MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER BUREAU
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STAFF REPORT

A BIOLOGICAL SURVEY OF SITES IN THE LOWER ST. JOSEPH RIVER WATERSHED BERRIEN AND CASS COUNTIES, MICHIGAN AUGUST 2006

INTRODUCTION

Staff of the Surface Water Assessment Section (SWAS), Water Bureau, Michigan Department of Environmental Quality (MDEQ), conducted qualitative biological surveys during the summer of 2006 to assess point and nonpoint source (NPS) pollution throughout the lower St. Joseph River Watershed (Figure 1). The goals of the monitoring were: 1) support the development of water quality-based effluent limits for National Pollutant Discharge Elimination System (NPDES) permits; 2) support the NPS Program; 3) determine if waters are attaining Michigan Water Quality Standards (WQS); and 4) determine if the quality of the water body is changing over time. The objective of this survey was to qualitatively characterize the biotic integrity of fish and macroinvertebrate communities with respect to existing habitat conditions at selected sites throughout the lower St. Joseph River Watershed. Lipsey (2007 draft) reports the results of surveys conducted by SWAS biologists in the Paw Paw River portion of the lower St. Joseph River Watershed. This report is focused upon all of the lower St. Joseph River Watershed, except the Paw Paw River, from Lake Michigan to the Indiana state line.

The surveys described in this report conducted at wadable sites were conducted according to the guidelines of Great Lakes and Environmental Assessment Section (GLEAS) Procedure 51 (MDEQ, 1990). The warmwater fish communities were scored with metrics that rate water bodies from excellent (+5 to +10) to poor (-5 to -10). The macroinvertebrate communities were scored with metrics that rate water bodies from excellent (+5 to +9) to poor (-5 to -9). Fish and macroinvertebrate ratings from +4 to -4 are considered acceptable. Negative ratings that are acceptable are indicative of water bodies that are strongly tending toward poor, while positive ratings that are acceptable indicate slight impairment (Creal et al., 1996). Fish communities collected from designated coldwater streams were determined to be attaining their coldwater designation if 1 percent (%) or greater of the fish community consisted of salmonids. Stream habitat was qualitatively evaluated at each station using a scoring system, which ranged in value from 0 (poor) to 200 (excellent). Macroinvertebrate community and habitat evaluations conducted during this survey at nonwadable sites were conducted according to a draft SWAS Procedure (MDEQ, 2007 draft). The nonwadable macroinvertebrate communities were scored with metrics that rate water bodies from excellent (76 to 100) to poor (0 to 25).

Two site selection methods were used to assess the lower St. Joseph River Watershed in 2006: stratified random and targeted. A probabilistic monitoring approach, using stratified random site selection to address statewide and regional questions about water quality, was used to select 32 stations throughout the lower St. Joseph River Watershed, which included the Paw Paw River Watershed (MDEQ, 2006 draft). In addition to probabilistic monitoring, sites within the lower St. Joseph River Watershed were selected for targeted monitoring to fulfill specific

monitoring requests, assess known or potential areas of concern, collect information and assess attainment of WQS from areas where historic survey information was lacking, or to collect information related to NPDES permits.

Sampling locations are shown in Figure 1. Fish and macroinvertebrate community ratings and habitat evaluations are given in Tables 1A and 1B, 2A and 2B, and Table 3, respectively. A summary of the sampling results from this survey along with the sampling results from 1996 and 2001 at the same locations are presented in Table 4.

BACKGROUND

The St. Joseph River Watershed is located in the Southern Michigan/Northern Indiana Till Plain ecoregion. Wesley and Duffy (1999) provide an assessment of the St. Joseph River Watershed summarizing the geography, history, geology and hydrology, soils and land use, dams, water quality, biological communities, and recreational use. The locations evaluated during this survey are located in what the St. Joseph River assessment refers to as the lower, and mouth portions of the St. Joseph River Watershed. The management options portion of the assessment details options for consideration and is based upon a watershed approach with goals that are consistent with the mission of the MDEQ.

