Wisconsin Department of Natural Resources Water Resources South District

Yahara Watershed Improvement Network (WINS) Adaptive Management Project

2017-2019 Status Report

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As part of the Yahara WINS Adaptive Management Project, the department agreed to conduct monitoring of the Yahara River and tributaries within the Yahara Watershed. Such monitoring could be used to evaluate the contemporary condition of respective stream segments within the watershed. Fourteen sites have been evaluated over the past 3 years (Table 1). The Yahara River at Windsor was chosen as a reference site to be surveyed annually so that annual variability could be considered for sampling conducted at various sites in subsequent years. One site, the Yahara River at the Bollig property north of STH 19 was evaluated 2 years in a row to determine the effects before/after removal of a concrete machine crossing.

Methods

The fisheries assemblage was determined by electroshocking a section of stream with a minimum station length of 35 times the mean stream width (Lyons, 1992). A stream tow barge with a generator and two probes was used at all sites. 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. Quantitative or qualitative habitat surveys (Simonson, et. al., 1994) were performed at all sites. Macroinvertebrate samples were obtained at a subset of sites by kick sampling and collecting bugs using a D-frame net in fall of each year and sent to the University of Wisconsin-Stevens Point for analysis. It should be noted that the trend site on the Yahara River at Windsor Road was not sampled in 2018 due to high water.

Results

A summary of the fisheries and habitat assessments can be found in Tables 2 and 3 respectively. A full list of fish collected can be found in the appendix. Macroinvertebrate data that was available at the time of this report can be found in Table 4.

The Wisconsin Streams Model (Lyons, 2008) predicted the stream segments to be cool transitional waters. A natural community verification process developed by Lyons (2015) showed the fishery assemblage to vary between cold transitional (cool-cold) and warm transitional (cool-warm) depending on segment. Therefore, the coolwater index of biotic integrity (IBI) developed by Lyons (2012) was applied to the sites based on the

community verification. For instance, if the stream segment verified as cold transitional (cool-cold), then the cool-cold IBI would be used to determine fishery health.

For macroinvertebrate samples, the wadable macroinvertebrate IBI (Weigel, 2009) and Hilsenhoff Biotic Index (HBI) (Hilsenhoff, 1987) was applied to the data.

Discussion

Comparison between streams is difficult because they don't directly connect with one another and they represent different sizes and thermal categories of waters. However, comparison and analysis between sites on the same stream is possible. It should be kept in mind that these sites may only represent a small segment of these larger systems, and the goal of this project was not to determine the overall health of each stream or the watershed.

Six Mile Creek

Six Mile Creek was assessed at 2 sites in 2017. The Wisconsin Streams Model (Lyons, 2008) shows the creek to vary between cold transitional (cool-cold) and warm transitional (cool-warm) for much of its length. The upper site at STH 113 was modeled to be a warm transitional (cool-warm) mainstem as it flows through Waunakee Marsh and this modeled community extends down to just downstream of South Division Street in Waunakee. The fishery at STH 113 appeared to verify the model prediction as there was an assemblage of warm transitional and warm water species. Most of the predominant species are tolerant to low dissolved oxygen concentrations and/or habitat disturbance. This species assemblage is common to streams that flow through channelized stream corridors and/or wetland complexes. The high organic content of wetland soils tends to cause dissolved oxygen demand. The cool-warm IBI for this section was 40, or "fair", owing to the presence of a variety of species, but most of them being tolerant.

Once in the Village of Waunakee, the gradient increases and the stream velocity is higher. The model shows this section to be a cold-transitional (cool-cold) stream. Indeed, mottled sculpin, a coldwater indicator species, become much more prevalent. This is likely the result of colder water temperatures because of better flow, but also more abundant rock and cobble substrate which this species prefers. White sucker and creek chub remained as predominant species. The fishery assemblage does not verify out directly as cool-cold or cool-warm. However, the presence of large numbers of sculpin indicates this section most closely resembles a cool-cold regime. Therefore, the cool-cold IBI is applied and shows a 70, or excellent, assemblage – most likely buoyed by the presence of large numbers of mottled sculpin.

The habitat assessment for these 2 sections showed an overall rating of "good" for both sections. A quantitative assessment was done on the site at STH 113 and a qualitative assessment done at Mill Road. While the 2 methods are not directly comparable, they do show that the overall habitat is similar. Both sites have excellent buffers, good width-to-depth ratios, and little bank erosion. Neither site has pools. The STH 113 site has higher

soft sediment and fewer riffles, but it does have more bends and slightly higher fish cover than the Mill Road site.

The macroinvertebrates showed a similar representation as the fish and for the same reasons. The MIBI at STH 113 was "poor", while it was "fair" at Mill Road. The HBI was also reflected the significant organic load coming out of the marsh with a "fairly poor" rating at STH 113.

Yahara River

The Yahara River is modeled to be warm transitional (cool-warm) for its entire length. However, the river contains species representing cold, warm, and transitional thermal regimes. Because it is a major tributary to Lake Mendota, there are several species that are more predominant in the lake, such as walleye and largemouth bass, which tend to find their way up the Yahara and become part of the species assemblage as well. The Yahara River was assessed at Windsor Road and upstream of STH 19. The Windsor Road site is being used as a reference site to track natural variation in biological and physical metrics. While the goal is to monitor this site on an annual basis, staff were unable to sample in 2018 due to high water. The STH 19 site was located upstream of a concrete farm crossing on a farm owned by the Bollig family. This crossing contained 2 culvert tubes but acted much like a dam in that it backed up water for several hundred meters upstream. The result was a trapping of sediment in this same area. Dane County has recently taken ownership of the property. The site was assessed in summer 2017, and later that year the crossing was removed. The site was re-assessed in 2018 to compare fish and habitat.

