MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER RESOURCES DIVISION
NOVEMBER 2016

STAFF REPORT

A BIOLOGICAL SURVEY OF THE KALAMAZOO RIVER WATERSHED ALLEGAN, BARRY, CALHOUN, EATON, HILLSDALE, JACKSON, KALAMAZOO, AND VAN BUREN COUNTIES, MICHIGAN JUNE-SEPTEMBER 2014

INTRODUCTION

Objective

Qualitative biological surveys of the Kalamazoo River watershed (Hydrologic Unit Code 04050003) were conducted by staff of the Michigan Department of Environmental Quality (MDEQ), Surface Water Assessment Section (SWAS), during June-September 2014. The surveys were performed according to the SWAS Procedure 51 (wadeable sites) (MDEQ, 1990; Creal et al., 1996) or Procedure 22 (nonwadeable sites) (MDEQ, 2013) at 24 (10 trend, 14 status) stations (Figure 1, Table 1), to characterize overall watershed status and trends.

In regards to targeted monitoring, Procedure 51 aquatic macroinvertebrate community and habitat condition assessments were completed on Portage Creek upstream and downstream of the former Performance Paper Mills site and within the newly created channel of Portage Creek. These data will provide information regarding the water quality of Portage Creek, the improvements since remediation at the Performance Paper Mills site, and pre-data for the Alcott Dam removal.

There were seven targeted monitoring requests from the MDEQ, Permits Section, biologists for National Pollutant Discharge Elimination System (NPDES) related monitoring in the Kalamazoo River watershed. Each request involves visual as well as Procedure 51 assessments at locations upstream and downstream of a Wastewater Treatment Plant (WWTP) (Battle Creek, Charlotte, Gun Lake, Kalamazoo, Marshall, and Plainwell WWTPs). The Battle Creek, Kalamazoo, Marshall, and Plainwell sites could not be sampled due to accessibility issues.

Janelle Hohm, Kalamazoo District Office, MDEQ, requested the Procedure 51 assessment of Arcadia Creek and Spring Brook. Arcadia Creek passes through Western Michigan University and has been a part of grant work for at least the past ten years to reduce phosphorus in line with the Lake Allegan Phosphorus Total Maximum Daily Load. The MDEQ, SWAS, had not previously collected Procedure 51 data from any stretch of Arcadia Creek. Spring Brook is a high quality trout stream that has riparian impacts due to residents mowing to the water's edge along the stream. Assessing the habitat and macroinvertebrates provided an update on the condition of the stream. In addition, there were six caged fish, Fish Contaminant Monitoring Program sites to assess remediation success in the Kalamazoo River and Portage Creek (Results available in separate Fish Contaminant Monitoring Report).

Background and Historical Sampling

The Kalamazoo River watershed is within the Southern Michigan Northern Indiana Till Plain (SMNITP) ecoregion (Omernik and Gallant, 1988). The SMNITP is characterized by lacustrine clay and silt soils, and historically white oak-white pine forest. The Kalamazoo River watershed is surrounded by forest, wetland, farmland, and commercial and residential properties. Historical contamination from paper mills and other industry continues to impact the watershed due to polychlorinated biphenyls (PCB) in the sediment. In 2010, the Enbridge Oil Spill occurred, contaminating Talmadge Creek and the Kalamazoo River with hundreds of thousands of gallons of crude oil near Marshall, Michigan, due to a ruptured pipeline.

Biological, chemical, and physical habitat conditions of the Kalamazoo River watershed were monitored at 45 sites by the MDEQ, Water Resources Division, in 2009 (Walterhouse, 2011) and at 6 sites in 2014 (Matousek, 2016). In 2009, macroinvertebrate ratings were acceptable (35), good (2) (nonwadeable sites), or excellent (8) and habitat ratings were marginal (9), good (25) (sampled under Procedure 22), or excellent (8) (habitat assessments were not completed at all sites). In 2014, Kalamazoo River watershed sites were sampled to monitor short-term and long-term effects of the 2010 Enbridge oil spill. Macroinvertebrate ratings were acceptable (5) or excellent (1) and habitat ratings were good (6). The yearly monitoring in oil-impacted areas has shown recovery of habitat and the macroinvertebrate community.

METHODS

Procedure 51 describes the methodology for macroinvertebrate and habitat surveys of wadeable streams, and was used to evaluate the stations. Procedure 51 rates macroinvertebrate communities as Poor (-9 to -5), Acceptable (-4 to +4), and Excellent (+5 to +9), based on the proportions of each taxa found, and the sensitivity of the community assemblage to water quality. Habitat was rated on a scale of Poor (<56), Marginal (56-104), Good (105-154), or Excellent (>154) based on in-stream and riparian characteristics and impairments.

Status, trend, and targeted sites were sampled to address specific areas of interest in the Kalamazoo River watershed. Procedure 51 was used to assess the macroinvertebrates and habitat at each targeted site. A target of 300 individual macroinvertebrates was counted at each site.

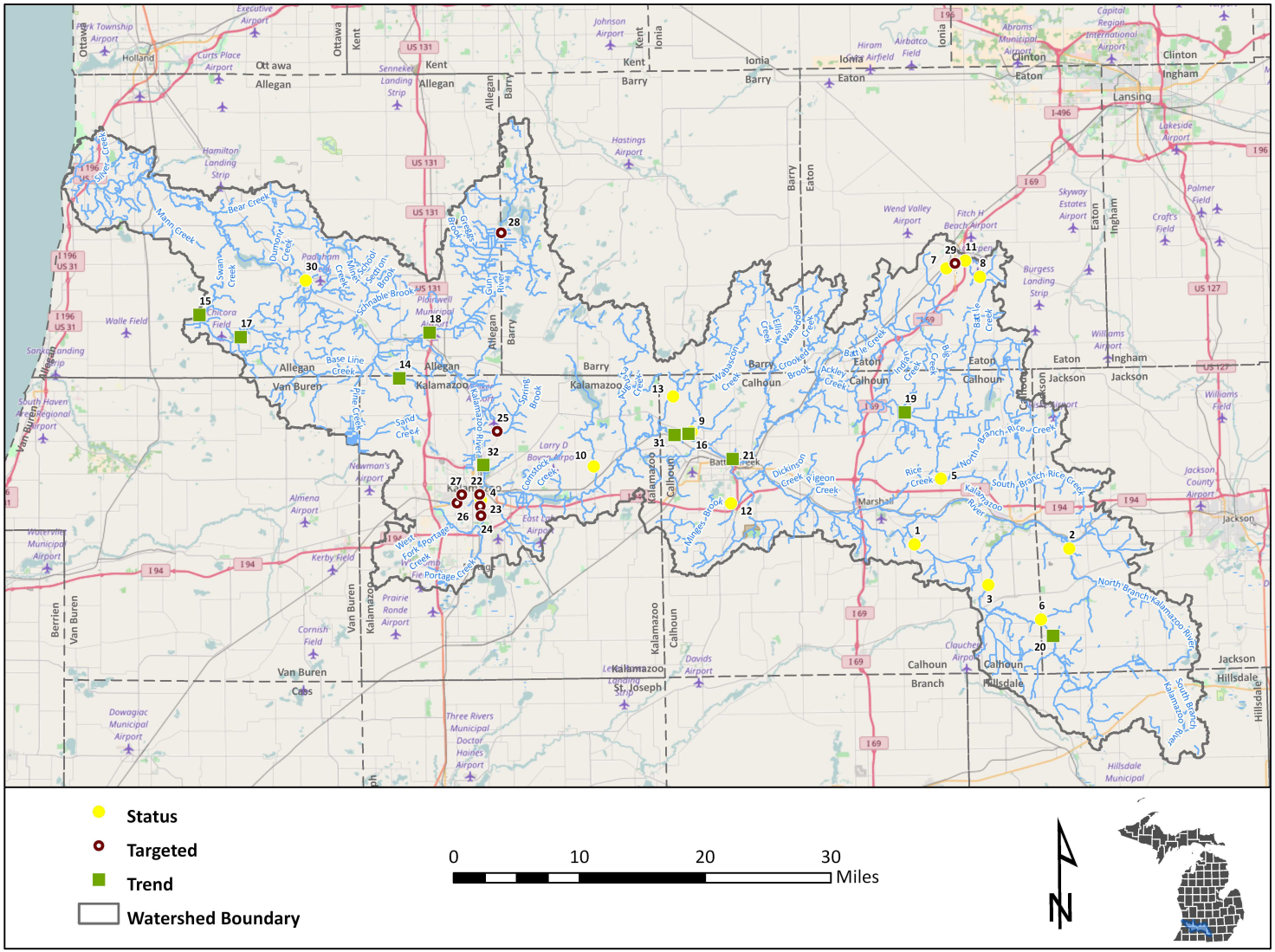

Figure 1. Status, Trend, and Targeted Sites in the Kalamazoo River Watershed.

Table 1. Status, Trend, and Targeted Sites in the Kalamazoo River Watershed.