The Friends of the St. Joseph River Association, Inc. was established in April of 1994 for the purpose of bringing together the people of the communities located within the St. Joseph River Watershed, working as one unit to clean and restore the St. Joseph River and also all rivers, streams, and creeks that flow into the St. Joseph River. The organization published the St. Joseph River Watershed Management Plan in 2005 (DeGraves, 2005) which describes the watershed's location and size, land use and natural history, population, geology, topography, hydrology, and the impaired and threatened designated uses. The plan identifies critical pollutants and concerns, identifies the sources and causes, and establishes seven goals designed to preserve, protect, and restore the watershed. The St. Joseph River Watershed Management Plan as well as additional information regarding the St. Joseph River Watershed can be accessed on the internet at http://www.stjoeriver.net. Kieser & Associates of Kalamazoo, Michigan, provided the technical services and Web site design and programming for the watershed project.

Sampling was conducted by GLEAS biologists at select sites throughout the lower St. Joseph River Watershed in 1991 (Heaton, 1992 and Heaton, 1997a), 1994 (Heaton, 1995a and 1995b), 1996 (Heaton, 1997b, Roush, 2001, and Walterhouse, 1997), and 2001 (Rockafellow, 2002a and 2002b). The historic sampling efforts with Procedure 51 involved the qualitative collection of macroinvertebrates, habitat data, and fishes, along with the collection of sediment and water samples at select sites. In general the surveys documented the presence of acceptable to excellent macroinvertebrate and/or fish communities at 29 locations throughout the watershed in 2001, 13 locations in 1996, and 28 locations in 1991/94, indicative of good water quality. In-stream habitat limitations were identified in portions of Hickory Creek, Big Meadow Drain, Pipestone Creek, Eau Claire Drain, McCoy Creek, Brandywine Creek, McKinzie Creek, and the headwaters of the Dowagiac River and its tributaries. The primary source of the in-stream habitat limitations were activities associated with efforts to maintain homogenous channels designed to rapidly convey excess storm water from the agricultural landscape. The activities included: historic dredging, cutting and spraying herbicides to control the growth of woody vegetation in the riparian zone, and the removal of large woody debris and sediments from the stream channels.

SAMPLING RESULTS

Fish Communities

Fish community sampling was conducted at 2 sites where previous sampling had not been conducted and the stream reach was designated as cold water. Trout accounted for more than 1% of the catch, indicating attainment of the coldwater fish designated use, at sites on Walton Creek at Walton Road (Station 11) and McKenzie Creek at 2271 Thunderbird Drive (Station 21). Brown and Rainbow Trout accounted for nearly 90% of the catch by number from Walton Creek. The size range of both species of trout which were collected indicated the presence of multiple year classes and natural reproduction. The site on McKenzie Creek is downstream of the reach at Barron Lake Road where previous sampling has documented that McKenzie Creek is not meeting its coldwater designated use. Trout accounted for only 2% of the total fish collected but the in-stream habitat at the site was limited by the activities of the riparian land owners who maintain their lawns along one bank to the edge of the water. Large woody debris, overhanging vegetation, undercut stream banks, and pool habitat was limited.

The efficiency of the electrofishing gear was good at each of the sites, sampling crews were comprised of experienced staff, and stream flows were minimal creating ideal sampling conditions to accurately characterize the fish communities inhabiting each of the stream reaches.

Fish sampling was also conducted on the Dowagiac River at Dodd Park with an electrofishing boat and Michigan Department of Natural Resources (MDNR) Fisheries staff. Multiple pass depletion sampling was conducted to estimate trout abundance and characterize the fish community in the dredged reach of the Dowagiac River that will be by-passed and filled in when the meander at Dodd Park is established. The fisheries data collected during the sampling effort can be obtained from MDNR Fisheries staff at the Plainwell District Office at 269-685-6851.

