently not considered impaired.

Helen Lake, WBIC: 611800

Helen Lake is a 6.16-acre hard water spring lake (impoundment). Historically, Helen Lake had a neutral, light brown water of high transparency and a littoral zone composed of 80 percent sand, 10 percent gravel, 5 percent rubble and 5 percent silt. The shoreline was entirely upland consisting of mixed hardwoods and conifers. The fish population was composed of rainbow trout and forage species.

Wausaukee Lake, WBIC: 612200

Wausaukee Lake is a 5.90-acre hard water drainage lake (impoundment) on the Wausaukee River. Historically, Wausaukee was slightly acid with light brown water of moderate transparency and had a littoral zone composed of 80 percent sand and 20 percent silt. Eighty percent of this lake is less than three feet deep. The entire shoreline was upland consisting of mixed hardwoods, conifers and cleared land. Brown trout and brook trout are reported to inhabit this lake. Waterfowl make limited use of the lake. The lake is located in the Village of Wausaukee, and hunting is prohibited. The Town of Wausaukee provides a park area with swimming facilities.

Wright Slough, WBIC: 609500

Wright Slough is a 23.24-acre lake that falls in Marinette County. This lake is managed for fishing and swimming and is currently not considered impaired (2015).

Cedar Lake, WBIC: 612000

Cedar Lake is a 6.25 acre a hard water spring pond. Historically, Cedar Lake was a neutral with clear water of high transparency and a littoral zone composed of muck. The entire shoreline was wetland, primarily coniferous bog. Information regarding the fish population is lacking, but forage species are

probably present. Sixty percent of the basin is less than three feet in depth. Waterfowl make limited use of this lake.

Coldwater Brook, WBIC: 612300

Coldwater Brook is a 1.73-mile river that falls in Marinette County. This river is an ORW water under NR102 as well as a Class I Trout Water under the Fisheries Program. This river is managed for fishing and swimming and is not considered impaired.

Little Wolf Lake, WBIC: 614500

Little Wolf Lake is a 7.50-acre hard water spring lake. Historically, Little Wolf Lake was slightly alkaline with light brown water of high transparency and had littoral zone composed entirely of muck. The shoreline was 80 percent wetland, consisting primarily of conifers and 20 percent upland of mixed hardwoods and conifers. The fish population includes northern pike, largemouth bass and perch. Waterfowl make limited use of this lake.

Cedar Creek, WBIC: 611900

Cedar Creek is a 0.59-mile river that in Marinette County. This river is an outstanding/exceptional resource water under NR102 as well as a Class II Trout Water under the Fisheries Program. This river is managed for fishing and swimming and is currently not considered impaired (2011).

Tessmer Pond, WBIC: 3000631

Tessmer Pond a lake that falls in Marinette County. This lake is managed for fishing and swimming and is currently not considered impaired (2017).

Grass Lake, WBIC: 614800

Grass Lake is a 49.69 acre is hard water drainage lake. Historically, Grass Lake was slightly alkaline with high transparency and a littoral zone composed of 80 percent marl and 20 percent muck. The shoreline as 50 percent upland, consisting of mixed hardwoods and conifers and 50 percent wetland of the open bog type. The fish population consists of northern pike, largemouth bass and bluegill. Moderately dense stands of bulrush occupy 30 percent of the lake area. Waterfowl make limited use of this lake during their spring and fall migrations. The inlet and outlet are a part of Wolf Creek.

Island Lake, WBIC: 614900

Island Lake is an 85.79-acre hard water drainage lake. Historically, Island Lake was slightly alkaline with clear water of high transparency and a composed littoral zone is 90 percent marl and 10 percent silt. The shoreline was 60 percent upland consisting of mixed hardwoods and conifers and 40 percent wetland primarily of open marsh. The fish population included northern pike, largemouth bass, bluegill, pumpkinseed and perch. Puddle ducks and diving ducks make use of this lake on their spring and fall migrations.

Twin Creek, WBIC: 609900

Twin Creek is a 7.48-mile river that falls in Marinette County. This river is managed for fishing and swimming and is currently not considered impaired. (Overview 10/17/2011)

McCall Creek, WBIC: 611200

McCall Creek is a 3.07-mile river that falls in Marinette County. This river is managed for fishing and swimming and is currently not considered impaired. (Overview 10/17/2011)

Little Pooch De Noch Lake, WBIC: 611100

(Historical Description 02/01/1975) Little Poch De Noch Lake is 1.91-acre hard water drained lake. Historically, Little Poch De Noch Lake was slightly alkaline with light brown water of moderate transparency and a littoral zone composed of 96 percent muck, 2 percent sand and 2 percent gravel. The entire shoreline was upland composed of hardwoods and scattered conifers. Information on the fish population is lacking; however, forage fish may be present. Puddle ducks occasionally nest here. There is no public access.