Site ID	Water Body	Location	Latitude	Longitude	County	AUID	STORET	Sample Type	Status/Trend/Targeted
1	Wilder Creek	Homer Road	42.22177	-84.90504	Calhoun	040500030404-01	130413	Wadeable	Status
2	North Branch Kalamazoo River	King Road	42.21425	-84.66523	Jackson	040500030103-01	380489	Wadeable	Status
3	South Branch Kalamazoo River	J Drive South	42.17384	-84.79154	Calhoun	040500030206-02	130414	Wadeable	Status
4	Portage Creek	Stockbridge Avenue	42.27745	-85.57703	Kalamazoo	040500030603-02	390112	Wadeable	Status
5	Rice Creek	22 1/2 Mile Road	42.29702	-84.86264	Calhoun	040500030405-01	130333	Wadeable	Status
6	Swains Lake Drain	Van Wert Road	42.13320	-84.71066	Jackson	040500030204-03	380411	Wadeable	Status
7	Battle Creek River	Kalamo Road	42.53892	-84.84961	Eaton	040500030306-01	230047	Wadeable	Status
8	Battle Creek River	Brookfield Road	42.52860	-84.79756	Eaton	040500030306-01	230266	Wadeable	Status
9	Wabascon Creek	Cross Street	42.35412	-85.24907	Calhoun	040500030502-01	130415	Wadeable	Status
10	Gull Creek	37th Street	42.31535	-85.40146	Kalamazoo	040500030507-06	390194	Wadeable	Status
11	Battle Creek River	u/s I69	42.54750	-84.81997	Eaton	040500030306-01	230248	Wadeable	Status
12	Minges Brook	Riverside Drive	42.27147	-85.18882	Calhoun	040500030410-01	130401	Wadeable	Status
13	Seven Mile Creek	U Drive (Meachem Rd)	42.39510	-85.27715	Calhoun	040500030504-01	130404	Wadeable	Status
14	Unnamed Trib to Base Line Creek	Ravine Rd (16th St)	42.41803	-85.70289	Kalamazoo	040500030903-01	390606	Wadeable	Trend
15	Swan Creek	110th Ave	42.49151	-86.01357	Allegan	040500030908-04	030693	Wadeable	Trend
16	Wabascon Creek	M-89 (Michigan Ave)	42.35195	-85.25389	Calhoun	040500030502-01	130171	Wadeable	Trend
17	Swan Lake Drain	41st St	42.46591	-85.94946	Allegan	040500030908-04	030694	Wadeable	Trend
18	Gun River	11th St	42.47051	-85.65536	Allegan	040500030703-01	030691	Wadeable	Trend
19	State and Indian Creek	19 1/2 Mile Rd	42.37374	-84.91739	Calhoun	040500030304-01	130403	Wadeable	Trend
20	S B Kalamazoo River	Folks Rd	42.11417	-84.69231	Jackson	040500030204-04	380481	Wadeable	Trend
21	Battle Creek River	d/s Michigan Ave	42.32256	-85.18568	Calhoun	040500030312-02	130402	Wadeable	Trend
22	Portage Creek	Vine St	42.28403	-85.57887	Kalamazoo	040500030603-02	390111	Wadeable	Targeted
23	Portage Creek	Alcott St	42.27051	-85.57807	Kalamazoo	040500030603-02	390616	Wadeable	Targeted
24	Portage Creek	Cork St	42.2595	-85.5769	Kalamazoo	040500030603-02	390106	Wadeable	Targeted
25	Spring Brook	Riverview Dr	42.35653	-85.55107	Kalamazoo	040500030605-01	390619	Wadeable	Targeted
26	Arcadia Creek	Kalamazoo Christian High School	42.27423	-85.61403	Kalamazoo	040500030606-04	390617	Wadeable	Targeted
27	Arcadia Creek	Oliver St	42.28387	-85.60663	Kalamazoo	040500030606-04	390618	Wadeable	Targeted
28	Gun River via drainage ditch	d/s Gun Lake WWTP	42.58499	-85.54292	Barry	040500030702-NA	080295	Wadeable	Targeted
29	Battle Creek River	d/s Charlotte WWTP	42.54456	-84.83608	Eaton	040500030306-01	230191	Wadeable	Targeted
30	Kalamazoo River	Grand Street	42.53100	-85.84804	Allegan	040500030907-01	030715	Nonwadeable	Status
*31	Kalamazoo River	Custer Rd	42.35074	-85.27561	Calhoun	040500030508-01	130052	Wadeable	Trend
*32	Kalamazoo River	d/s Mosel Ave	42.31784	-85.57284	Kalamazoo	040500030606-01	390082	Wadeable	Trend
*Not Sampled Due to High Water Conditions									

RESULTS

Macroinvertebrate communities were sampled and scored using Procedure 51 for wadeable streams and Procedure 22 for nonwadeable sites (Tables 2A-2H, Tables 4A-B). Habitat was sampled in wadeable streams (Tables 3A-3G).

Status and Trend Sites

Kalamazoo River

North Branch of the Kalamazoo River at King Road (Station 2) scored Acceptable (2) for macroinvertebrates and Excellent (170) for habitat. This stretch included wetland vegetation buffers and forested vegetation buffers. One home located along the stretch had a lawn mowed to the water's edge, but this was a small portion of the reach. The substrate included plentiful cobble and gravel with visual observations of minnows and bluegills within the habitat. The primary taxa were amphipods.

South Branch of the Kalamazoo River at J Drive South (Station 3) scored Acceptable (1) for macroinvertebrates and Good (152) for habitat. The stretch included a park with a railcar, gravel ramp, and dock. The stretch had aquatic macrophytes along the edge and overhanging vegetation present. The substrate included gravel and sand in the center and silt depositional pockets along the edges. The dominant taxa was amphipods. Caddisflies and mayflies were present.

South Branch of the Kalamazoo River at Folks Road (Station 20) scored Acceptable (3) for macroinvertebrates and Excellent (165) for habitat. The stretch had mostly wetland grasses and shrubs as vegetative protection. The substrate consisted mostly of gravel with small amounts of sand. Undercut banks were prevalent along the banks as well as large woody debris. Muck substrate was located just upstream of Folks Road on the right bank. Pleurocerids were the dominant taxa with mayflies and caddisflies present.

Kalamazoo River at Grand Street (Station 30) was sampled under the nonwadeable procedure, (Procedure 22). The macroinvertebrates scored Poor (20) with corixids as the dominant taxa. Mayflies and caddisflies were present. This stretch of the Kalamazoo River was primarily sand with some snags and leaf packs.

Kalamazoo River at Custer Road (Station 31) and Kalamazoo River downstream of Mosel Avenue (Station 32) are wadeable trend sites that were not sampled due to high water conditions in 2014 and will be sampled again in 2019.

Battle Creek River

Battle Creek River at Kalamo Road (Station 7) scored Acceptable (1) for macroinvertebrates and Good (109) for habitat. This stretch had macrophytes present in the middle of the river. A field tile pipe into the river was located just upstream of Kalamo Road. The surrounding banks were all herbaceous. The stream substrate included equal amounts of cobble, gravel, and sand. The stretch also had freshwater sponges located on cobble and logs within the stretch. Downstream of Kalamo Road is a cow pasture that allows cows access to the stream but they are fenced off from other portions of the stream. Simuliids were the dominant taxa with mayflies and caddisflies present.

Battle Creek River at Brookfield Road (Station 8) scored Acceptable (-1) for macroinvertebrates and Good (120) for habitat. This stretch had a cattle pasture along the right bank with barbed

wire just upstream of Brookfield Road. The substrate was primarily sand with large woody debris and some boulders. The stretch had overhanging vegetation along the banks. The dominant taxa was amphipods with mayflies and caddisflies present.

Battle Creek River upstream of I-69 (Station 11) scored Acceptable (-1) for macroinvertebrates and Good (106) for habitat. This stretch was accessed via church property mowed to the water's edge on the right bank. There was some large woody debris, but not much cover or stable habitat. The river would be classified as a ditch with high banks at this portion with a silty and sandy bottom. The dominant taxa was corixids. Mayflies and caddisflies were present in the reach.

Battle Creek River downstream of Michigan Avenue (Station 21) scored Excellent (5) for macroinvertebrates and Good (116) for habitat. A walking bridge was located over the river within the reach. The stream has very swift flow making wading difficult. The river was sampled downstream of Michigan Avenue due to access issues and flow. The reach is all cobble substrate located in downtown Battle Creek with a river walk adjacent to the sampled river.

Wabascon Creek

Wabascon Creek at Cross Street (Station 9) scored Excellent (7) for macroinvertebrates and Good (140) for habitat. The stretch consisted of a large pool with logs across the stream upstream of the pooled area and sand below the pooled area. Brookside Park meets Wabascon Creek at Cross Street. The dominant taxa were baetids with a total of 25 taxa including mayflies, caddisflies, and stoneflies.

Wabascon Creek at M-89 (Michigan Avenue) (Station 16) scored Excellent (5) for macroinvertebrates and Good (125) for habitat. Homes line either side of the creek with canopies cleared near the residences and buffer strips removed. Throughout the rest of the reach substrate is primarily sand with gravel/cobble/sand. A riffle is present upstream of the bridge at M-89. Hydropsychids were the dominant taxa with all sensitive taxa present: mayflies, caddisflies, and stoneflies.

Additional Streams in the Watershed

Wilder Creek at Homer Road (Station 1) scored Acceptable (3) for macroinvertebrates and Good (121) for habitat. The site had large woody debris and overhanging vegetation. Old cement bridge abutments were located within the stretch. The substrate, sandy upstream of the abutments, turned into silt and then muck downstream of the abutments. The D Drive bridge was holding sediment from going downstream. Thirty-five taxa were counted in this reach with a dominance of amphipods.

Portage Creek at Stockbridge Avenue (Station 4) scored Acceptable (1) for macroinvertebrates and Good (120) for habitat. This stretch runs parallel to railroad tracks, has heavy cobble riffles, and cement filled bags as shoreline protection. Other portions of the reach had submerged logs and tree lined banks. Two dominant taxa include simuliids and hydropsychids. This stretch is downstream of Alcott Street and upstream of Vine Street. This stretch is a part of the new streambed created to restore Portage Creek due to PCB contamination.

Rice Creek at 22 1/2 Mile Road (Station 5) scored Acceptable (0) for macroinvertebrates and Good (105) for habitat. This stretch of creek has a tree lined buffer with a soy bean field along one side and a lawn mowed to the water's edge on the opposite bank. The substrate was silty along the agricultural field and included cobble along the mowed lawn edge. The creek

included snags down the center of the creek. The site included a total of 30 taxa with corixids as the dominant taxa. Caddisflies and mayflies were present in this reach.

Swains Lake Drain at Van Wert Road scored (Station 6) Acceptable (2) for macroinvertebrates and Good (118) for habitat. The stretch had a few trees across the stream with ample overhanging grasses. The banks were primarily wetland with standing water on the southern bank. The substrate was soft and silty. The stretch included 34 taxa with a dominance of calyopterygids. Caddisflies and mayflies were present.

Gull Creek at 37th Street (Station 10) scored Excellent (6) for macroinvertebrates and Excellent (167) for habitat. This creek had plentiful cobble substrate with large woody debris and tree lined banks. The site included all sensitive taxa: stoneflies, caddisflies, and mayflies. Thirty taxa were counted in this stretch. Amphipods were the dominant taxa.

Minges Brook at Riverside Drive (Station 12) scored Acceptable (3) for macroinvertebrates and Good (127) for habitat. This stretch had an artificial riffle placed within the stretch with a mix of sand, gravel, and silt substrate. Deep pools were present with slow moving water. The banks on each side were mowed to the water's edge along a portion and did not have much riparian vegetation. Chironomids was the dominant taxa. Mayflies and caddisflies were present.

Seven Mile Creek at U Drive (Meachem Road) (Station 13) scored Acceptable (3) for macroinvertebrates and Good (144) for habitat. This site is surrounded by wetlands making access to the creek difficult. The stretch was sampled downstream of Meachem Road due to silt up to hip height upstream of the road. Instream vegetation was present along with downed branches and trees. The substrate was very silty along the banks with sand and gravel in the middle of the creek. The dominant taxa were baetids with all sensitive taxa present: mayflies, caddisflies, and stoneflies.