Macroinvertebrate Communities

The macroinvertebrate community scores ranged from 7 to -7 at the 25 wadable sites which were evaluated throughout the watershed. The only site rated as poor, indicative of not meeting the other indigenous aquatic life designated use, was Hickory Creek at Snow Road (Station 2). The site was a small, habitat limited, headwater agricultural ditch, with muck substrate and grassy stream banks. Five sites were rated as excellent and 19 sites were rated as acceptable. Of the 19 sites which were rated as acceptable, 8 of the sites scored in the negative range. The 8 sites with negative scores, tending toward poor that would be considered moderately impaired, were located at the following locations: Hickory Creek at Cleveland Road (Station 1), Pipestone Creek at the west crossing of Naomi Road (Station 3) and the east crossing of Naomi Road (Station 4), Eau Claire Drain off Laberty Road (Station 5) and at Keigley Road (Station 6), Lemon Creek at Andrews University (Station 7) and at Red Bud Trail (Station 8), and Brandywine Creek upstream of U.S. 12 (Station 23). All of these sites were either at stream reaches that had been dredged or were just downstream of dredged reaches. The abundance of sites throughout the watershed that support macroinvertebrate communities that rate either excellent or acceptable with minimal impairment demonstrates general attainment of WQS throughout the watershed.

The macroinvertebrate communities evaluated with the draft nonwadable procedure on the St. Joseph River off Indian Springs Road (Station 26) and off Moccasin Path (Station 27) were scored as good (69) and fair (50), respectively.

Habitat

Overall stream habitat scores, which consider in-stream habitat as well as the adjacent stream banks and riparian habitat at the 25 sites in the lower St Joseph River Watershed ranged from 89 (marginal) to 172 (excellent). Glide/pool metrics were used to evaluate habitat at 14 of the sites and riffle/run metrics were used at the remaining 11 sites. None of the sites in the watershed were rated as poor with the overall stream habitat rating protocol. Overall, stream habitat at 3 of the sites was rated as excellent, 20 sites were rated as good, and 2 were rated as marginal. The sites with better overall habitat that scored excellent included: Dowagiac River off Pucker Drive (Station 12), Dowagiac River at Kinzie Road (Station 14), and Brandywine Creek at Country Club Road (Station 22). The sites where habitat scores were better tended to be natural (unmodified) stream channels with a diversity of substrates including coarse substrates, an abundance of large woody debris, and wide, wooded or wetland corridors adjacent to the stream channel.

Stratified Random Sample Results

In 2006, 86% ± 14% (using a 95% confidence interval) of the streams in the lower St. Joseph River Watershed were estimated to be supporting the other indigenous aquatic life designated use component of Rule 323.1100(1)(e) of Michigan's WQS. This estimate is based the results of sampling 32 sites in the lower St. Joseph River Watershed and includes the Paw Paw River Watershed. Details of these results along with statewide random sampling results will be available later in 2007.

Comparison of 2006 Results to Historic Surveys

Macroinvertebrate community sampling was conducted at 7 stations in 2006 where sampling had also been conducted in 2001 (Table 6). At 6 of the sites the 2006 macroinvertebrate community scores were within plus or minus 3 points of the historic survey results indicating that conditions have probably not changed significantly. Of these 6 sites, scores improved at 1 of the sites, decreased at 3 of the sites and were unchanged at 2 sites. The macroinvertebrate score decreased by 5 points at the site on Brandywine Creek at U.S. 12 (Station 23). The large decrease at the Brandywine Creek site could be related to the different Procedure 51 sampling methods employed in 2006 or the decrease could be an indication that drain maintenance activities and/or farming practices upstream in the watershed have impacted the macroinvertebrate community. The site specific habitat was scored as good during both investigations.

Nonpoint Source (NPS) Problem Summary

A tremendous amount of energy and resources were devoted to developing the St. Joseph River Watershed Management Plan (DeGraves, 2005) and the St. Joseph River Assessment (Wesley and Duffy, 1999). These 2 lengthy documents provide a thorough review of many issues in the St. Joseph River Watershed and include sections devoted to identification of NPS problems and solutions. Together the 2 documents form a solid foundation and need to be consulted and used to guide future activities in the watershed.