Birch Lake, WBIC: 614100

Birch Lake is a 17.33-acre hard water drainage lake. Historically, Birch Lake had slightly alkaline with clear water of high transparency and a littoral zone composed of 90 percent muck and some marl. The shoreline was 80 percent wetland, consisting primarily of shrub bog, and 20 percent upland of mixed hardwoods and conifers. The known fish population includes northern pike and perch. Waterfowl make limited use of this lake. Floating and submergent Vegetation are moderate in density over 35 to 40 percent of the basin.

Fence Lake, WBIC: 614600

Fence Lake is a 16.98-acre hard water drainage lake. Historically, Fence Lake had slightly acid with light brown water of moderate transparency. The littoral zone is composed entirely of muck. The shoreline is 80 percent upland, consisting of mixed hardwoods and conifers, and 20 percent wetland of open bog. Northern pike and minnows are reported to be present. Waterfowl make limited use of this lake.

Coulter Slough, WBIC: 609600

Coulter Slough is a 64.76-acre lake that falls in Marinette County. This lake is managed for fishing and swimming and is currently not considered impaired (2017).

Lost Lake, WBIC: 587900

Lost Lake is a 41.43-acre soft water seepage lake. Historically, Lost Lake had neutral, clear water of high transparency and a littoral zone composed of 70 percent muck and 30 percent sand. The shoreline was 50 percent wetland of shrub bog and 50 percent upland of mixed hardwoods and conifers. The fish species include largemouth bass and panfish. Waterfowl make limited use of this lake. A Town of Wausaukee boat landing provides public access with parking. Two dwellings are located on the shoreline. Submergent and floating vegetation are present over most of the littoral zone.

Wolf Lake, WBIC: 614200

Wolf Lake is a 78.69-acre hard water drainage lake having slightly alkaline, light brown water of high transparency. The littoral zone is 90 percent marl and 10 percent muck. The shoreline is 70 percent wetland, consisting primarily of shrub bog, and 30 percent upland of hardwoods and conifers. The known fish population consists of northern pike, perch, largemouth bass and bluegill. Slake have been stocked, but apparently have not survived. Waterfowl make limited use of this lake. The Town of

Wausaukee provides public access with limited parking. Twenty-six dwellings are located on the shoreline. Wolf Creek and a channel from Lake 18-1 are inlets to this lake. The outlet flows to the Menominee River. Submergent aquatic vegetation is moderate in density, as are floating and emergent plants in some areas.

Trout Lake, WBIC: 592600

Trout Lake is a 10.39-acre hard water seepage lake. Historically, Trout Lake was slightly alkaline with light brown water of moderate transparency and a littoral zone composed 45 percent sand, 25 percent muck, 25 percent silt and 5 percent rubble. The shoreline was 60 percent coniferous bog wetland and 40 percent upland. Information is lacking on the fish population, but largemouth bass and panfish may be present. Waterfowl make limited use of this lake. Nearly 50 percent of the lake basin is less than 3 feet deep. Submergent aquatic plants are moderate in density in some areas.

Little Island Lake, WBIC: 615200

Little Island lake is a 9.56-acre hard water drainage lake. Historically, Little Island Lake was neutral with light brown water of moderate transparency and a littoral zone composed of 95 percent muck and 5 percent marl. The shoreline was 95 percent wetland of coniferous bog and 5 percent upland consisting of mixed hardwoods and conifers. Bluegill and forage species were observed.

Long Lake, WBIC: 587800

Long Land is a 54.85-acre soft water seepage lake. Historically, Long Lake was neutral with light brown water of moderate transparency. The littoral zone is 95 percent muck, 3 percent sand and 2 percent gravel. The shoreline is 80 percent upland, consisting of mixed hardwoods and conifers and 20 percent wetland marsh. The fish population includes largemouth bass, northern pike and probably panfish. Waterfowl make limited use of this lake. A Town of Wausaukee landing provides public access with parking. One dwelling is located on the shoreline. Emergent and submergent aquatic vegetation is moderate in density throughout the lake basin.