Unnamed Tributary to Baseline Creek at Ravine Road (16th Avenue) (Station 14) also known as Franklin Drain scored Acceptable (-2) for macroinvertebrates and Marginal (89) for habitat. The drain runs through agricultural fields and disappears into a farm field downstream of Ravine Road. Access to the drain was provided by the driveway of a home with rain gardens and planted buffers. The drain has a sand bottom with small amounts of gravel/cobble/silt. Banks are exposed and sediment deposition is prevalent in the drain. Dominant taxa were amphipods with very few mayflies and caddisflies present.

Swan Creek at 110th Avenue (Station 15) scored Acceptable (1) for macroinvertebrates and Good (114) for habitat. Cobble was located upstream and downstream from the 110th Avenue bridge. Numerous trees were cut down to stumps with half of the banks covered with vegetation and half open. Areas of the reach were silted in where vegetative cover was absent. Amphipods were the dominant taxa with mayflies and caddisflies present.

Swan Lake Drain at 41st Street (Station 17) scored Acceptable (0) for macroinvertebrates and Marginal (88) for habitat. This stretch of the drain had eroded banks with sand depositional bars throughout. The banks are lined with some trees. Some large woody debris and overhanging vegetation are present. Downstream of 41st Street there was no cover, all vegetation cleared as a backyard of a home. Amphipods were the primary taxa with caddisflies and mayflies present.

Gun River at 11th Street (Station 18) scored Acceptable (-1) for macroinvertebrates and Good (151) for habitat. This stretch of river had mostly sand substrate, sporadic cobble, and plentiful

large woody debris of all sizes. This stretch had deep pools with variable pool sizes. The sampling location was adjacent to and upstream of the Conservation Club. The dominant taxa was hydropsychids with mayflies and caddisflies present.

State and Indian Creek at 19 1/2 Mile Road (Station 19) scored Acceptable (0) for macroinvertebrates and Marginal (92) for habitat. This stream reach lies in the middle of two agricultural fields. Some cobble was located along the banks of the stream with mostly reed canary grass along the banks. The substrate was primarily sand with some pockets of silt. The dominant taxa was elmids with mayflies and caddisflies present.

Targeted Sites

A survey of Portage Creek was conducted at Stations 22-24 (Vine, Alcott, and Cork Streets) to assess current conditions following dredging to remove PCBs and restoration of a new stream bed (Figure 2). Pre-data were collected in September 2009 at Cork and Vine Streets; pre-data was not available at Alcott Street since this is a new streambed. Post-data collection occurred in 2013 and 2014 to assess macroinvertebrate communities and available habitat at all three sites in the restored stretch of Portage Creek.

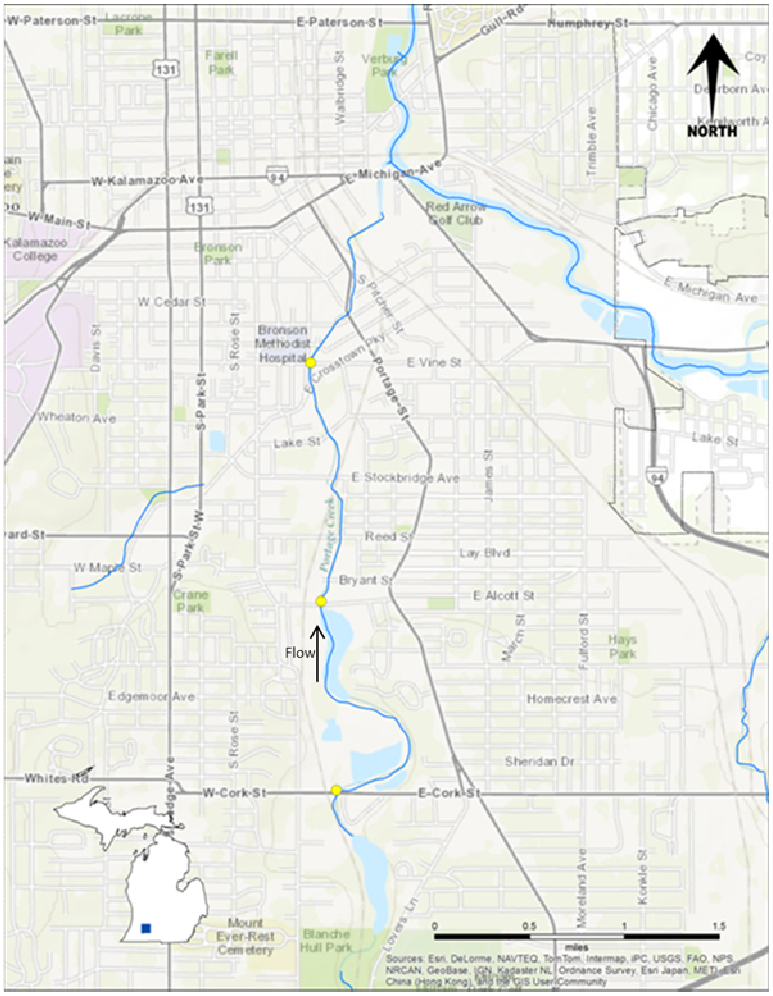

Figure 2. 2014 Sampling Locations on Portage Creek: (1) Vine Street; (2) Alcott Street; and (3) Cork Street.

The 2014 sampling resulted in the following rankings and scores for habitat: Vine Street, Marginal (89); Alcott Street, Good (146); and Cork Street, Excellent (160) (Table 5). The macroinvertebrate scores were: Vine Street, Acceptable (-1), Alcott Street, Acceptable (1), and Cork Street, Acceptable (2) (Table 5).

Spring Brook at Riverview Drive (Station 25) scored Acceptable (2) for macroinvertebrates and Marginal (93) for habitat. This site had lawn mowed to the water's edge on both sides, open canopy, and a primarily sand bottom with some pools containing large boulders and undercut banks. The dominant taxa was amphipods along with some mayflies and caddisflies.

Arcadia Creek at Kalamazoo Christian High School (Station 26) scored Poor (-5) for macroinvertebrates and Good (116) for habitat. The creek goes underground via a culvert along the edge of the high school football stadium with the stretch sampled downstream of the underground stretch. The underground stretch is having a negative impact on the creek. The area sampled is primarily sand and has banks stabilized with vegetation. Chironomids were the dominant taxa. A couple of mayflies were counted, but no caddisflies or stoneflies.

Arcadia Creek at Oliver Street (Station 27) scored Acceptable (-1) for macroinvertebrates and Good (136) for habitat. This stretch had aquatic vegetation stands, good vegetative buffer, and mostly a sand and gravel bottom. The dominant taxa were chironomids. Caddisflies and mayflies were found in this stretch of the creek.

Gun River via a drainage ditch downstream of the Gun Lake WWTP (Station 28) scored Poor (-6) for macroinvertebrates and Marginal (76) for habitat. The drainage ditch takes a 90-degree bend just downstream of the sampled stretch. The WWTP is upstream from the sampled reach, which lies in the middle of agricultural fields. The south bank of the channelized drainage ditch is steep. Cladophora is present in the middle of the channel at nuisance conditions. The dominant taxa are isopods, with only a total of 15 taxa present in the reach. Stoneflies, mayflies, and caddisflies were all absent from this reach.

Battle Creek River downstream of the Charlotte WWTP (Station 29) scored Excellent (5) for macroinvertebrates and Good (117) for habitat. This reach had historical channelization, a primarily sand substrate with small amounts of gravel, and habitat via leaf packs and large woody debris. An elevated pipe was located over the Battle Creek River parallel to Cochran Road. The dominant taxa were simuliids and hydropsychids. A total of 28 taxa were counted in the reach with caddisflies and mayflies present.

DISCUSSION

The Kalamazoo River watershed encompasses 534.5 miles of total stream length and 1737.7 square miles in watershed area with numerous types of water bodies. The Kalamazoo River sampling locations showed good macroinvertebrate communities and habitats. The one exception is the nonwadeable site sampled at Grand Street. Due to the sampling procedures of Procedure 22, the location of the random sampling site denotes where macroinvertebrate sampling occurs. This stretch would score higher if all available habitats were sampled as in Procedure 51 sampling procedures. Since primarily sand substrate was sampled, these locations did not produce the same macroinvertebrate diversity as multiple habitat types would have produced.

The Battle Creek River sites are all meeting water quality standards; however, impact is evident due to cattle access and the absence of stable habitat along the banks. The river would benefit

from excluding cattle from the river and allowing vegetation to grow along the banks of the stream.

Wabascon Creek scored excellent for macroinvertebrates at both sites. The creek has good water quality, excellent macroinvertebrate communities, and beneficial in-stream habitat. This creek will be important to conserve and protect. The greatest improvements to this creek to maintain water quality is to preserve the shoreline habitat at homes along the creek.

Gull Creek is a pristine system that provides excellent macroinvertebrate communities with all sensitive taxa present and excellent habitat with large woody debris and cobble. This creek will be important to protect and keep in its current condition.

Wilder Creek, Rice Creek, Swains Lake Drain, Minges Brook, Seven Mile Creek, Unnamed Tributary to Baseline Creek, Swan Creek, Swan Lake Drain, Gun River at 11th Street and State and Indian Creek are all meeting water quality standards.

Portage Creek at Vine Street scored at the lower end of Acceptable for habitat due to failing coir bundles, canopy removal, and poor riparian habitat overall. In addition, Vine Street lacks sinuosity and pool variability. The lack of habitat at Vine Street resulted in a lower end of Acceptable macroinvertebrate score. Alcott Street scored positively for habitat with stable banks, low embeddedness, and lack of flashiness. Alcott Street would benefit from canopy cover from trees and more variability of substrate beyond cobble. Macroinvertebrate communities scored well with a variety of mayflies and caddisflies. Cork Street had the highest score for habitat with stable banks, good epifaunal substrate, and good frequency of riffles. The highest habitat score related to the highest score for macroinvertebrates due to favorable substrate of cobble, low sediment deposition, and good bank stability. Portage Creek at Stockbridge Avenue was a status site sampled within the new streambed reach. The site is meeting water quality standards, but would benefit from improved shoreline protection and natural stable banks instead of cement filled bags.

Table 5. Comparison of Procedure 51 Habitat and Macroinvertebrate Scores During Three Sampling Seasons.