Overall, water quality in the lower portion of the St. Joseph River and its tributaries is good. Limitations to the biological communities can be primarily attributed to habitat limitations created by historic and current efforts to quickly drain water from agricultural portions of the watershed. The following site-specific and general problems were observed in 2006:

- Many of the smaller tributaries have been dredged to facilitate drainage of the historic abundant wetland habitat in the watershed. Recovery of these streams is hampered by continued dredging activities, large woody debris removal, and riparian management activities that prevent trees and shrubs from becoming established along the stream banks. The drain maintenance efforts have also produced flashy flow regimes in homogenous stream channels where the unstable sand and silt substrates are slowly being transported downstream.

- Buffer strips are absent along many of the agricultural drains and streams in the watershed and row crops are currently planted to the top of the stream bank. Property owners at many locations maintain nearly all of their property along the stream channel by mowing to the waters edge. Trees and shrubs along the stream banks provide shade and in-stream cover, help stabilize stream banks, and serve as a source for large woody debris in the future.

- Adoption of best management practices in the watershed designed to reduce upland erosion and slow the rate of stream flow throughout the watershed will benefit the aquatic biota residing in the streams throughout the watershed.

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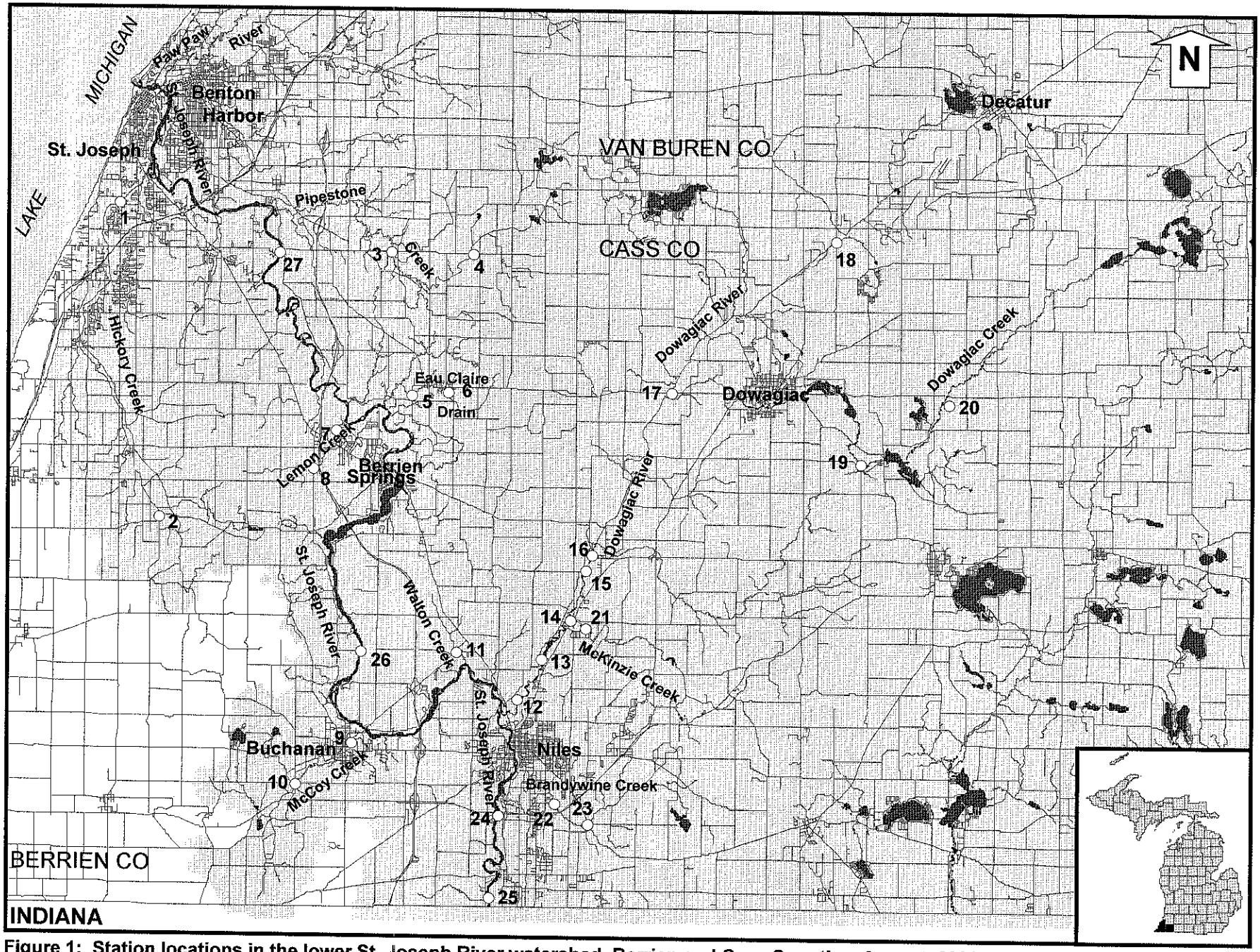