The species assemblage for both sites did not verify out as cold transitional or warm transitional. However, the predominance of mottled sculpin at both sites, along with the presence of several specimens of brown trout, suggests that the Yahara River trends more toward cold transitional than warm transitional.

The reference site at Windsor Road contained a diversity of species, with mottled sculpin being predominant. There was a dramatic difference in the number of white suckers found between 2017 and 2019, with 2019 being considerably lower. There were also fewer game species found. Overall IBI scores were very similar, with both years rating as "excellent".

While maintaining a "good" rating for habitat, the overall habitat score decreased 15 points, losing points for bank erosion as well as fish habitat. This may just be an artifact of not sampling in exactly the same points, but annual sampling will reveal if it is a trend.

Macroinvertebrates showed no major changes between 2017 and 2018. The MIBI was "fair" for both years and the HBI was "good" to "very good" indicating little organic loading.

At the STH 19 (Bollig property), biologists were somewhat puzzled by the lack of

numbers and variety of fish found in this section in 2017, particularly given the amount of fish cover. There was an increase in numbers of fish and species diversity in the 2018 survey. The reason for this cannot be explained as the habitat metrics were almost identical pre- and postcrossing removal. Because of the natural stream narrowing which occurred, it was assumed there would be increased velocity, resulting in a decrease in fine sediments. Based on measurements taken, this did not occur. While the area experienced some high flows, the gradient of this stretch is not particularly high and may require more time for sediment mobilization.

Macroinvertebrate quality did not change pre- and post- crossing removal. This is not surprising as the macroinvertebrates are more indicative of water quality. The MIBI score was "fair" and similar to the score at Windsor Road. The HBI was "fair" indicating some organic loading.



Yahara River (Bollig Property) - Before



Yahara River (Bollig Property) - After

Badfish Creek

Badfish Creek was assessed at six sites in southern Dane County and Rock County from 2017 to 2019. It is modeled to be a warm transitional (cool-warm) mainstem throughout this length. The fish assemblage confirmed this to be the case and while most species were from the transitional or warm thermal regime, most sites contained several brown trout. These trout presumably migrated out of Rutland (Anthony) Branch or Spring Creek which are both coldwater tributaries to Badfish Creek and managed for trout.

The upper half of Badfish Creek, specifically upstream of East Leedle Mill Road near the Dane-Rock County border has been hydrologically modified (channelized). The sites at Old Stage and Old Stone fall within this area. In this channelized section, the banks are high and have many eroded areas. The channel is U-shaped with fallen trees providing most of the cover. Downstream from here, the river retains much of its normal meander pattern as it makes its way through a well buffered wetland and wooded corridor. It also retains a typical riffle/run/pool pattern. Sedimentation (silt) is low in all



sections, with the bottom substrate mostly gravel and sand with rubble/cobble and occasional boulders in riffles.

Fish surveys showed a variety of non-game and game species. Shocking and capture efficiency were somewhat hampered by the high conductivity of the stream as well as elevated flows and velocity which were the result high rainfall in 2018 and 2019. Overall, IBI scores ranged from 50 (good) to 90 (excellent). The lowest scores were where tolerant species and omnivores, namely white sucker, were predominant. Some scores were also depressed by a lack of benthic invertivores in the lower sections.

Interestingly, the most prevalent game species were channel catfish and brown trout which make up opposite ends of the thermal spectrum. As noted earlier, the brown trout are probably migrants from Rutland (Anthony) Branch and Spring Creek that find their way into Badfish Creek and are able to tolerate the moderately warmer temperatures, at least for certain parts of the year. More traditionally, Badfish Creek is made up of species that are common to the Yahara River system and generally represent transitional or warm thermal regimes. Some of these species inevitably migrate in and out of the Yahara River as conditions warrant. The quality of the fishery was likely a reflection of the quality of the habitat. The large stream quantitative and qualitative habitat surveys showed most sections to have adequate cover, good bottom substrate, and good overall depth. The lower sections run through an area of wet meadows with little riparian disturbance and good flow/gradient to maximize scour. With the exception of the Old Stage Road site, all overall habitat scores were "good" to "excellent".

Water quality is impacted by the 30 million gallons per day of effluent from the Madison Metropolitan Sewerage District at the headwaters of the creek. It is on the state's 303(d) list of impaired waters because of excessive phosphorus that exceeds the 0.075 mg/l criteria. Excessive macrophyte and algal growth was noted at several sites. The creek is also on the list because of historic PCB concentrations in fish which initiated a fish consumption advisory. For this project, several specimens of channel catfish were

submitted for tissue analysis to determine contemporary PCB levels in fish flesh. The results of this testing were not available at this time.

Dorn Creek

Dorn Creek is a 5.5-mile-long tributary to Six Mile Creek which flows into Lake Mendota. In 2017 and 2018, a section of the creek was the initial site for the Dane County Legacy phosphorus removal project known as "Suck the Muck". Soft sediment was removed from a 2.3-mile stretch of the creek between CTH M and CTH K by hydraulic dredging.

Dorn Creek is modeled to transition from a cold transitional (cold-cool) to a warm transitional (cool-warm) system within the dredged area. The fishery of this system has been a modest assemblage of cool transitional and warmwater species, most of which are tolerant to lower water and/or habitat quality. The stream was surveyed at 3 sites since 2014: CTH K, CTH Q and between CTH M and CTH Q. The site upstream of CTH K is different from the sections downstream of CTH K in that it is higher gradient, and thus a coarser bottom. It was not dredged. The latter 2 sites were within the boundaries of the section dredged. Warm transitional IBIs for all sites prior to dredging were considered "poor". After sediment removal, the section between CTH M and CTH Q could not be re-surveyed because the stream was now too deep for wading.