		2009				2013				2014			
		Habitat		Macroinvertebrate		Habitat		Macroinvertebrate		Habitat		Macroinvertebrate	
Water body	Location	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score
Portage Creek	Vine Street	Marginal	92	Acceptable	0	Good	111	Acceptable	-1	Marginal	89	Acceptable	-1
Portage Creek	Alcott Street	NA	NA	NA	NA	Excellent	155	Acceptable	2	Good	146	Acceptable	1
Portage Creek	Cork Street	Good	139	Acceptable	0	Excellent	164	Acceptable	1	Excellent	160	Acceptable	2

The rankings and scores of the habitat and macroinvertebrates have varied marginally from 2009 to 2014. The macroinvertebrate scores have consistently been at the Acceptable ranking. The macroinvertebrate scores have varied slightly from year to year, but have been steady and will take time for recolonization of macroinvertebrate communities due to the extensive work conducted within the stream to remove PCBs. The habitat scores have shown relatively consistent levels as well. Vine Street draws the most concern due to a nonexistent canopy and failing coir bundles, which could have helped the riparian habitat improve. Reinstallation of the coir bundles is highly recommended to improve the vegetation adjacent to and within the stream banks. Cork and Alcott Streets had very similar scores in 2013 and 2014. These stretches will continue to change with the removal of Alcott Dam. The Michigan Department of Natural Resources, Fisheries Division, proposes to continue a three-year study in Portage Creek to review fish movement and the connectivity created from removing Alcott Dam. The Fisheries Division completes habitat scoring with their fish studies that should be monitored to assure the riparian habitat improves over time.

Spring Brook at Riverview Drive would benefit from leaving a buffer strip on either side of the stream to decrease sediment inputs from the banks. In addition, planting trees along the banks would provide cover for the stream and allow a cooler temperature for this high quality trout stream.

Arcadia Creek at Oliver Street meets water quality standards with good macroinvertebrate and habitat scores; however, Arcadia Creek at Kalamazoo Christian High School scored Poor (-5) for macroinvertebrates. Improvements have been made to Arcadia Creek by running through a concrete channel instead of pipes through the downtown; however, Arcadia Creek still has areas that are underground between Stadium Drive and downtown. At the high school, the creek runs towards Howard Street, goes in between a parking lot and tennis courts, and then pools before going underground at Howard Street. The creek would benefit from being day lighted, decreasing impervious surfaces at the High School, and providing buffer strips to prevent runoff from rain events.

Gun River via a drainage ditch downstream of the Gun Lake WWTP scored Poor (-6) for macroinvertebrates and had a Marginal (76) habitat. This site is being affected by steep banks without buffer strips along the agricultural fields on each bank of the ditch. In addition, the sharp 90-degree turn in the water body is not providing appropriate flow conditions. The presence of Cladophora in the stream reach shows that nutrient levels are higher than in other areas of the watershed. Water chemistry sampling is recommended in 2019 to assess phosphorus conditions in the ditch.

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Table 2A. Qualitative macroinvertebrate sampling results for

	Wilder Creek	North Branch Kalamazoo River	South Branch Kalamazoo River	Portage Creek
	Homer Road	King Road	J Drive S	Stockbridge Avenue
	8/27/2014	8/27/2014	8/27/2014	9/3/2014
TAXA	STATION 1	STATION 2	STATION 3	STATION 4
PLATYHELMINTHES (flatworms)				
Turbellaria				30
ANNELIDA (segmented worms)				
Oligochaeta (worms)	2		1	1
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	40	82	151	50
Decapoda (crayfish)	2	1	1	1
Isopoda (sowbugs)	1			7
Arachnoidea				
Hydracarina	1		2	4
Insecta				
Ephemeroptera (mayflies)				
Baetidae	15	27	25	19
Caenidae		4		
Heptageniidae	7	6	1	1
Isonychiidae	1	5		
Siphlonuridae				1
Tricorythidae	2	12	3	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	4	1	1	
Corduliidae			1	
Gomphidae	1			
Zygoptera (damselflies)				
Calopterygidae	14	16	60	
Coenagrionidae	1		8	
Plecoptera (stoneflies)				
Perlidae		2		
Hemiptera (true bugs)				
Belostomatidae	2	1	4	
Corixidae	20		2	
Gerridae	7	48	1	
Mesoveliidae	1			
Nepidae	1	1	1	
Notonectidae	1			
Pleidae	27	2	5	
Veliidae	15	1	7	
Trichoptera (caddisflies)				
Brachycentridae	12		37	
Helicopsychidae		9	1	
Hydropsychidae	7		4	75
Leptoceridae	5	10	2	5
Limnephilidae	6	1		
Philopotamidae	2			9
Phryganeidae			3	
Coleoptera (beetles)				
Dytiscidae (total)	1		1	
Haliplidae (adults)	2			
Psephenidae (adults)		1	1	
Elmidae	4	13	5	12
Gyrinidae (larvae)	1			
Diptera (flies)				
Ceratopogonidae		2		
Chironomidae	26		15	4
Culicidae	3			
Dixidae	10	1	1	
Simuliidae	5	1	3	88
Tipulidae				1
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)			35	
Bithyniidae				4
Lymnaeidae		50	13	
Physidae	9	1	16	
Pelecypoda (bivalves)				
Corbiculidae		1	2	3
TOTAL INDIVIDUALS	258	299	413	315

	STATION 1		STATION 2		STATION 3		STATION 4	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	35	1	26	1	32	1	18	0
NUMBER OF MAYFLY TAXA	4	1	5	1	3	0	3	0
NUMBER OF CADDISFLY TAXA	5	1	3	0	5	1	3	0
NUMBER OF STONEFLY TAXA	0	-1	1	1	0	-1	0	-1
PERCENT MAYFLY COMP.	9.69	0	18.06	0	7.02	0	6.67	0
PERCENT CADDISFLY COMP.	12.40	0	6.69	0	11.38	0	28.25	0
PERCENT DOMINANT TAXON	15.50	1	27.42	0	36.56	0	27.94	0
PERCENT ISOPOD, SNAIL, LEE	3.88	1	17.06	-1	15.50	-1	3.49	1
PERCENT SURF. AIR BREATHE	31.01	-1	18.06	0	5.33	1	0.00	1
TOTAL SCORE		3		2		1		1
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 2B. Qualitative macroinvertebrate sampling results for

TAXA	Rice Creek 22 1/2 Mile Rd 8/27/2014 STATION 5	Swains Lake Drain Van Wert Rd 8/20/2014 STATION 6	Battle Creek River Kalamo Road - West 7/23/2014 STATION 7	Battle Creek River Brookfield Road 7/30/2014 STATION 8
PORIFERA (sponges)			1	
ANNELIDA (segmented worms)				
Hirudinea (leeches)		1		
Oligochaeta (worms)	8	2	3	6
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	25	33	21	76
Decapoda (crayfish)	4	2	11	14
Arachnoidea				
Hydracarina			5	
Insecta				
Ephemeroptera (mayflies)				
Baetidae		2	42	3
Caenidae		5		
Heptageniidae	20	2	1	1
Tricorythidae	1			
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	1	4		1
Corduliidae	1			
Gomphidae				1
Libellulidae		18		
Zygoptera (damselflies)				
Calopterygidae	23	46	3	12
Coenagrionidae		2	1	
Hemiptera (true bugs)				
Belostomatidae	1			
Corixidae	46	11	2	45
Gerridae	1	3		
Mesoveliidae		3		
Nepidae	1			1
Notonectidae	5	2		
Pleidae		1		
Veliidae	3			
Megaloptera				
Sialidae (alder flies)		1		
Trichoptera (caddisflies)				
Brachycentridae				3
Helicopsychidae	23			
Hydropsychidae		15	33	35
Hydroptilidae		4		
Leptoceridae	1	2	1	15
Limnephilidae	7	1		1
Molannidae		1		
Phryganeidae			1	
Polycentropodidae		3		
Uenoidae	5			
Coleoptera (beetles)				
Dytiscidae (total)		5		
Gyrinidae (adults)	2			
Haliplidae (adults)	9			3
Hydrophilidae (total)		2		
Elmidae	16	12	4	10
Diptera (flies)				
Athericidae				1
Ceratopogonidae	1			
Chaoboridae				1
Chironomidae	15	37	38	12
Culicidae		1		
Dixidae	1	3		3
Simuliidae		1	108	1
Tabanidae	1			
Tipulidae				1
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	9		1	
Lymnaeidae	8	9		1
Physidae	2	1	4	3
Planorbidae			2	
Viviparidae		3		
Pelecypoda (bivalves)				
Corbiculidae	1		16	1
Sphaeriidae (clams)	9	4	3	1
TOTAL INDIVIDUALS	250	242	301	252

METRIC	STATION 5 Value	STATION 5 Score	STATION 6 Value	STATION 6 Score	STATION 7 Value	STATION 7 Score	STATION 8 Value	STATION 8 Score
TOTAL NUMBER OF TAXA	30	1	34	1	21	0	26	1
NUMBER OF MAYFLY TAXA	2	0	3	0	2	0	2	0
NUMBER OF CADDISFLY TAXA	4	0	6	1	3	0	4	0
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	8.40	0	3.72	0	14.29	0	1.59	-1
PERCENT CADDISFLY COMP.	14.40	0	10.74	0	11.63	0	21.43	0
PERCENT DOMINANT TAXON	18.40	1	19.01	1	35.88	0	30.16	0
PERCENT ISOPOD, SNAIL, LEE	7.60	0	5.79	0	2.33	1	1.59	1
PERCENT SURF. AIR BREATHE	27.20	-1	11.57	0	0.66	1	19.84	-1
TOTAL SCORE		0		2		1		-1
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 2C. Qualitative macroinvertebrate sampling results for

TAXA	Wabascon Creek Cross Street 7/1/2014 STATION 9	Gull Creek 37th Street 7/1/2014 STATION 10	Battle Creek River upstream I-69 7/23/2014 STATION 11	Minges Brook Riverside Drive (downstream) 9/3/2014 STATION 12
ANNELIDA (segmented worms)				
Hirudinea (leeches)	1	1	1	
Oligochaeta (worms)	1		1	4
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	27	83	25	30
Decapoda (crayfish)	1	15	3	2
Isopoda (sowbugs)	2	11		
Arachnoidea				
Hydracarina	1			5
Insecta				
Ephemeroptera (mayflies)				
Baetidae	47	6	11	56
Caenidae		2		
Ephemeridae		6		
Heptageniidae	11	50	10	6
Isonychiidae		6		
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	3	1		1
Cordulegastridae	1			
Gomphidae	1			
Libellulidae		1	1	
Zygoptera (damselflies)				
Calopterygidae		1	5	44
Lestidae		2		
Plecoptera (stoneflies)				
Perlidae	24	10		
Hemiptera (true bugs)				
Belostomatidae				1
Corixidae	23		150	
Gerridae	5	1	2	1
Mesoveliidae				1
Notonectidae			1	
Pleidae				1
Veliidae			2	
Megaloptera				
Corydalidae (dobson flies)		2		
Trichoptera (caddisflies)				
Brachycentridae	14		1	1
Helicopsychidae	3	1		
Hydropsychidae	28	9		21
Hydroptilidae	2			
Leptoceridae	37	4	15	7
Limnephilidae		1	2	
Philopotamidae		2	1	
Coleoptera (beetles)				
Dytiscidae (total)				1
Haliplidae (adults)			3	
Psephenidae (adults)	2	7		
Elmidae	10	11	8	5
Diptera (flies)				
Athericidae			2	
Ceratopogonidae		1	1	
Chironomidae	34	17	1	50
Dixidae			1	
Simuliidae		2	26	46
Tipulidae		3		5
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	2			
Hydrobiidae			1	
Lymnaeidae		1		
Physidae	1	2		
Planorbidae			1	
Pelecypoda (bivalves)				
Corbiculidae			3	
Sphaeriidae (clams)	3	10	4	
TOTAL INDIVIDUALS	284	269	282	288