Figure 1: Station locations in the lower St. Joseph River watershed, Berrien and Cass Counties, August, 2006.

Table 1A. Qualitative fish sampling results for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, .

TAXA	Walton Creek Walton Rd 8/14/2006 STATION 11	McKenzie Creek 2271 Thunderbird 8/15/2006 STATION 21
Petromyzontidae (lampreys)		
Lampetra appendix ammocoete (Amer. brook)	1	
Salmonidae (trouts)		
Oncorhynchus mykiss (Rainbow tr.)	3	
Salmo trutta (Brown trout)	44	2
Umbridae (mudminnows)		
Umbra limi (Central mudminnow)	5	
Esocidae (pikes)		
Esox americanus (Grass Pike)		1
Cyprinidae (minnows and carps)		
Nocomis biguttatus (Horneyhead)		7
Semotilus atromaculatus (Creek)		59
Cottidae (sculpins)		
Cottus bairdii (Mottled sculpin)		1
Catostomidae (suckers)		
Catostomus commersoni (W. sucker)		2
Hypentelium nigricans (N. hog sucker)		4
Ictaluridae (Bullhead, Catfish)		
Noturus flavus (Stonecat)		2
Centrarchidae (sunfish)		
Lepomis cyanellus (Green sunfish)		1
Percidae (perch)		
Etheostoma caeruleum (Rainbow d.)		6
Etheostoma nigrum (Johnny darter)		3
TOTAL INDIVIDUALS	53	88
Number of hybrid sunfish	0	0
Number of anomalies	0	0
Percent anomalies	0.000	0.000
Percent salmonids	**88.7**	**2.3**
Reach sampled (ft)	600	400
Area sampled (sq ft)	3,000	8,000
Density (# fish/sq ft)	0.018	0.011
Gear	bps	bps

Table 1B. Fish metric evaluation of select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 20(

METRIC	Walton Creek Walton Rd 8/14/2006 STATION 11 Value	Score	McKenzie Creek 2271 Thunderbird 8/15/2006 STATION 21 Value	Score
TOTAL NUMBER OF TAXA	4		11	
NO. OF DARTER, SCULPIN, MADTOM TAX.	0		4	
NUMBER OF SUNFISH TAXA	0		1	
NUMBER OF SUCKER TAXA	0		2	
NUMBER OF INTOLERANT TAXA	3		5	
PERCENT TOLERANT	9.43		73.86	
PERCENT OMNIVOROUS TAXA	9.43		69.32	
PERCENT INSECTIVOROUS TAXA	0.00		27.27	
PERCENT PISCIVOROUS TAXA	0.00		1.14	
% SIMPLE LITHOPHILIC SPAWNER TAXA	0.00		13.64	
TOTAL SCORE	Not scored		Not scored	

FISH COMMUNITY RATING Both sites attain coldwater designation

Table 2A. Qualitative macroinvertebrate sampling results for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