Morgan Lake, WBIC: 589300

Morgan Lake is a 93.22-acre hard water seepage lake. Historically, Morgan Lake was slightly alkaline with clear water of high transparency and a littoral zone composed of 45 percent sand, 40 percent silt, 8 percent muck, 5 percent rubble and 2 percent gravel. The shoreline was primarily upland (95 percent), consisting of mixed hardwoods and conifers and there is a small wetland area of open meadow. Fish species inhabiting this lake included largemouth bass, bluegill, black crappie, pumpkinseed and perch. Trout are also reported to be present. Waterfowl make limited use of this lake. There is no public access. Five dwellings are located on the shoreline. Approximately 30 percent of the lake basin is less than 3 feet deep. Submergent aquatic vegetation is dense throughout most of the lake basin.

Rector Lake, WBIC: 591100

Rector Lake is a 4.10-acre medium hard water seepage lake. Historically, Rector Lake had slightly acid with light brown water of high transparency and a littoral zone with 70 percent sand and the 30 percent muck. The shoreline was entirely upland, consisting of hardwoods and conifers. Information on the fish population is lacking; however, the lake may support a largemouth bass and panfish population.

Appendix C: Monitored Waters

STATION ID	STATION NAME	WBIC	WATERBODY NAME	EARLIEST FIELDWORK	LATEST FIELDWORK
383088	Menominee River at County Hwy JJ	609000	Menominee River	04/23/1980	04/18/2017
10040928	Twin Creek N of Twin Creek Rd	609900	Twin Creek	05/04/2013	04/14/2017
10032500	Wausaukee River at Hwy. C near Athelstan	611400	Wausaukee River	07/28/2016	10/03/2016
383127	Menominee River - S Channel 500' Below Ogden St L Bank	609000	Menominee River	08/02/1989	09/22/2016
10019102	Green Bay -- Red Arrow Park	20	Lake Michigan	10/01/1999	09/22/2016
10019988	Menominee River -- Boom Landing	609000	Menominee River	06/17/2009	08/19/2016
10003822	Wolf Lake	614200	Wolf Lake	07/27/1999	08/16/2016
10018990	Long Lake -- Access at End Of Public Access Point Rd	587800	Long Lake	07/15/2010	07/16/2016
10019126	Menominee River - Upper Scott Flowage -- Access at STH 180	609400	Upper Scott Flowage 4060	10/28/2009	06/03/2016
10009738	Menominee River- Wallace/Mcallister Bridge	609000	Menominee River	10/13/2011	08/31/2015
383150	Menominee River - South Channel At Bridge	609000	Menominee River	06/18/1992	08/19/2015
10003648	Lost Lake	587900	Lost Lake	09/26/1994	08/01/2015
10003662	Menomin R - 30 Grand Rpd Flow	610700	Grand Rapids Flowage	05/04/1994	08/01/2015
10003665	Upper Scott Flowage	609400	Upper Scott Flowage 4060	09/17/2003	08/01/2015
10003791	Morgan Lake	589300	Morgan Lake	04/29/1999	08/01/2015
10003824	Fence Lake	614600	Fence Lake	07/27/1999	08/01/2015
10003825	Grass Lake	614800	Grass Lake	07/27/1999	08/01/2015
10003826	Island Lake	614900	Island Lake	09/08/2000	08/01/2015
10036742	Coulter Slough	609600	Coulter Slough	06/24/2010	08/01/2015
10012732	Lower Scott Flowage	609200	Scott Flowage	06/26/1991	08/01/2015
10018344	Menominee River -- Hwy JJ Access	609000	Menominee River	05/05/2005	07/17/2015
10019110	Menominee River -- Bear Point Access - STH 180	609000	Menominee River	07/28/2010	07/17/2015
10019111	Menominee River -- Access at Hiatt Rd	609000	Menominee River	07/22/2004	07/17/2015
383016	Menominee River - USH 41 Marinette	609000	Menominee River	10/31/2011	01/01/2015
10041789	Wolf Creek DS of bridge crossing at Pike River Rd	613900	Wolf Creek	05/21/2014	01/01/2015
10042718	Wolf Creek 15m US Keating Rd	613900	Wolf Creek	09/24/2014	09/24/2014
10042719	Wolf Creek 10m US Naragon Rd	613900	Wolf Creek	08/13/2014	09/24/2014
10042952	Wolf Creek 350m DS Lubka Rd	613900	Wolf Creek	08/13/2014	09/24/2014
10042953	Wolf Creek 115m DS Island Lake Rd	613900	Wolf Creek	09/24/2014	09/24/2014