METRIC	STATION 9 Value	STATION 9 Score	STATION 10 Value	STATION 10 Score	STATION 11 Value	STATION 11 Score	STATION 12 Value	STATION 12 Score
TOTAL NUMBER OF TAXA	25	1	30	1	27	1	20	0
NUMBER OF MAYFLY TAXA	2	0	5	1	2	0	2	0
NUMBER OF CADDISFLY TAXA	5	1	5	1	4	0	3	0
NUMBER OF STONEFLY TAXA	1	1	1	1	0	-1	0	-1
PERCENT MAYFLY COMP.	20.42	1	26.02	1	7.45	0	21.53	1
PERCENT CADDISFLY COMP.	29.58	1	6.32	0	6.74	0	10.07	0
PERCENT DOMINANT TAXON	16.55	1	30.86	0	53.19	-1	19.44	1
PERCENT ISOPOD, SNAIL, LEE	2.11	1	5.58	0	1.06	1	0.00	1
PERCENT SURF. AIR BREATHE	10.56	0	2.97	1	56.03	-1	1.74	1
TOTAL SCORE		7		6		-1		3
MACROINV. COMMUNITY RATING		EXCELLENT		EXCELLENT		ACCEPT.		ACCEPT.

Table 2D. Qualitative macroinvertebrate sampling results for Seven Mile Creek U Drive (Meachem Road) 9/3/2014

TAXA	STATION 13
ANNELIDA (segmented worms)	
Hirudinea (leeches)	1
Oligochaeta (worms)	1
ARTHROPODA	
Crustacea	
Amphipoda (scuds)	12
Decapoda (crayfish)	3
Insecta	
Ephemeroptera (mayflies)	
Baetidae	112
Heptageniidae	11
Isonychiidae	2
Siphlonuridae	2
Odonata	
Anisoptera (dragonflies)	
Aeshnidae	2
Cordulegastridae	1
Zygoptera (damselflies)	
Calopterygidae	16
Plecoptera (stoneflies)	
Perlidae	3
Hemiptera (true bugs)	
Gerridae	1
Mesoveliidae	1
Nepidae	1
Pleidae	1
Veliidae	50
Trichoptera (caddisflies)	
Hydropsychidae	12
Leptoceridae	1
Diptera (flies)	
Ceratopogonidae	3
Chironomidae	1
Dixidae	1
Simuliidae	9
MOLLUSCA	
Gastropoda (snails)	
Ancylidae (limpets)	5
Pelecypoda (bivalves)	
Sphaeriidae (clams)	1
TOTAL INDIVIDUALS	253

METRIC	STATION 13 Value	Score
TOTAL NUMBER OF TAXA	25	1
NUMBER OF MAYFLY TAXA	4	1
NUMBER OF CADDISFLY TAXA	2	0
NUMBER OF STONEFLY TAXA	1	1
PERCENT MAYFLY COMP.	50.20	1
PERCENT CADDISFLY COMP.	5.14	0
PERCENT DOMINANT TAXON	44.27	-1
PERCENT ISOPOD, SNAIL, LEECH	2.37	1
PERCENT SURF. AIR BREATHERS	21.34	-1
TOTAL SCORE		3
MACROINV. COMMUNITY RATING		ACCEPT.

Table 2E. Qualitative macroinvertebrate sampling results for

TAXA	Franklin Drain Ravine Road 8/8/2014 STATION 14	Swan Creek upstream 110th Avenue 8/7/2014 STATION 15	Wabascon Creek M-89 7/29/2014 STATION 16	Swan Lake Drain 41st Street 8/7/2014 STATION 17
PORIFERA (sponges)	1			
ANNELIDA (segmented worms)				
Oligochaeta (worms)			3	
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	142	62	41	103
Decapoda (crayfish)	5	2	1	1
Isopoda (sowbugs)	79	2	4	26
Arachnoidea				
Hydracarina	1			
Insecta				
Ephemeroptera (mayflies)				
Baetidae	1	30	8	4
Heptageniidae	1	36	23	20
Siphlonuridae			2	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	1	1	1	2
Zygoptera (damselflies)				
Calopterygidae	9	19		4
Plecoptera (stoneflies)				
Perlidae			1	
Hemiptera (true bugs)				
Corixidae	1	18		2
Gelastocoridae				1
Gerridae	2		5	
Mesoveliidae	4			4
Nepidae			1	
Notonectidae				1
Veliidae	1	1		4
Megaloptera				
Corydalidae (dobson flies)		1		
Trichoptera (caddisflies)				
Brachycentridae		5	17	32
Glossosomatidae				3
Hydropsychidae	1	9	58	24
Hydroptilidae			2	
Leptoceridae			25	
Molannidae				1
Philopotamidae			2	
Polycentropodidae			1	
Coleoptera (beetles)				
Dytiscidae (total)	3	8		
Gyrinidae (adults)		1		
Haliplidae (adults)	1			1
Hydrophilidae (total)				2
Psephenidae (adults)			1	
Elmidae			12	2
Diptera (flies)				
Athericidae				3
Ceratopogonidae		1		
Chironomidae	10	29	20	23
Culicidae				2
Dixidae		4		
Simuliidae		10	13	1
Tipulidae			8	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	1		1	
Lymnaeidae	1			
Physidae	1			
Planorbidae				1
Pelecypoda (bivalves)				
Corbiculidae				1
Sphaeriidae (clams)				1
TOTAL INDIVIDUALS	266	239	250	269

METRIC	STATION 14 Value	STATION 14 Score	STATION 15 Value	STATION 15 Score	STATION 16 Value	STATION 16 Score	STATION 17 Value	STATION 17 Score
TOTAL NUMBER OF TAXA	20	1	18	0	23	0	26	1
NUMBER OF MAYFLY TAXA	2	1	2	0	3	0	2	0
NUMBER OF CADDISFLY TAXA	1	0	2	0	6	1	4	0
NUMBER OF STONEFLY TAXA	0	-1	0	-1	1	1	0	-1
PERCENT MAYFLY COMP.	0.75	-1	27.62	1	13.20	0	8.92	0
PERCENT CADDISFLY COMP.	0.38	-1	5.86	0	42.00	1	22.30	0
PERCENT DOMINANT TAXON	53.38	-1	25.94	0	23.20	0	38.29	-1
PERCENT ISOPOD, SNAIL, LEE	30.83	-1	0.84	1	2.00	1	10.04	0
PERCENT SURF. AIR BREATHE	4.51	1	11.72	0	2.80	1	6.32	1
TOTAL SCORE		-2		1		5		0
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		EXCELLENT		ACCEPT.

Table 2F. Qualitative macroinvertebrate sampling results for

TAXA	Gun River Conservation Club u/s 11th Street 8/8/2014 STATION 18	State and Indian Creek Drain 19.5 Mile Road 7/30/2014 STATION 19	South Branch Kalamazoo River Folks Road 8/20/2014 STATION 20	Battle Creek River Michigan Avenue (downstream) 7/29/2014 STATION 21
PLATYHELMINTHES (flatworms)				
Turbellaria		1		
ANNELIDA (segmented worms)				
Oligochaeta (worms)		13	3	1
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	78	31	34	17
Decapoda (crayfish)	3	3	1	
Isopoda (sowbugs)	68			1
Arachnoidea				
Hydracarina			1	1
Insecta				
Ephemeroptera (mayflies)				
Baetidae	9		4	37
Caenidae		3	2	
Ephemeridae			4	
Heptageniidae	14	8	23	8
Isonychiidae				2
Siphlonuridae			5	7
Tricorythidae			3	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	2	1	4	
Gomphidae			2	
Zygoptera (damselflies)				
Calopterygidae	7	1	4	
Coenagrionidae		8		
Lestidae		1		
Hemiptera (true bugs)				
Belostomatidae		1		
Corixidae			1	
Gerridae	1	1		
Mesoveliidae			1	
Nepidae			1	
Notonectidae		1		
Veliidae		2		
Megaloptera				
Corydalidae (dobson flies)			1	
Sialidae (alder flies)			1	
Trichoptera (caddisflies)				
Brachycentridae	16		13	22
Helicopsychidae			35	
Hydropsychidae	34		12	90
Hydroptilidae				41
Leptoceridae	2	61	2	15
Limnephilidae	1		2	1
Philopotamidae				5
Polycentropodidae			3	
Uenoidae			4	
Coleoptera (beetles)				
Dytiscidae (total)		2		
Gyrinidae (adults)		1	1	
Haliplidae (adults)		10		
Elmidae	13	66	16	2
Psephenidae (larvae)			7	
Scirtidae (larvae)		2		
Diptera (flies)				
Athericidae				3
Ceratopogonidae			2	
Chaoboridae		1		
Chironomidae	3	26	10	4
Dixidae				9
Simuliidae	3		2	9
Tabanidae	2		1	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)		1	5	2
Physidae	1	4		
Planorbidae	1	1		
Pleuroceridae			50	
Pelecypoda (bivalves)				
Corbiculidae		1	1	
Sphaeriidae (clams)			2	
TOTAL INDIVIDUALS	258	251	263	277

METRIC	STATION 18 Value	Score	STATION 19 Value	Score	STATION 20 Value	Score	STATION 21 Value	Score
TOTAL NUMBER OF TAXA	18	0	26	1	36	1	20	0
NUMBER OF MAYFLY TAXA	2	0	2	0	6	1	4	1
NUMBER OF CADDISFLY TAXA	4	0	1	-1	7	1	6	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	8.91	0	4.38	0	15.59	0	19.49	1
PERCENT CADDISFLY COMP.	20.54	0	24.30	0	27.00	0	62.82	1
PERCENT DOMINANT TAXON	30.23	0	26.29	0	19.01	1	32.49	0
PERCENT ISOPOD, SNAIL, LEE	27.13	-1	2.39	1	20.91	-1	1.08	1
PERCENT SURF. AIR BREATHE	0.39	1	7.57	0	1.52	1	0.00	1
TOTAL SCORE		-1		0		3		5
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		EXCELLENT