TAXA	Hickory Creek u/s Cleveland Rd 8/8/2006 STATION 1	Hickory Creek u/s Snow Rd 8/8/2006 STATION 2	Pipestone Creek Naomi Rd-West Crossing 8/9/2006 STATION 3	Pipestone Creek Naomi Rd-East d/s 8/9/2006 STATION 4
PLATYHELMINTHES (flatworms)				
Turbellaria			3	1
ANNELIDA (segmented worms)				
Hirudinea (leeches)		2	1	1
Oligochaeta (worms)		1	6	8
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	72	80	100	
Decapoda (crayfish)	3	2	6	1
Isopoda (sowbugs)	36	151		
Insecta				
Ephemeroptera (mayflies)				
Baetidae	2	4	1	
Heptageniidae	21		15	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	3	1	1	5
Gomphidae	3		1	
Zygoptera (damselflies)				
Calopterygidae	6		3	9
Coenagrionidae			1	9
Hemiptera (true bugs)				
Belostomatidae				1
Corixidae	38	12		9
Gerridae	2	1	1	4
Pleidae				1
Saldidae		3		
Veliidae			1	4
Megaloptera				
Corydalidae (dobson flies)			2	
Sialidae (alder flies)	5			
Trichoptera (caddisflies)				
Brachycentridae	31			
Hydropsychidae	18		23	79
Hydroptilidae	1			
Leptoceridae	1	4		
Limnephilidae	2		1	3
Polycentropodidae	3			
Uenoidae			12	
Coleoptera (beetles)				
Dytiscidae (total)	1			
Gyrinidae (adults)	1	8		
Haliplidae (adults)	5	1		
Elmidae	13	7	67	5
Diptera (flies)				
Ceratopogonidae		2		1
Chironomidae	20	46	5	82
Simuliidae	2	1	3	1
Tabanidae		2		
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)				17
Physidae		12		23
Planorbidae				8
Pleuroceridae			57	
Pelecypoda (bivalves)				
Sphaeriidae (clams)		1	8	1
Unionidae (mussels)				1
TOTAL INDIVIDUALS	289	341	318	274

Table 2B. Macroinvertebrate metric evaluation of select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

METRIC	Hickory Creek u/s Cleveland Rd 8/8/2006 STATION 1 Value	Score	Hickory Creek u/s Snow Rd 8/8/2006 STATION 2 Value	Score	Pipestone Creek Naomi Rd-West Crossing 8/9/2006 STATION 3 Value	Score	Pipestone Creek Naomi Road-East d/s 8/9/2006 STATION 4 Value	Score
TOTAL NUMBER OF TAXA	23	0	20	0	22	0	23	0
NUMBER OF MAYFLY TAXA	2	0	1	-1	2	0	0	-1
NUMBER OF CADDISFLY TAXA	6	1	1	-1	3	0	2	0
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	7.96	0	1.17	-1	5.03	0	0.00	-1
PERCENT CADDISFLY COMP.	19.38	0	1.17	-1	11.32	0	29.93	1
PERCENT DOMINANT TAXON	24.91	0	44.28	-1	31.45	0	29.93	0
PERCENT ISOPOD, SNAIL, LEECH	12.46	-1	48.39	-1	18.24	-1	17.88	-1
PERCENT SURF. AIR BREATHERS	16.26	0	7.33	0	0.63	1	6.93	1
TOTAL SCORE	-1		-7		-1		-2	
MACROINV. COMMUNITY RATING	ACCEPT.		POOR		ACCEPT.		ACCEPT.	

Table 2A (cont.). Qualitative macroinvertebrate sampling results for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

TAXA	EauClaire Drain off Laberty Rd 8/8/2006 STATION 5	Eau Claire Drain Keigley Rd 8/9/2006 STATION 6	Lemon Creek Andrews University Apts 8/8/2006 STATION 7	Lemon Creek u/s of Red Bud Trl 8/8/2006 STATION 8
PLATYHELMINTHES (flatworms)				
Turbellaria		175		
ANNELIDA (segmented worms)				
Hirudinea (leeches)	1	2		2
Oligochaeta (worms)	135	35		4
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	1		214	107
Decapoda (crayfish)				2
Isopoda (sowbugs)	3			1
Arachnoidea				
Hydracarina		6		
Insecta				
Ephemeroptera (mayflies)				
Baetidae			1	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae		5		2
Gomphidae	1			
Zygoptera (damselflies)				
Calopterygidae			16	5
Coenagrionidae		2		22
Hemiptera (true bugs)				
Corixidae				13
Gerridae	1	1	2	1
Veliidae		4	1	1
Trichoptera (caddisflies)				
Hydropsychidae	1		3	3
Limnephilidae	2		1	1
Uenoidae	1		1	
Coleoptera (beetles)				
Dytiscidae (total)	1	1		
Gyrinidae (adults)	7			
Haliplidae (adults)				3
Hydrophilidae (total)	1		1	
Elmidae	2	45	2	10
Diptera (flies)				
Ceratopogonidae	1			1
Chironomidae	88	3	41	102
Simuliidae			1	
Tabanidae	2			
Tipulidae	14		6	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)				1
Physidae	4		3	39
Planorbidae	1			13
Viviparidae				1
Pelecypoda (bivalves)				
Pisidiidae	3			1
Sphaeriidae (clams)		5		
TOTAL INDIVIDUALS	270	284	293	335