STATION ID	STATION NAME	WBIC	WATERBODY NAME	EARLIEST FIELDWORK	LATEST FIELDWORK
10042954	Holmes Creek 30m US Pike River Rd	615400	Holmes Creek	09/03/2014	09/24/2014
10003783	Little Mccall Lake	587600	Little McCall Lake	07/27/1999	09/23/2014
10003790	Moose Lake	589200	Moose Lake	07/27/1999	09/23/2014
10003792	Mud Lake	589500	Mud Lake	07/27/1999	09/23/2014
10003798	Trout Lake	592600	Trout Lake	07/27/1999	09/23/2014
10003799	Unnamed Lake (T34 R21E S18)	593000	Unnamed	07/27/1999	09/23/2014
10003816	Mccall Lake	611300	McCall Lake	07/27/1999	09/23/2014
10003817	Helen Lake	611800	Helen Lake	07/27/1999	09/23/2014
10003818	Cedar Lake	612000	Cedar Lake	07/27/1999	09/23/2014
10022266	Long Lake	587800	Long Lake	09/17/2003	09/14/2014
10037445	Menominee River US Ogden St Bridge	609000	Menominee River	06/13/2012	08/27/2014
10042584	Menominee River 0.6mi W of Hwy 180 (NE of Marinette)	609000	Menominee River	08/18/2014	08/18/2014
10020121	Menominee River -- Access at STH 180	609000	Menominee River	07/28/2010	05/29/2013
10037555	Unnamed US Grand Rapids Road	610550	Unnamed	06/05/2012	09/25/2012
383097	Wolf Lake - Deepest Part	614200	Wolf Lake	10/20/1980	09/10/2012
10038248	Wolf Lake Nearshore Site	614200	Wolf Lake	09/10/2012	09/10/2012
10037345	Menominee River 750 ft Downstream of USH 41	609000	Menominee River	07/26/2005	09/05/2012
10003821	Birch Lake	614100	Birch Lake	07/27/1999	09/07/2011
10003828	Little Island Lake	615200	Little Island Lake	07/27/1999	09/07/2011
10033195	Wright Slough	609500	Wright Slough	09/09/2009	09/07/2011
384012	Scott Flowage - Center	609400	Upper Scott Flowage 4060	07/17/1979	08/31/2011
10003823	Little Wolf Lake	614500	Little Wolf Lake	07/27/1999	08/29/2011

Appendix D: Watershed Report¹

WBIC	Waterbody Name	Start Mile	End Mile	Current Use	Attainable Use	Supporting Attainable Use	Designated Use	Impairments	Sources	Assessment	Impaired Water Status
70	Green Bay (Wi-Menominee Aoc)	0	6.43	WWSF	WWSF	Not Supporting	Default FAL	Contaminated Sediment	NA	Monitored	Pollutant Removed, 303d Listed
70	Green Bay (Gl Shoreline)	0	8.94	WWSF	WWSF	Supporting	Default FAL	NA	NA	Monitored	303d Listed
583500	University Creek	0	1.77	FAL	FAL	Not Assessed	Default FAL	NA	NA	Not Assessed	NA
587600	Little Mccall Lake	0	8.85	Small	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
587800	Long Lake	0	57	Shallow Seepage	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
587900	Lost Lake	0	40	Deep Seepage	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
589200	Moose Lake	0	16.22	Deep Seepage	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
589300	Morgan Lake	0	83	Deep Seepage	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
589500	Mud Lake	0	18.19	Shallow Seepage	FAL	Not Assessed	Default FAL	NA	NA	No Assessment	NA
591100	Rector Lake	0	4.1	Small	FAL	Fully Supporting	Default FAL	NA	NA	No Assessment	NA
592600	Trout Lake	0	10.39	Deep Seepage	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
609000	Menominee River	0	3.45	WWSF	WWSF	Not Supporting	Default FAL	Contaminated Sediment	NA	Monitored	303d Listed

WBIC	Waterbody Name	Start Mile	End Mile	Current Use	Attainable Use	Supporting Attainable Use	Designated Use	Impairments	Sources	Assessment	Impaired Water Status
609000	Menominee River	3.45	43.02	WWSF	WWSF	Not Assessed	Default FAL	NA	NA	Monitored	Pollutant Removed, 303d Listed
609000	Menominee River	43.21	87.8	WWSF	WWSF	Not Assessed	Default FAL	NA	NA	Monitored	Pollutant Removed, 303d Listed
609400	Scott Flowage, Upper	0	124.48	Shallow Lowland	FAL	Fully Supporting	Default FAL	NA	NA	No Assessment	NA
609500	Wright Slough	0	23.24	FAL	FAL	Not Assessed	Default FAL	NA	NA	Evaluated: Modeled Data	NA
609600	Coulter Slough	0	1.45	FAL	FAL	Not Assessed	Default FAL	NA	NA	Not Assessed	NA
609900	Twin Creek	0	8	FAL	Cold	Not Assessed	Default FAL	NA	NA	No Assessment	NA
610550	Local Water	0	5.02	FAL	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
610700	Grand Rapids Flowage (Imp)	0	259	Shallow Lowland	FAL	Not Assessed	Default FAL	NA	NA	No Assessment	NA
610900	Poch De Noch Lake	0	30.69	Shallow Headwater	FAL	Not Assessed	Default FAL	NA	NA	No Assessment	NA
611100	Little Poch De Noch Lake	0	1.91	Small	FAL	Not Assessed	Default FAL	NA	NA	No Assessment	NA