Table 2G. Qualitative macroinvertebrate sampling results for

TAXA	Portage Creek Vine Avenue 6/26/2014 STATION 22	Portage Creek Alcott Street 6/26/2014 STATION 23	Portage Creek Cork Street 6/26/2014 STATION 24	Spring Brook Riverview Drive 7/2/2014 STATION 25
PLATYHELMINTHES (flatworms)				
Turbellaria	1			1
ANNELIDA (segmented worms)				
Hirudinea (leeches)	1	2		
Oligochaeta (worms)	17	2	3	3
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	88	58	5	64
Decapoda (crayfish)		3	11	1
Isopoda (sowbugs)	53	7	65	
Arachnoidea				
Hydracarina	1	4	4	32
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae		1		
Baetidae	1	33	17	13
Ephemerellidae	1			38
Ephemeridae				2
Heptageniidae		3	1	
Tricorythidae	1			
Odonata				
Anisoptera (dragonflies)				
Aeshnidae				1
Zygoptera (damselflies)				
Calopterygidae	1	5	1	1
Plecoptera (stoneflies)				
Perlidae			1	
Hemiptera (true bugs)				
Corixidae	2		1	
Gerridae	1			1
Pleidae	1			
Veliidae	7			5
Trichoptera (caddisflies)				
Brachycentridae		2		4
Hydropsychidae	7	37	76	6
Hydroptilidae	4			
Leptoceridae	93	48	16	13
Limnephilidae				1
Coleoptera (beetles)				
Dytiscidae (total)		2		
Gyrinidae (adults)		1		
Haliplidae (adults)		1		3
Elmidae	3		3	8
Scirtidae (larvae)				3
Diptera (flies)				
Ceratopogonidae				7
Chironomidae	18	39	40	18
Dixidae		2		1
Simuliidae	7	14	12	2
Tipulidae			2	32
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	4	5		
Physidae	4	1		
Pelecypoda (bivalves)				
Corbiculidae	1	1	3	
Sphaeriidae (clams)			1	
TOTAL INDIVIDUALS	317	271	262	260

METRIC	STATION 22 Value	Score	STATION 23 Value	Score	STATION 24 Value	Score	STATION 25 Value	Score
TOTAL NUMBER OF TAXA	23	0	22	0	18	0	24	0
NUMBER OF MAYFLY TAXA	3	0	3	0	2	0	3	0
NUMBER OF CADDISFLY TAXA	3	0	3	0	2	0	4	0
NUMBER OF STONEFLY TAXA	0	-1	0	-1	1	1	0	-1
PERCENT MAYFLY COMP.	0.95	-1	13.65	0	6.87	0	20.38	1
PERCENT CADDISFLY COMP.	32.81	1	32.10	1	35.11	1	9.23	0
PERCENT DOMINANT TAXON	29.34	0	21.40	0	29.01	0	24.62	0
PERCENT ISOPOD, SNAIL, LEE	19.56	-1	5.54	0	24.81	-1	0.00	1
PERCENT SURF. AIR BREATHE	3.47	1	1.48	1	0.38	1	3.46	1
TOTAL SCORE		-1		1		2		2
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 2H. Qualitative macroinvertebrate sampling results for

TAXA	Arcadia Creek Kalamazoo Christian High School 7/2/2014 STATION 26	Arcadia Creek Oliver Street 7/2/2014 STATION 27	Gun River via drainage ditch downstream Gun Lake WWTP 6/30/2014 STATION 28	Battle Creek River d/s Charlotte WWTP, Cochran Rd - d/s 7/23/2014 STATION 29
PLATYHELMINTHES (flatworms)				
Turbellaria		1	72	
ANNELIDA (segmented worms)				
Hirudinea (leeches)	1	2		
Oligochaeta (worms)	6	7		7
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	33	4	23	38
Decapoda (crayfish)	1	3		11
Isopoda (sowbugs)	49	49	180	
Arachnoidea				
Hydracarina		1	1	
Insecta				
Ephemeroptera (mayflies)				
Baetidae	2	55		2
Ephemerellidae		12		
Heptageniidae				11
Isonychiidae		2		
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	1	4	2	3
Gomphidae				1
Zygoptera (damselflies)				
Calopterygidae		2		2
Coenagrionidae	1	1		
Lestidae	1			
Hemiptera (true bugs)				
Corixidae	7		2	3
Gerridae		2	1	
Mesoveliidae				1
Nepidae	1			
Notonectidae	1			
Veliidae		5	1	1
Trichoptera (caddisflies)				
Brachycentridae				1
Hydropsychidae		11		48
Hydroptilidae				1
Leptoceridae				38
Philopotamidae				2
Coleoptera (beetles)				
Dytiscidae (total)			4	
Haliplidae (adults)	1		2	
Elmidae	1	4		13
Diptera (flies)				
Ceratopogonidae		1	3	2
Chironomidae	144	74	13	25
Culicidae			3	
Dixidae	4	2		2
Psychodidae				1
Simuliidae		5	20	48
Tipulidae	1	3		1
MOLLUSCA				
Gastropoda (snails)				
Lymnaeidae				1
Physidae	1			1
Planorbidae	1			2
Pelecypoda (bivalves)				
Corbiculidae				1
Sphaeriidae (clams)	1	1	1	1
TOTAL INDIVIDUALS	258	251	328	268

METRIC	STATION 26 Value	Score	STATION 27 Value	Score	STATION 28 Value	Score	STATION 29 Value	Score
TOTAL NUMBER OF TAXA	20	0	23	0	15	0	28	1
NUMBER OF MAYFLY TAXA	1	0	3	0	0	-1	2	0
NUMBER OF CADDISFLY TAXA	0	-1	1	-1	0	-1	5	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	0.78	-1	27.49	1	0.00	-1	4.85	0
PERCENT CADDISFLY COMP.	0.00	-1	4.38	0	0.00	-1	33.58	1
PERCENT DOMINANT TAXON	55.81	-1	29.48	0	54.88	-1	17.91	1
PERCENT ISOPOD, SNAIL, LEE	20.16	-1	20.32	-1	54.88	-1	1.49	1
PERCENT SURF. AIR BREATHE	3.88	1	2.79	1	3.96	1	1.87	1
TOTAL SCORE		-5		-1		-6		5
MACROINV. COMMUNITY RATING	POOR		ACCEPT.		POOR		EXCELLENT	

Table 3A. Habitat evaluation for	Wilder Creek Homer Road GLIDE/POOL	N B Kalamazoo River King Road GLIDE/POOL	S B Kalamazoo River J Drive S GLIDE/POOL	Portage Creek Stockbridge Avenue RIFFLE/RUN	Rice Creek 22 1/2 Mile Rd GLIDE/POOL
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	7	18	13	13	13
Embeddedness (20)*				15	
Velocity/Depth Regime (20)*				13	
Pool Substrate Characterization (20)**	10	16	14		9
Pool Variability (20)**	9	10	9		11
Channel Morphology					
Sediment Deposition (20)	12	19	16	11	14
Flow Status - Maint. Flow Volume (10)	9	10	9	9	9
Flow Status - Flashiness (10)	9	10	9	1	7
Channel Alteration (20)	11	19	19	8	13
Frequency of Riffles/Bends (20)*				11	
Channel Sinuosity (20)**	6	16	14		7
Riparian and Bank Structure					
Bank Stability (L) (10)	8	10	9	7	6
Bank Stability (R) (10)	8	10	9	7	3
Vegetative Protection (L) (10)	9	8	9	7	6
Vegetative Protection (R) (10)	9	9	9	7	2
Riparian Veg. Zone Width (L) (10)	7	6	7	4	4
Riparian Veg. Zone Width (R) (10)	7	9	6	7	1
TOTAL SCORE (200):	121	170	152	120	105
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON-IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Date:	8/27/2014		8/27/2014		8/27/2014		9/3/2014		8/27/2014	
Weather:	Partly Cloudy		Sunny		Cloudy		Sunny		Partly Cloudy	
Air Temperature:	70	Deg. F.	80	Deg. F.	70	Deg. F.	80	Deg. F.	70	Deg. F.
Water Temperature:		Deg. F.	75	Deg. F.	68	Deg. F.	61	Deg. F.	70	Deg. F.
Ave. Stream Width:	15	Feet	25	Feet	50	Feet	30	Feet	33	Feet
Ave. Stream Depth:	20	Feet	1.5	Feet	1.5	Feet	1	Feet	1.5	Feet
Surface Velocity:		Ft./Sec.	1.4	Ft./Sec.	1.6	Ft./Sec.	2.2	Ft./Sec.	0.6	Ft./Sec.
Estimated Flow:		CFS	52.5	CFS	120	CFS	66	CFS	29.7	CFS
Stream Modifications:	Dredged		None		None		Dredged		Dredged	
Nuisance Plants (Y/N):	N		N		N		N		N	
Report Number:										

STORET No.:	130413	380489	130414	390112	130333
Stream Name:	Wilder Creek	N B Kalamazoo River	S B Kalamazoo River	Portage Creek	Rice Creek
Road Crossing/Location:	Homer Road	King Road	J Drive S	Stockbridge Avenue	22 1/2 Mile Rd
County Code:	13	38	13	39	13
TRS:	03S05W09	03S03W16	03S04W32	02S11W22	02S05W14
Latitude (dd):	42.22177363	42.21424868	42.17384218	42.27745368	42.29702
Longitude (dd):	-84.90503818	-84.66522754	-84.7915395	-85.57702681	-84.86264
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater	Coldwater
USGS Basin Code:	450007	4050007	4050007	4050007	4050003

* Applies only to Riffle/Run stream Surveys
** Applies only to Glide/Pool stream Surveys