A survey was conducted upstream of CTH Q. While species diversity and overall fish numbers increased after

dredging, the IBI remained poor as the fish assemblage was dominated by white suckers and creek chubs which made up 93% of the total number of fish collected. A quantitative habitat survey found this section of stream to be lacking in riffles, pools and hard substrate. The dredging removed only the silt that had accumulated, but not the hardpan of clay underneath. This lack of hard substrate is likely a natural condition considering the stream runs through a low gradient wetland complex where organic matter is the main substrate. The clay is likely from historic runoff from upstream farm fields that has compressed into the hardpan that exists today.

While the section between CTH M and CTH Q was not assessed, this project restored the natural meandering stream thread which will improve the habitat for fish. The project also re-established a connection to the wetland for fish species such as northern pike which migrate out of Lake Mendota to spawn in the wetland vegetation.

Token Creek

This spring-fed trout stream is the primary tributary to the upper Yahara River, providing significant base flow for the Yahara River and Lake Mendota (40 to 50 percent). Intense

agricultural practices along with expanding urban growth has contributed sediment and nutrients to the stream. The stream is listed as a Class III trout stream from STH 51 to Token Creek Drive and a Class II trout stream from Token Creek Drive to an unnamed tributary (WBIC 5033839) northwest of Sun Prairie. This same section is listed on the state's 303(d) list. Specifically, it deals with the impairments caused by sedimentation and a TMDL has been written for the sediment impairment.

A major dam on the creek once created a 44-acre millpond. In 1992 this dam partially failed, and the millpond became a shallow- to deep-water marsh. At least two significant springs and numerous seeps have been identified in the area formerly covered by the millpond. These springs are identified by two major tributaries rising to form clearly defined wetland/stream tracts that lead to the creek. Biologists believe that preserving the springs is essential for maintaining the existing brown trout fishery and establishing a brook trout fishery. The millpond, as previously maintained, absorbed the cold water springs, which heated the water and impacted the creek's fishery and water quality. WDNR recognized the potential of restoring the millpond area to a natural cold water stream corridor surrounded by good quality wetlands. In partnership with the town of Windsor, Dane County, local conservation groups and residents, WDNR purchased 69 acres of the Token Creek Millpond area for \$1 million. The Token Creek Millpond dam

was removed and restored to a brook trout fishery. The stream is buffered by wetlands that have developed since the dam failed.

The section between STH 51 and Token Creek Lane was part of the Dane County Legacy Phosphorus removal project known as "Suck the Muck". In 2019, sediment was removed from this section.

The section upstream of the project was evaluated in 2019. Based on the data, the stream appears to represent its modeled natural community of cold transitional (cold-cool) and as a trout water. Mottled sculpin, a



coldwater indicator species, dominated the fishery assemblage and brown trout were common. The cool transitional IBI was "excellent", and the overall habitat score was 63 ("good") with plentiful cover for fish.

Summary and conclusions

Overall, the sampling of these admittedly limited number of sites showed the sections on these tributaries to be relatively healthy, both from a fishery and habitat perspective. The variety of species indicates most of these systems to be diverse, transitional streams. This does not mean that all sections of these streams of the Yahara watershed are in the same condition. As part of the adaptive management process, sites in the watershed with lower water and habitat quality will have to be identified and managers will need to determine if rehabilitation efforts are both feasible and cost effective to enhance the environment of these streams overall.

Fish tend to respond well to good habitat in deference to water quality unless the perturbations are extreme. While not all the macroinvertebrate data has been returned, the data show "fair" water quality at most sites. Macroinvertebrates can be more sensitive to water quality and nutrient loading. Additional analysis will be conducted once all the data is available.

Station Name	Swims Station Id	Year
Sixmile Creek at STH 113	10010967	2017
Sixmile Creek at Mill Road	10010966	2017
Yahara River at Sth 19 (Bollig)	133039	2017
YAHARA RIVER - UPSTREAM OF WINDSOR RD.	10012028	2017
Badfish Creek - Casey Road	10012601	2017
Badfish Creek at Old Stage Rd	10016544	2018
Badfish Creek at STH 138	10051559	2018
Badfish Creek at Riley Road	10029969	2018
Yahara River at Sth 19 (Bollig)	133039	2018
Dorn Creek at CTH Q	133065	2019
YAHARA RIVER - UPSTREAM OF WINDSOR RD.	10012028	2019
TOKEN CREEK - UPSTREAM OF COUNTY PARK	10011992	2019
Badfish Creek at Old Stone Road	10052818	2019
Badfish Creek at Sth 59 Bridge	543057	2019

 Table 1: Sites for the Yahara River Watershed Adaptive Management Project

Badfish Creek	Year	Modeled NC	Verified NC	CC IBI	CW IBI
Old Stone Road	2019	CWMS	CWMS		50 (Good)
Old Stage Rd	2018	CWMS	CWMS*		90 (Excellent)
STH 138	2018	CWMS	CWMS		70 (Excellent)
Riley Road	2018	CWMS	CWMS		50 (Good)
Sth 59 Bridge	2019	CWMS	CWMS*		70 (Excellent)
Casey Road	2017	CWMS	CWMS		60 (Good)
Yahara River					
Upstream of Windsor Rd.	2017	CWMS	CCMS	80 (Excellent)	
Upstream of Windsor Rd.	2019	CWMS	CCMS*	90 (Excellent)	
Sth 19 (Bollig)	2017	CWMS	ССНЖ	90 (Excellent)	
Sth 19 (Bollig)	2018	CWMS	CCMS*	100 (Excellent)	
Dorn Creek					
CTH Q	2019	CCHW	CWMS		20 (Poor)
Token Creek					
Upstream of County Park	2019	CCMS	CCMS*	80 (Excellent)	
Sixmile Creek					
Upstream STH 113	2017	CWMS	CWMS		40 (Fair)
Upstream Mill Road	2017	CCMS	ССНЖ	70 (Excellent)	
* Does not fit community model ex	actly:bestp	professional jud	gement applie	d	
CC = Cold transitional (cold-cod		HW = Headw			
CW = Warm transitional (cool-v	warm)		MS = Mainst		