WBIC	Waterbody Name	Start Mile	End Mile	Current Use	Attainable Use	Supporting Attainable Use	Designated Use	Impairments	Sources	Assessment	Impaired Water Status
611200	Mccall Creek	0	3	FAL	WWFF	Fully Supporting	Default FAL	NA	NA	No Assessment	NA
611300	Mccall Lake	0	20.74	Deep Headwater	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
611400	Wausaukee River	0	5.55	Cold (Class II Trout)	Cold (Class II Trout)	Supporting	Cold	NA	NA	Monitored	NA
611400	Wausaukee River	5.55	27.31	Cold (Class I Trout)	Cold (Class I Trout)	Not Assessed	Cold	NA	NA	No Assessment	NA
611400	Wausaukee River	27.32	29.01	Cold (Class II Trout)	Cold (Class II Trout)	Not Assessed	Cold	NA	NA	No Assessment	NA
611500	Little Wausaukee River	0	9	Cold (Class I Trout)	Cold (Class I Trout)	Fully Supporting	Cold	NA	NA	Monitored	NA
611500	Little Wausaukee Creek (Extension)	9	11	FAL	FAL	Not Assessed	Default FAL	NA	NA	No Assessment	NA
611800	Helen Lake	0	6.16	Small	FAL	Supporting	Default FAL	NA	NA	Not Assessed	NA
611900	Cedar Creek	0	0.58	FAL	FAL	Not Assessed	Cold	NA	NA	No Assessment	NA
612000	Cedar Lake	0	20	Small	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
612200	Wausaukee Lake	0	5.9	Small	FAL	Supporting	Default FAL	NA	NA	Not Assessed	NA

WBIC	Waterbody Name	Start Mile	End Mile	Current Use	Attainable Use	Supporting Attainable Use	Designated Use	Impairments	Sources	Assessment	Impaired Water Status
612300	Coldwater Brook	0	2	Cold (Class I Trout)	Cold (Class I Trout)	Not Assessed	Cold	NA	NA	No Assessment	NA
612700	Heubler Creek	0	2	Cold (Class I Trout)	Cold (Class I Trout)	Not Assessed	Cold	NA	NA	No Assessment	NA
612800	Heubler Lake	0	2.64	Small	FAL	Not Assessed	Default FAL	NA	NA	No Assessment	NA
613900	Wolf Creek	0	11	FAL	WWSF	Fully Supporting	Default FAL	NA	NA	Monitored	NA
614000	Local Water	0	2.9	FAL	FAL	Not Assessed	Default FAL	NA	NA	Not Assessed	NA
614100	Birch Lake	0	17.33	Deep Lowland	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
614200	Wolf Lake	0	73	Deep Lowland	FAL	Fully Supporting	Default FAL	NA	NA	Monitored	NA
614500	Little Wolf Lake	0	7.5	Small	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
614600	Fence Lake	0	16.98	Deep Lowland	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
614800	Grass Lake	0	43	Deep Headwater	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
614900	Island Lake	0	81	Deep Headwater	FAL	Supporting	Default FAL	NA	NA	Monitored	NA
615200	Little Island Lake	0	9.56	Small	FAL	Supporting	Default FAL	NA	NA	Monitored	NA

WBIC	Waterbody Name	Start Mile	End Mile	Current Use	Attainable Use	Supporting Attainable Use	Designated Use	Impairments	Sources	Assessment	Impaired Water Status
615400	Holmes Creek	0	1.69	Cold (Class II Trout)	Cold (Class II Trout)	Not Assessed	Cold	NA	NA	No Assessment	NA
615400	Holmes Creek	1.69	11.27	Cold (Class I Trout)	Cold (Class I Trout)	Not Assessed	Cold	NA	NA	No Assessment	NA
615500	Cedarville Creek	3.24	7.65	Cold (Class I Trout)	Cold (Class I Trout)	Fully Supporting	Cold	NA	NA	No Assessment	NA
3000631	Tessmer Pond	0	1.15	FAL	FAL	Not Assessed	Default FAL	NA	NA	Not Assessed	NA

ⁱ 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.