Table 3B. Habitat evaluation for	Swains Lake Drain Van Wert Rd GLIDE/POOL	Battle Creek River Kalamo Road - West GLIDE/POOL	Battle Creek River Brookfield Road GLIDE/POOL	Wabascon Creek Cross Street GLIDE/POOL	Gull Creek 37th Street RIFFLE/RUN
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	7	15	13	14	15
Embeddedness (20)*					18
Velocity/Depth Regime (20)*					10
Pool Substrate Characterization (20)**	6	16	10	13	
Pool Variability (20)**	1	6	10	9	
Channel Morphology					
Sediment Deposition (20)	16	15	13	12	19
Flow Status - Maint. Flow Volume (10)	10	9	10	9	10
Flow Status - Flashiness (10)	9	2	1	8	9
Channel Alteration (20)	13	10	13	19	20
Frequency of Riffles/Bends (20)*					19
Channel Sinuosity (20)**	6	10	10	12	
Riparian and Bank Structure					
Bank Stability (L) (10)	9	9	8	9	9
Bank Stability (R) (10)	9	9	6	9	9
Vegetative Protection (L) (10)	8	3	8	9	10
Vegetative Protection (R) (10)	8	3	6	9	10
Riparian Veg. Zone Width (L) (10)	8	2	8	4	4
Riparian Veg. Zone Width (R) (10)	8	0	4	4	5
TOTAL SCORE (200):	118	109	120	140	167
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON-IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Date:	8/20/2014	7/23/2014	7/30/2014	7/1/2014	7/1/2014
Weather:	Sunny	Partly Cloudy	Sunny	Sunny	Cloudy
Air Temperature:	75 Deg. F.	70 Deg. F.	70 Deg. F.	81 Deg. F.	65 Deg. F.
Water Temperature:	67 Deg. F.	74 Deg. F.	63 Deg. F.	75 Deg. F.	67 Deg. F.
Ave. Stream Width:	15 Feet	25 Feet	23 Feet	25 Feet	35 Feet
Ave. Stream Depth:	0.7 Feet	1 Feet	1.5 Feet	1.3 Feet	3.5 Feet
Surface Velocity:	0.2 Ft./Sec.	1.4 Ft./Sec.	0.5 Ft./Sec.	1.9 Ft./Sec.	2.9 Ft./Sec.
Estimated Flow:	2.1 CFS	35 CFS	17.25 CFS	61.75 CFS	355.25 CFS
Stream Modifications:	None	Dredged		None	None
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	380411	230047	230266	130415	390194
Stream Name:	Swains Lake Drain	Battle Creek River	Battle Creek River	Wabascon Creek	Gull Creek
Road Crossing/Location:	Van Wert Rd	Kalamo Road - West	Brookfield Road	Cross Street	37th Street
County Code:	38	23	23	13	39
TRS:	04S03W07	02N05W24	02N04W28	01S08W28	02S09W07
Latitude (dd):	42.1332	42.538337	42.52859773	42.35411908	42.31535
Longitude (dd):	-84.71066	-84.849727	-84.79755932	-85.24906708	-85.40146
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4050003	4050003	4050007	4050007	4050003

* Applies only to Riffle/Run stream Surveys
** Applies only to Glide/Pool stream Surveys

Table 3C. Habitat evaluation for	Battle Creek River u/s I-69 GLIDE/POOL	Minges Brook Riverside Drive (downstre GLIDE/POOL	Seven Mile Creek U Drive (Meachem Road) GLIDE/POOL
HABITAT METRIC			
Substrate and Instream Cover			
Epifaunal Substrate/ Avail Cover (20)	8	13	11
Embeddedness (20)*			
Velocity/Depth Regime (20)*			
Pool Substrate Characterization (20)**	11	12	11
Pool Variability (20)**	1	10	7
Channel Morphology			
Sediment Deposition (20)	11	18	13
Flow Status - Maint. Flow Volume (10)	9	9	9
Flow Status - Flashiness (10)	6	9	9
Channel Alteration (20)	10	19	19
Frequency of Riffles/Bends (20)*			
Channel Sinuosity (20)**	4	16	13
Riparian and Bank Structure			
Bank Stability (L) (10)	9	6	9
Bank Stability (R) (10)	9	8	9
Vegetative Protection (L) (10)	9	3	9
Vegetative Protection (R) (10)	6	2	9
Riparian Veg. Zone Width (L) (10)	9	1	7
Riparian Veg. Zone Width (R) (10)	4	1	9
TOTAL SCORE (200):	106	127	144
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Date:	7/23/2014	9/3/2014	9/3/2014
Weather:	Partly Cloudy	Sunny	Sunny
Air Temperature:	72 Deg. F.	75 Deg. F.	78 Deg. F.
Water Temperature:	71 Deg. F.	63 Deg. F.	61 Deg. F.
Ave. Stream Width:	25 Feet	18 Feet	17 Feet
Ave. Stream Depth:	2.5 Feet	1 Feet	1 Feet
Surface Velocity:	0.6 Ft./Sec.	1 Ft./Sec.	0.9 Ft./Sec.
Estimated Flow:	37.5 CFS	18 CFS	15.3 CFS
Stream Modifications:	Dredged	Canopy Removal	None
Nuisance Plants (Y/N):	N	N	N
Report Number:			
STORET No.:	230248	130401	130404
Stream Name:	ttle Creek River	Minges Brook	Seven Mile Creek
Road Crossing/Location:	u/s I-69	Riverside Drive (d/s)	U Drive (Meachem Road)
County Code:	23	13	13
TRS:	02N04W19	02S08W25	01S08W08
Latitude (dd):	42.5475	42.27147	42.3951
Longitude (dd):	-84.81997	-85.18882	-85.27715
Ecoregion:	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater	Coldwater	Coldwater
USGS Basin Code:	4050003	4050003	4050003

* Applies only to Riffle/Run stream Surveys
** Applies only to Glide/Pool stream Surveys

Table 3D. Habitat evaluation for	Franklin Drain Ravine Road GLIDE/POOL	Swan Creek upstream 110th Avenue GLIDE/POOL	Wabascon Creek M-89 GLIDE/POOL	Swan Lake Drain 41st Street GLIDE/POOL	Gun River Conservation Club u/s 11th Street GLIDE/POOL
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	10	13	11	8	15
Embeddedness (20)*					
Velocity/Depth Regime (20)*					
Pool Substrate Characterization (20)**	8	8	8	9	13
Pool Variability (20)**	3	11	14	6	14
Channel Morphology					
Sediment Deposition (20)	13	9	10	10	16
Flow Status - Maint. Flow Volume (10)	6	6	7	6	8
Flow Status - Flashiness (10)	2	5	3	2	5
Channel Alteration (20)	9	15	18	9	19
Frequency of Riffles/Bends (20)*					
Channel Sinuosity (20)**	13	13	16	8	15
Riparian and Bank Structure					
Bank Stability (L) (10)	6	4	8	1	8
Bank Stability (R) (10)	6	4	8	1	8
Vegetative Protection (L) (10)	4	5	6	5	9
Vegetative Protection (R) (10)	4	5	6	5	9
Riparian Veg. Zone Width (L) (10)	4	9	5	9	3
Riparian Veg. Zone Width (R) (10)	1	7	5	9	9
TOTAL SCORE (200):	89	114	125	88	151
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Date:	8/8/2014	8/7/2014	7/29/2014	8/7/2014	8/8/2014
Weather:	Sunny	Sunny	Cloudy	Sunny	Sunny
Air Temperature:	68 Deg. F.	72 Deg. F.	52 Deg. F.	72 Deg. F.	75 Deg. F.
Water Temperature:	63 Deg. F.	67 Deg. F.	65 Deg. F.	68 Deg. F.	64 Deg. F.
Ave. Stream Width:	3 Feet	14 Feet	30 Feet	14 Feet	21 Feet
Ave. Stream Depth:	0.2 Feet	1.5 Feet	1.5 Feet	0.5 Feet	1.5 Feet
Surface Velocity:	0.5 Ft./Sec.	0.5 Ft./Sec.	0.3 Ft./Sec.	0.3 Ft./Sec.	1.9 Ft./Sec.
Estimated Flow:	0.3 CFS	10.5 CFS	13.5 CFS	2.1 CFS	59.85 CFS
Stream Modifications:	Dredged	Canopy Removal	Canopy Removal	Dredged	Canopy Removal
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	390606	30693	130171	30694	30691
Stream Name:	Franklin Drain	Swan Creek	Wabascon Creek	Swan Lake Drain	Gun River
Road Crossing/Location:	Ravine Road	upstream 110th Avenue	M-89	41st Street	Conservation Club u/s 11th Street
County Code:	39	03	13	03	03
TRS:	01S12W03	01N14W07	01S08W28	01N14W15	01N11W18
Latitude (dd):	42.41803	42.49151	42.35195	42.46591	42.47015
Longitude (dd):	-85.70289	-86.01357	-85.25389	-85.94946	-85.655356
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater	Coldwater	Coldwater	Warmwater	Coldwater
USGS Basin Code:	4050003	4050003	4050003	4050003	4050003

* Applies only to Riffle/Run stream Surveys
** Applies only to Glide/Pool stream Surveys

Table 3E. Habitat evaluation for	State and Indian Creek D	South Branch Kalamazoo	Battle Creek River
	19.5 Mile Road	Folks Road	Michigan Avenue (downstream)
	GLIDE/POOL	RIFFLE/RUN	RIFFLE/RUN
HABITAT METRIC			
Substrate and Instream Cover			
Epifaunal Substrate/ Avail Cover (20)	7	15	15
Embeddedness (20)*		16	19
Velocity/Depth Regime (20)*		10	13
Pool Substrate Characterization (20)**	8		
Pool Variability (20)**	1		
Channel Morphology			
Sediment Deposition (20)	20	17	16
Flow Status - Maint. Flow Volume (10)	9	10	9
Flow Status - Flashiness (10)	2	10	5
Channel Alteration (20)	10	19	9
Frequency of Riffles/Bends (20)*		14	8
Channel Sinuosity (20)**	3		
Riparian and Bank Structure			
Bank Stability (L) (10)	7	10	10
Bank Stability (R) (10)	7	10	10
Vegetative Protection (L) (10)	5	8	0
Vegetative Protection (R) (10)	5	8	0
Riparian Veg. Zone Width (L) (10)	4	9	1
Riparian Veg. Zone Width (R) (10)	4	9	1
TOTAL SCORE (200):	92	165	116
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	EXCELLENT (NON-IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Date:	7/30/2014	8/20/2014	7/29/2014
Weather:	Sunny	Sunny	Partly Cloudy
Air Temperature:	64 Deg. F.	78 Deg. F.	70 Deg. F.
Water Temperature:	66 Deg. F.	72 Deg. F.	68 Deg. F.
Ave. Stream Width:	10 Feet	42 Feet	80 Feet
Ave. Stream Depth:	1 Feet	1.1 Feet	2 Feet
Surface Velocity:	0.5 Ft./Sec.	0.5 Ft./Sec.	0.9 Ft./Sec.
Estimated Flow:	5 CFS	23.1 CFS	144 CFS
Stream Modifications:	Dredged	None	Canopy Removal
Nuisance Plants (Y/N):	N	N	Y
Report Number:			
STORET No.:	130403	380481	130402
Stream Name:	lian Creek Drain	Branch Kalamazoo River	Battle Creek River
Road Crossing/Location:	19.5 Mile Road	Folks Road	Michigan Avenue (downstream)
County Code:	13	38	13
TRS:	01S05W20	04S03W19	02S08W01
Latitude (dd):	42.37374	42.11417	42.32256
Longitude (dd):	-84.91739	-84.69231	-85.18568
Ecoregion:	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater	Coldwater	Warmwater
USGS Basin Code:	4050003	4050003	4050003