Table 2: Fish Assemblage, Modeled and Verified Natural Community and IBI

Table 3: Habitat Surveys of Waters for the 2017 Yahara River Adaptive Management Project Small Streams (< 10 m) Quantitative Habitat Rating</td>

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		C 1	Mean	Buffer	Maria Baal	F		0(De el	Width		Riffle	RR	Bend		04 F iles	% Fine	04 51 -1	% Fish	Habitat
Station Name	Sample Date	Stream Width (m)	Burrer Width	Score	Frosion (m)	Score	% Pool	% POOI	Batio	VV/D Ratio	Ratio	Score	Bena	Score	% Fine	Score	% FISH	Score	(Rating)
Yahara River- Unstream of Windsor Rd	14-Aug-2017	7 23	10	15	0.2	3 10	7 9	7 (117	9 1	10 2	2 10	6 29	15	29 70	- JCOIC	5 17 1	11	15 70 (Good)
Yahara River Unstream STH 19 (Bollig)	29-Aug-2017	/ .2.5	10) 15	0.2	2 10) (1 8.8	7 1	0 10.2		11 24	10	86.89	, , , , , , , , , , , , , , , , , , ,	0 14 7	71	10 55 (Good)
SIXMILE CREEK Linstream STH 113	29-Aug-2017	6 19	10) 15	(10	9:	3 (0.0 72	8 1	0 (6.02	15	72 7	, c	0 94 (18	15 70 (Good)
Yahara River Unstream STH 19 (Bollig)	08/01/2018	77	/ 10) 15	0.26	5 10) (11.4	4 1	0 (15.97		89.2	, (0 16 (12	15 55 (Good)
Dorn Creek AT CTH O BRIDGE	09/06/2019	3.3	3 10) 15	0.3	2 10	4.2	3 (0 6.9	4 1	0 38.78	3 (18.89	5	100	$\overline{\mathbf{b}}$	0 45.8	34	15 55 (Good)
Yahara River- Upstream of Windsor Rd.	08/26/2019	6.9	9 10) 15	0.58	3 5	2.48	3 (0.5	8 1	0 11.6	5 10) 7.75	15	37.08	3	5	6	5 55 (Good)
	00/20/2015	0.5			0.50	-			10.5	-		-	, ,,,,,		5/100			-	5 55 (6664)
Large Streams (> 10 m) Quantitative Habitat Ra	ating		L.										1				-		
													Ανσ				1		
				Mean								%	Deep	Max					
				Bank		Riff Rif	f Bend				%	Rocky	Water	Thalweg					
		Stream	Mean Bank	Stab	Riffle Riffle	Ratio	Bend	Bend Bend	% Fish	% Fish Cove	r Rockv	Sub	Depth	Depth	Habitat Score				
Station Name	Sample Date	Width (m)	Stab Perc	Score	Ratio	Score	Ratio	Ratio Score	Cover	Score	Sub	Score	(m)	Score	(Rating)				
Badfish Creek - Casey Road	28-Aug-17	17.49	45.42	12	6.9	5 12	14.8	1 8	3 19.2	5 2	5 66.46	5 25	5 1.06	16	90 (Excellent)				
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Small Stream Qualitative Habitat Rating		•	÷		•	·				·		•	·	°	•	<u>, 10</u>	<u></u>		
							Riffle									1			
			Riparian	Bank		Width	Riffle	Fine	Fish	Habitat									
		Stream	Buffer	Erosion	Pool Area	Depth	Ratio	Sediments	Cover	Score									
Station Name	Sample Date	Width (m)	Score	Score	Score	Score	Score	Score	Score	(Rating)									
Sixmile Creek - Upstream of Mill Rd	11-Aug-17	7	/ 15	5 5	; (0 10) .	5 10	0 1	0 55 (Good)									
Token Creek - Uptream of County Park	11-Sep-19	9	8 15	5 10) :	3 10) 10) (0 1	5 63 (Good)									
Badfish Creek at Old Stage Rd	19-Sep-18	s g	15	5 5	; (0 10) () 10	0	5 45 (Fair)									
-																			
Large Stream Qualitative Habitat																			
					Maximum	Riffle													
				Bank	Thalweg	Riffle	Rocky												
		Stream	Stream	Stability	Depth	Ratio	Substrate	Fish Cover	Hab										
Station Name		Width (m)	Depth (m)	Score	Score	Score	Score	Score	Score	Hab Status									
Badfish Creek at Old Stone Road	29-Aug-19	14	0.8	3 4	10	5 () 25	5 25	5 7	0 Good									
Badfish Creek at STH 138	19-Sep-18	13	0.75	5 8	2	5 8	3 16	5 16	5 7	3 Good									
Badfish Creek at Riley Road	19-Sep-18	16	5 0.8	3 4	10	5 8	3 25	5 16	5 6	9 Good									
Badfish Creek at Sth 59 Bridge	29-Aug-19	14	0.7	7 4	25	5 8	3 25	5 25	5 8	7 Excellent									

 Table 4: Macroinvertebrate Data for Streams in the Yahara River Watershed

Station Name	Start Date/Time	MIBI (Rating)	HBI (Rating)
Badfish Creek - Old Stage Rd	10/17/2018 0:00	3.37 (Fair)	5.71 (Fair)
Station Name	Start Date/Time	MIBI (Rating)	HBI (Rating)
Yahara River - Sth 19 (before dam removal)	11/21/2017 0:00	4.45 (Fair)	6.28 (Fair)
Yahara River - Sth 19 (after dam removal)	10/17/2018 0:00	4.19 (Fair)	6.39 (Fair)
Station Name	Start Date/Time	MIBI (Rating)	HBI (Rating)
Yahara River - Windsor Rd	11/21/2017 0:00	3.47 (Fair)	4.66 (Good)
Yahara River - Windsor Rd Yahara River - Windsor Rd	11/21/2017 0:00 10/17/2018 0:00	3.47 (Fair) 4.20 (Fair)	4.66 (Good) 4.0 (Very Good)
Yahara River - Windsor Rd Yahara River - Windsor Rd	11/21/2017 0:00 10/17/2018 0:00	3.47 (Fair) 4.20 (Fair)	4.66 (Good) 4.0 (Very Good)
Yahara River - Windsor Rd Yahara River - Windsor Rd Station Name	11/21/2017 0:00 10/17/2018 0:00 Start Date/Time	3.47 (Fair) 4.20 (Fair) MIBI (Rating)	4.66 (Good) 4.0 (Very Good) HBI (Rating)
Yahara River - Windsor Rd Yahara River - Windsor Rd Station Name Sixmile Creek at Sth 113	11/21/2017 0:00 10/17/2018 0:00 Start Date/Time 11/21/2017 0:00	3.47 (Fair) 4.20 (Fair) MIBI (Rating) 1.73 (Poor)	4.66 (Good) 4.0 (Very Good) HBI (Rating) 6.99 (Fairly Poor)

References:

- 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. 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. 2015. Methodology for Using Field Data to Identify and Correct Wisconsin Stream "Natural Community" Misclassifications. Version 5. May 29, 2015.
- 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.

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Station Name	Sample Date	Species	Number	Length (in)	Modeled NC	Verified NC	CC IBI	CW IBI
Sixmile Creek at STH 113	11-Aug-17	LARGEMOUTH BASS	2	1.9-3.2	CWMS	CWMS		40 (Fair)
Sixmile Creek at STH 113	11-Aug-17	BLUEGILL	12	3.4 - 4.1	L			
Sixmile Creek at STH 113	11-Aug-17	WHITE SUCKER	76	-				
Sixmile Creek at STH 113	11-Aug-17	COMMON CARP	2	-				
Sixmile Creek at STH 113	11-Aug-17	CREEK CHUB	54	-				
Sixmile Creek at STH 113	11-Aug-17	GREEN SUNFISH	10	-				
Sixmile Creek at STH 113	11-Aug-17	MOTTLED SCULPIN	1	-				
Sixmile Creek at STH 113	11-Aug-17	GOLDEN SHINER	13	-				
Sixmile Creek at STH 113	11-Aug-17	CENTRAL STONEROLLER	3	-				
Sixmile Creek at STH 113	11-Aug-17	YELLOW BULLHEAD	3	-				
Sixmile Creek at STH 113	11-Aug-17	BLACK BULLHEAD	3	-				
Sixmile Creek - Unstream of Mill Rd	11-Aug-17	BLUEGILI	23	23-67		сснw	70 (Excellent)	
Sixmile Creek - Upstream of Mill Rd	11-Aug-17	LARGEMOUTH BASS	1	1 2 - 18 5	5		, o (Excernency	
Sixmile Creek - Unstream of Mill Rd	11-Aug-17		78	112 1013				
Sixmile Creek - Upstream of Mill Rd	11-Aug-17		90					
Sixmile Creek - Opstream of Mill Pd	11-Aug-17		50					
Sixmile Creek - Upstream of Mill Rd	11-Aug-17		140					
Sixinite Creek - Opstream of Will Ru	11-Aug-17		140		·			
Sixmile Creek - Upstream of Mill Rd	11-Aug-17	GREEN SUNFISH	65					
Sixmile Creek - Upstream of Mill Rd	11-Aug-17	LOGPERCH	2	-				
Sixmile Creek - Upstream of Mill Rd	11-Aug-17	GOLDEN SHINER	1	-	•			
Sixmile Creek - Upstream of Mill Rd	11-Aug-17	COMMON CARP	2	-	•			
Sixmile Creek - Upstream of Mill Rd	11-Aug-17	BLACK BULLHEAD	1	-				
Sixmile Creek - Upstream of Mill Rd	11-Aug-17	BLUNTNOSE MINNOW	39	-				
Sixmile Creek - Upstream of Mill Rd	11-Aug-17	CENTRAL STONEROLLER	8					
Vahara River - Unstream of Windsor Rd	14-Διισ-17	MOTTLED SCULPIN	142		CWMS	CCMS	80 (Excellent)	1
Vahara River Unstream of Windsor Rd	14 Aug 17		166		evins	cents	oo (Execution)	
Vahara River - Upstream of Windsor Rd.	14-Aug-17		100					
Yahara River - Upstream of Windsor Rd.	14-Aug-17		2					
ranara River - Opstream of Windsor Ru.	14-Aug-17		2		·			
Yahara River - Opstream of Windsor Rd.	14-Aug-17		20	-	•			
Yanara River - Upstream of Windsor Rd.	14-Aug-17		10					
Yanara River - Upstream of Windsor Rd.	14-Aug-17		2					
Yanara River - Upstream of Windsor Rd.	14-Aug-17	FRESHWATER DRUM	8					
Yahara River - Upstream of Windsor Rd.	14-Aug-17	GREEN SUNFISH	17	-	•			
Yahara River - Upstream of Windsor Rd.	14-Aug-17	HORNYHEAD CHUB	40	-	•			
Yahara River - Upstream of Windsor Rd.	14-Aug-17	COMMON SHINER	51	-	•			
Yahara River - Upstream of Windsor Rd.	14-Aug-17	CREEK CHUB	33	-	•			
Yahara River - Upstream of Windsor Rd.	14-Aug-17	WALLEYE	12	11.0 - 13.1	L			
Yahara River - Upstream of Windsor Rd.	14-Aug-17	BROWN TROUT	6	3.5 - 20.4	1			
Yahara River - Upstream of Windsor Rd.	14-Aug-17	BLUEGILL	5	3.4 - 4.9	9			
Yahara River - Upstream of Windsor Rd.	14-Aug-17	LARGEMOUTH BASS	6	2.6 - 4.0)			
Yahara River - Upstream of Windsor Rd.	26-Aug-19	CENTRAL MUDMINNOW	1	-	CWMS	CCMS*	90 (Excellent)	
Yahara River - Upstream of Windsor Rd.	26-Aug-19	HORNYHEAD CHUB	1	-				
Yahara River - Upstream of Windsor Rd.	26-Aug-19	GOLDEN SHINER	3	-				
Yahara River - Upstream of Windsor Rd.	26-Aug-19	COMMON SHINER	3	-				
Yahara River - Upstream of Windsor Rd.	26-Aug-19	BLUNTNOSE MINNOW	16	-				
Yahara River - Upstream of Windsor Rd.	26-Aug-19	FATHEAD MINNOW	4	-				
Yahara River - Upstream of Windsor Rd.	26-Aug-19	CREEK CHUB	8	-				
Yahara River - Upstream of Windsor Rd.	26-Aug-19	WHITE SUCKER	11	-				
Yahara River - Upstream of Windsor Rd	26-Aug-19	BLACK BULLHEAD	1	-	1		1	
Yahara River - Upstream of Windsor Rd.	26-Aug-19	BROOK SILVERSIDE	2	-			1	-
Yahara River - Upstream of Windsor Rd	26-Aug-19	GREEN SUNFISH	22	-				
Yahara River - Unstream of Windsor Pd	26-Aug-10	BILIEGILI	27	21-20	3			
Vahara River - Unstream of Windsor Pd	20-Aug-19		2/	2.1-3.5			-	
Vahara River - Unstream of Windsor Pd	20-Aug-19	GREEN SUNEISU V DUUECUU	1	2.0-0.3	,		-	
Vahara River - Upstream of Windsor Ru.	20-Aug-19	CANTAL DARTER	1	-				
ranara River - Upstream of Windsor Rd.	26-Aug-19		8	-				
ranara River - Upstream of Windsor Rd.	26-Aug-19		7					
Yanara River - Upstream of Windsor Rd.	26-Aug-19	YELLOW PERCH	1	5.7	/			
ranara River - Upstream of Windsor Rd.	26-Aug-19	LUGPERCH	1	-				
Yahara River - Upstream of Windsor Rd.	26-Aug-19	MOTTLED SCULPIN	144	-				