* Applies only to Riffle/Run stream Surveys
** Applies only to Glide/Pool stream Surveys

Table 3F. Habitat evaluation for	Portage Creek Vine Avenue GLIDE/POOL	Portage Creek Alcott Street RIFFLE/RUN	Portage Creek Cork Street RIFFLE/RUN	Spring Brook Riverview Drive GLIDE/POOL	Arcadia Creek Kalamazoo Christian High School GLIDE/POOL
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	11	7	18	8	10
Embeddedness (20)*		18	18		
Velocity/Depth Regime (20)*		14	14		
Pool Substrate Characterization (20)**	15			8	11
Pool Variability (20)**	1			9	3
Channel Morphology					
Sediment Deposition (20)	8	18	19	10	11
Flow Status - Maint. Flow Volume (10)	10	10	10	10	10
Flow Status - Flashiness (10)	5	10	7	7	9
Channel Alteration (20)	3	3	19	17	14
Frequency of Riffles/Bends (20)*		16	18		
Channel Sinuosity (20)**	2			12	9
Riparian and Bank Structure					
Bank Stability (L) (10)	9	10	10	3	10
Bank Stability (R) (10)	9	10	7	3	9
Vegetative Protection (L) (10)	7	6	10	3	7
Vegetative Protection (R) (10)	7	6	5	3	7
Riparian Veg. Zone Width (L) (10)	1	9	4	0	5
Riparian Veg. Zone Width (R) (10)	1	9	1	0	1
TOTAL SCORE (200):	89	146	160	93	116
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON-IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Date:	6/26/2014	6/26/2014	6/26/2014	7/2/2014	7/2/2014
Weather:	Partly Cloudy	Parrtly Cloudy	Sunny	Partly Cloudy	Sunny
Air Temperature:	70 Deg. F.	70 Deg. F.	77 Deg. F.	68 Deg. F.	74 Deg. F.
Water Temperature:	68 Deg. F.	67 Deg. F.	75 Deg. F.	62 Deg. F.	73 Deg. F.
Ave. Stream Width:	35 Feet	32 Feet	25 Feet	12 Feet	9.5 Feet
Ave. Stream Depth:	1.5 Feet	2 Feet	1 Feet	1.5 Feet	1 Feet
Surface Velocity:	0.6 Ft./Sec.	0.9 Ft./Sec.	2.6 Ft./Sec.	1.6 Ft./Sec.	0.6 Ft./Sec.
Estimated Flow:	31.5 CFS	57.6 CFS	65 CFS	28.8 CFS	5.7 CFS
Stream Modifications:	Dredged	Dredged	None	Canopy Removal	Relocated
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	390111	390616	390106	390619	390617
Stream Name:	Portage Creek	Portage Creek	Portage Creek	Spring Brook	Arcadia Creek
Road Crossing/Location:	Vine Avenue	Alcott Street	Cork Street	Riverview Drive	Kalamazoo Christian High School
County Code:	39	39	39	39	39
TRS:	02S11W22	02S11W27	02S11W27	01S11W25	02S11W20
Latitude (dd):	42.28386	42.270514	42.259587	42.35653	42.27423
Longitude (dd):	-85.57887	-85.578068	-85.576948	-85.55107	-85.61403
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater	Warmwater	Warmwater	Coldwater	Warmwater
USGS Basin Code:	4050003	4050003	4050003	4050003	4050003

* Applies only to Riffle/Run stream Surveys
** Applies only to Glide/Pool stream Surveys

Table 3G. Habitat evaluation for	Arcadia Creek Oliver Street GLIDE/POOL	Gun River via drainage ditch downstream Gun Lake WWTP GLIDE/POOL	Battle Creek River d/s Charlotte WWTP, Cochran Rd - d/s RIFFLE/RUN
HABITAT METRIC			
Substrate and Instream Cover			
Epifaunal Substrate/ Avail Cover (20)	14	2	9
Embeddedness (20)*			11
Velocity/Depth Regime (20)*			10
Pool Substrate Characterization (20)**	15	7	
Pool Variability (20)**	4	3	
Channel Morphology			
Sediment Deposition (20)	19	4	15
Flow Status - Maint. Flow Volume (10)	8	9	9
Flow Status - Flashiness (10)	10	4	2
Channel Alteration (20)	15	8	9
Frequency of Riffles/Bends (20)*			8
Channel Sinuosity (20)**	8	2	
Riparian and Bank Structure			
Bank Stability (L) (10)	9	9	8
Bank Stability (R) (10)	9	9	8
Vegetative Protection (L) (10)	9	7	9
Vegetative Protection (R) (10)	9	8	9
Riparian Veg. Zone Width (L) (10)	3	2	6
Riparian Veg. Zone Width (R) (10)	4	2	4
TOTAL SCORE (200):	136	76	117
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

Date:	7/2/2014	6/30/2014	7/23/2014
Weather:	Sunny	Cloudy	Cloudy
Air Temperature:	81 Deg. F.	75 Deg. F.	Deg. F.
Water Temperature:	72 Deg. F.	64 Deg. F.	71 Deg. F.
Ave. Stream Width:	10.5 Feet	11 Feet	25 Feet
Ave. Stream Depth:	0.4 Feet	0.83 Feet	1 Feet
Surface Velocity:	1.1 Ft./Sec.	0.6 Ft./Sec.	1.4 Ft./Sec.
Estimated Flow:	4.62 CFS	5.478 CFS	35 CFS
Stream Modifications:	None	Dredged	None
Nuisance Plants (Y/N):	N	Y	Y
Report Number:			
STORET No.:	390618	80295	230191
Stream Name:	Arcadia Creek	Gun River via drainage ditch	Battle Creek River
Road Crossing/Location:	Oliver Street	downstream Gun Lake WWTP	d/s Charlotte WWTP, Cochran Rd - d/s
County Code:	39	08	23
TRS:	02S11W21	02N10W06	02N05W24
Latitude (dd):	42.28387	42.5849955	42.54456
Longitude (dd):	-85.60663	-85.5429268	-84.83608
Ecoregion:	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater		Warmwater
USGS Basin Code:	4050003	4050003	4050003

* Applies only to Riffle/Run stream Surveys
** Applies only to Glide/Pool stream Surveys

Table 4A. Macroinvertebrate Results for the Nonwadeable Procedure (Procedure 22) of the Kalamazoo River at Grand Street.

MACROINVERTEBRATE TEMPLATE

TAXA	Kalamazoo 9/26/14 Allegan
PORIFERA CF	
PLATYHELMINTHES (flatworms)	
Turbellar CG	1
ANNELIDA (segmented worms)	
Oligocha CG	14
ARTHROPODA	
Amphip Sh	54
Isopoda Sh	4
Hydraca P	5
Insecta	
Ephemeroptera (mayflies)	
Baetida CG	6
Heptage Sc	9
Isonychi CF	1
Odonata	
Anisoptera (dragonflies)	
Gomph P	1
Zygoptera (damselflies)	
Coenag P	6
Hemiptera (true bugs)	
Corixida CG	207
Gerrida P	1
Veliidae P	2
Trichoptera (caddisflies)	
Leptoce Sh	1
Coleoptera (beetles)	
Elmidae CG	6
Chirono CG	97
Simuliid CF	2
MOLLUSCA	
Gastropoda (snails)	
Lymnaei Sc	1
Physida Sc	11

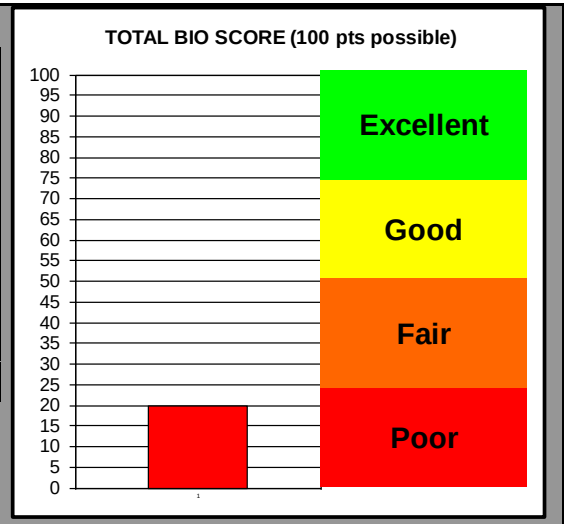
METRIC	STATION 1 Value
TOTAL ABUNDANCE	429
TOTAL RICHNESS	19
NUMBER OF EPHEMEROPTERA FAMILIES	3
NUMBER OF PLECOPTERA FAMILIES	0
NUMBER OF TRICHOPTERA FAMILIES	1
NUMBER OF DIPTERA TAXA	2
TRICHOPTERA ABUNDANCE	1
ABUNDANCE OF DOMINANT TAXON	207
SHREDDER ABUNDANCE	59
SCRAPER ABUNDANCE	21
COLL-FILTERER ABUNDANCE	3
COLL-GATH ABUNDANCE	331
PREDATOR ABUNDANCE	15

Table 4B. Nonwadeable Procedure (Procedure 22) Data for the Kalamazoo River at Grand Street.

DATE: 9/26/14
RIVER: Kalamazoo
STATION NUMBER: Allegan

Attribute	Data Sheet Box #	Value
Total Abundance	1	429
Total Richness	2	19
Number of Ephemeroptera Families	3	3
Number of Plecoptera Families	4	0
Number of Trichoptera Families	5	1
Number of Diptera Taxa	6	2
Trichoptera Abundance	7	1
Abundance of Dominant Taxon	8	207
Shredder Abundance	9	59
Scraper Abundance	10	21
Coll-Filterer Abundance	11	3
Coll-Gath Abundance	12	331
Predator Abundance	13	15

Metric Calculations	Value	Metric Score
FFG Diversity (25)	1.114599842	8
Habitat Stability FFG Surrogate (25)	0.061538462	0
% Trichoptera (20)	0.233100233	0
EPT Richness (8)	4	3
Total Richness (7)	19	5
Diptera Richness (5)	2	2
Plecoptera Richness (5)	0	0
% Dominance (5)	48.25174825	2
	Total Score=	20



FFG Diversity Workbook	0.393634631
Numbers calculated automatically	0.213060244
based on FFG abundance above.	0.05006903
	0.288677083
	0.169158855
FFG Diversity =	1.114599842