Appendix: Fish Data for Yahara River Adaptive Management Project

Appendix (continued):

Station Name	Sample Date	Species	Number	Length (in)	Modeled NC	Verified NC	CC IBI	CW IBI
Yahara River at Sth 19 (Bollig)	11-Aug-17	LARGEMOUTH BASS	9	1.7 - 17.3	CWMS	CCHW	90 (Excellent)	
Yahara River at Sth 19 (Bollig)	11-Aug-17	BLUEGILL	1	4.2				
Yahara River at Sth 19 (Bollig)	11-Aug-17	MOTTLED SCULPIN	109	-				
Yahara River at Sth 19 (Bollig)	11-Aug-17	FRESHWATER DRUM	3	-				
Yahara River at Sth 19 (Bollig)	11-Aug-17	LOGPERCH	3	-				
Yahara River at Sth 19 (Bollig)	11-Aug-17	COMMON SHINER	10	-				
Yahara River at Sth 19 (Bollig)	11-Aug-17	FATHEAD MINNOW	1	-				
Yahara River at Sth 19 (Bollig)	11-Aug-17	GREEN SUNFISH	39	-				
Yahara River at Sth 19 (Bollig)	11-Aug-17	HORNYHEAD CHUB	3	-				
Yahara River at Sth 19 (Bollig)	11-Aug-17	CENTRAL MUDMINNOW	13	-				
Yahara River at Sth 19 (Bollig)	11-Aug-17	CREEK CHUB	5	-				
Yahara River at Sth 19 (Bollig)	11-Aug-17	WHITE SUCKER	8	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	MOTTLED SCULPIN	104	-	CWMS	CCMS*	100 (Excellent)	
Yahara River at Sth 19 (Bollig)	01-Aug-18	WHITE SUCKER	51	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	FRESHWATER DRUM	2	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	COMMON SHINER	22	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	BLUNTNOSE MINNOW	14	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	HORNYHEAD CHUB	20	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	SPOTFIN SHINER	1	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	LOGPERCH	9	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	JOHNNY DARTER	27	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	FATHEAD MINNOW	10	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	GREEN SUNFISH	7	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	CENTRAL MUDMINNOW	3	-				
Yahara River at Sth 19 (Bollig)	01-Aug-18	BROWN TROUT	1	17.2				
Yahara River at Sth 19 (Bollig)	01-Aug-18	LARGEMOUTH BASS	9	2.4 - 4.4				
Yahara River at Sth 19 (Bollig)	01-Aug-18	SMALLMOUTH BASS	2	2.7 - 3.3				
Yahara River at Sth 19 (Bollig)	01-Aug-18	BLACK CRAPPIE	1	1.9				
Yahara River at Sth 19 (Bollig)	01-Aug-18	BLUEGILL	14	1.7 - 4.0				

Appendix (continued)

Station Name	Sample Date	Species	Number	Length (in)	Modeled NC	Verified NC	CC IBI	CW IBI
Badfish Creek at Old Stone Road	29-Aug-19	WHITE SUCKER	60	-	CWMS	CWMS		50 (Good)
Badfish Creek at Old Stone Road	29-Aug-19	NORTHERN HOG SUCKER	12	-				
Badfish Creek at Old Stone Road	29-Aug-19	HORNYHEAD CHUB	17	-				
Badfish Creek at Old Stone Road	29-Aug-19	COMMON CARP	2	-				
Badfish Creek at Old Stone Road	29-Aug-19	COMMON SHINER	10	-				
Badfish Creek at Old Stone Road	29-Aug-19	WESTERN BLACKNOSE DACE	8	-				
Badfish Creek at Old Stone Road	29-Aug-19	FATHEAD MINNOW	6	-				
Badfish Creek at Old Stone Road	29-Aug-19	YELLOW BULLHEAD	1	-				
Badfish Creek at Old Stone Road	29-Aug-19	SPOTEIN SHINER	1	-				
Badfish Creek at Old Stone Road	29-Aug-19	BROWN TROUT	5	8.5 - 17.5				
Badfish Creek at Old Stone Boad	29-Aug-19	NORTHERN PIKE	1	23.7				
Badfish Creek at Old Stone Road	29-Aug-19	WALLEYE	1	14.2				
Badfish Creek at Old Stone Road	29-Aug-19	LARGEMOLITH BASS	1	22				
Badfish Creek at Old Stone Road	20 Aug 10		6	-				
baufish creek at old stolle hoad	23-Aug-13	CREEK CHOB	0					
Radfich Crook at Old Stago Rd	10 Cop 19	CHANNEL CATEISH	7	14 2 10 1	CIA/BAS	C14/84C*		00 (Evcallant)
Badfish Creek at Old Stage Rd	19-Sep-18		10	14.5 - 16.1	CVVIVIS	CVVIVIS		90 (Excellent)
Badfish Creek at Old Stage Ru	19-3ep-18		10	10.2 15 4				
Badfish Creek at Old Stage Rd	19-Sep-18		5	10.5 - 15.4				
Baufish Creek at Old Stage Ru	19-3ep-18		5	-				
Badfish Creek at Old Stage Rd	19-Sep-18		8	-				
Badfish Creek at Old Stage Rd	19-Sep-18	HORNYHEAD CHUB	2	-				
Badfish Creek at Old Stage Rd	19-Sep-18	NORTHERN HOG SUCKER	3	-				
Badfish Creek at Old Stage Rd	19-Sep-18	GREEN SUNFISH	16	-				
Badfish Creek at Old Stage Rd	19-Sep-18	MOTILED SCULPIN	6	-				
Badfish Creek at Old Stage Rd	19-Sep-18	CREEK CHUB	1	-				
Badfish Creek at Old Stage Rd	19-Sep-18	JOHNNY DARTER	3	-				
Badfish Creek at STH 138	19-Sep-18	BROWN TROUT	5	12.1 - 15.7	CWMS	CWMS		70 (Excellent)
Badfish Creek at STH 138	19-Sep-18	BLUEGILL	5	2 - 2.22				
Badfish Creek at STH 138	19-Sep-18	CHANNEL CATFISH	1	15.3				
Badfish Creek at STH 138	19-Sep-18	WHITE SUCKER	28	-				
Badfish Creek at STH 138	19-Sep-18	NORTHERN HOG SUCKER	9	-				
Badfish Creek at STH 138	19-Sep-18	SPOTFIN SHINER	1	-				
Badfish Creek at STH 138	19-Sep-18	COMMON SHINER	8	-				
Badfish Creek at STH 138	19-Sep-18	EMERALD SHINER	6	-				
Badfish Creek at STH 138	19-Sep-18	HORNYHEAD CHUB	20	-				
Badfish Creek at STH 138	19-Sep-18	WESTERN BLACKNOSE DACE	13	-				
Badfish Creek at STH 138	19-Sep-18	CREEK CHUB	2	-				
Badfish Creek at STH 138	19-Sep-18	GREEN SUNFISH	1	-				
Badfish Creek at STH 138	19-Sep-18	JOHNNY DARTER	4	-				
Badfish Creek at Riley Road	19-Sep-18	CHANNEL CATFISH	11	16.0 - 17.5	CWMS	CWMS		50 (Good)
Badfish Creek at Riley Road	19-Sep-18	WALLEYE	1	7.9				
Badfish Creek at Riley Road	19-Sep-18	ROCK BASS	1	5.2				
Badfish Creek at Riley Road	19-Sep-18	BLUEGILL	5	2.0 - 3.0				
Badfish Creek at Riley Road	19-Sep-18	LARGEMOUTH BASS	1	3.3				
Badfish Creek at Riley Road	19-Sep-18	WHITE SLICKER	32	-				
Badfish Creek at Riley Road	19-Sep-18	ERESHWATER DRUM	52					
Badfish Creek at Riley Road	10 Sop 10		0					
Badfish Creek at Riley Road	19-Sep-18		2					
Badfish Creek at Riley Road	10 Cop 18							
Badfish Crook at Bilov Boad	19-Sep-18	WESTERN BLACKNOSE DACE	1	-				
Badiish Creek at Riley Road	19-3ep-18		2	-				
Badfish Creek at Riley Road	19-Sep-18	EIVIERALD SHINER	2	-				
Badfish Creek at Riley Road	19-Sep-18	COMMON SHINER	10	-				
Badfish Creek at Riley Road	19-Sep-18	GREEN SUNFISH	1	-				
Badfish Creek at Riley Road	19-Sep-18	CENTRAL MUDMINNOW	1	-				
Badfish Creek at Riley Road	19-Sep-18	BLUN INOSE MINNOW	1	-				
Badfish Creek at Riley Road	19-Sep-18	JOHNNY DARTER	2	-				
	20.5		· · · ·		C) 1 /2 /C	0140 KG +		70 (7 11 1
Badfish Creek at Sth 59 Bridge	29-Aug-19	WHITE SUCKER	6	-	CWMS	CWMS*		70 (Excellent)
Badtish Creek at Sth 59 Bridge	29-Aug-19	NURTHERN HOG SUCKER	10	-				
Badfish Creek at Sth 59 Bridge	29-Aug-19	LARGEMOUTH BASS	1	2.7				
Badfish Creek at Sth 59 Bridge	29-Aug-19	BANDED DARTER	9	-				
Badfish Creek at Sth 59 Bridge	29-Aug-19	HORNYHEAD CHUB	8	-				
Badfish Creek at Sth 59 Bridge	29-Aug-19	WESTERN BLACKNOSE DACE	11	-				
Badfish Creek at Sth 59 Bridge	29-Aug-19	COMMON SHINER	2	-				
Badfish Creek at Sth 59 Bridge	29-Aug-19	EMERALD SHINER	1	-				
Badfish Creek at Sth 59 Bridge	29-Aug-19	SPOTFIN SHINER	3	-				
Badfish Creek at Sth 59 Bridge	29-Aug-19	CHANNEL CATFISH	1	16.8 - 17.8				
Badfish Creek - Casey Road	28-Aug-17	CHANNEL CATFISH	13	15.3 - 18.2	CWMS	CWMS		60 (Good)
Badfish Creek - Casey Road	28-Aug-17	BROWN TROUT	8	8.6 - 15.2				
Badfish Creek - Casey Road	28-Aug-17	WALLEYE	2	13.9 - 14.0				
Badfish Creek - Casey Road	28-Aug-17	SAUGER	1	13.2				
Badfish Creek - Casey Road	28-Aug-17	PUMPKINSEED	1	6				
Badfish Creek - Casey Road	28-Aug-17	BLUEGILL	5	5.7 - 6.4				
Badfish Creek - Casey Road	28-Aug-17	NORTHERN HOG SUCKER	15	-				
Badfish Creek - Casey Road	28-Aug-17	WHITE SUCKER	40	-				
Badfish Creek - Casey Road	28-Aug-17	CREEK CHUB	3	-				
Badfish Creek - Casev Road	28-Aug-17	HORNYHEAD CHUB	23	-				
Badfish Creek - Casev Road	28-Aug-17	WESTERN BLACKNOSE DACE	17	-				
Badfish Creek - Casev Road	28-Aug-17	EMERALD SHINFR	25	-				
Badfish Creek - Casey Road	28-Δ110-17	COMMON SHINER	10	-				
Badfish Creek - Casey Road	28-Δ110-17	SPOTEIN SHINER	5	-				
Badfish Creek - Casey Road	28-Δ110-17	BANDED DARTER	2	-				
coscy hour	20 108 17	EN	_	-				

Appendix (continued):

Station Name	Sample Date	Species	Number	Length (in)	Modeled NC	Verified NC	CC IBI	CW IBI
Token Creek - Upstream of County Park	11-Sep-19	BROWN TROUT	13	4.0 - 20.1	CCMS	CCMS*	80 (Excellent)	
Token Creek - Upstream of County Park	11-Sep-19	BLUEGILL	9	2.4 - 4.1				
Token Creek - Upstream of County Park	11-Sep-19	MOTTLED SCULPIN	130	-				
Token Creek - Upstream of County Park	11-Sep-19	WHITE SUCKER	41	-				
Token Creek - Upstream of County Park	11-Sep-19	GREEN SUNFISH	5	-				
Token Creek - Upstream of County Park	11-Sep-19	BROOK STICKLEBACK	2	-				
Token Creek - Upstream of County Park	11-Sep-19	FATHEAD MINNOW	1	-				
Spring (Dorn) Creek at CTH Q	06-Sep-19	WHITE SUCKER	285	-	CCHW	CWMS		20 (Poor)
Spring (Dorn) Creek at CTH Q	06-Sep-19	CREEK CHUB	48	-				
Spring (Dorn) Creek at CTH Q	06-Sep-19	CENTRAL MUDMINNOW	3	-				
Spring (Dorn) Creek at CTH Q	06-Sep-19	MOTTLED SCULPIN	3	-				
Spring (Dorn) Creek at CTH Q	06-Sep-19	BROOK STICKLEBACK	2	-				
Spring (Dorn) Creek at CTH Q	06-Sep-19	PEARL DACE	1	-				
Spring (Dorn) Creek at CTH Q	06-Sep-19	BLUNTNOSE MINNOW	7	-				
Spring (Dorn) Creek at CTH Q	06-Sep-19	GOLDEN SHINER	3	-				
Spring (Dorn) Creek at CTH Q	06-Sep-19	LARGEMOUTH BASS	5	2.5 - 3.3				