Table 2B (cont.). Macroinvertebrate metric evaluation of select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

METRIC	EauClaire Drain Off Laberty Road 8/8/2006 STATION 5		Eau Claire Drain Keigley Rd 8/9/2006 STATION 6		Lemon Creek Andrews University Apts 8/8/2006 STATION 7		Lemon Creek Upstream of Red Bud Trail 8/8/2006 STATION 8	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	20	1	12	1	14	0	22	1
NUMBER OF MAYFLY TAXA	0	-1	0	-1	1	0	0	-1
NUMBER OF CADDISFLY TAXA	3	0	0	-1	3	0	2	0
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	0.00	-1	0.00	-1	0.34	-1	0.00	-1
PERCENT CADDISFLY COMP.	1.48	-1	0.00	-1	1.71	-1	1.19	-1
PERCENT DOMINANT TAXON	50.00	-1	61.62	-1	73.04	-1	31.94	0
PERCENT ISOPOD, SNAIL, LEECH	3.33	1	0.70	1	1.02	1	17.01	-1
PERCENT SURF. AIR BREATHERS	3.70	1	2.11	1	1.37	1	5.37	1
TOTAL SCORE	-2		-3		-2		-3	
MACROINV. COMMUNITY RATING	ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.	

Table 2A (cont.). Qualitative macroinvertebrate sampling results for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

TAXA	McCoy Creek 729 E 3rd St. 8/14/2006 STATION 9	McCoy Creek Bakertown Rd 8/14/2006 STATION 10	Walton Creek Walton Rd 8/14/2006 STATION 11	Dowagiac River 1803 Pucker Dr 8/16/2006 STATION 12
PLATYHELMINTHES (flatworms)				
Turbellaria			3	
ANNELIDA (segmented worms)				
Hirudinea (leeches)		10	1	1
Oligochaeta (worms)	23	12	14	9
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	107	48	132	29
Decapoda (crayfish)	2	1		6
Isopoda (sowbugs)	2	4	38	
Insecta				
Ephemeroptera (mayflies)				
Baetidae	9	24	19	32
Ephemerellidae				1
Heptageniidae	1	2		7
Isonychiidae				3
Odonata				
Anisoptera (dragonflies)				
Aeshnidae		1	1	
Gomphidae				7
Zygoptera (damselflies)				
Calopterygidae	1	22	1	1
Coenagrionidae		1		
Plecoptera (stoneflies)				
Perlidae				7
Pteronarcyidae				5
Hemiptera (true bugs)				
Corixidae	2	33		10
Gerridae		3	1	
Veliidae			1	
Trichoptera (caddisflies)				
Brachycentridae		11	1	73
Glossosomatidae	1		1	1
Hydropsychidae	71	10	32	45
Hydroptilidae	4			
Leptoceridae	1	9	3	2
Limnephilidae		5	4	2
Molannidae		1		
Phryganeidae		1		
Polycentropodidae			6	
Uenoidae	2		1	10
Coleoptera (beetles)				
Dryopidae	1			
Elmidae	3	2	5	14
Diptera (flies)				
Athericidae			5	1
Ceratopogonidae			1	
Chironomidae	26	19	23	17
Culicidae			1	
Simuliidae	15	42	2	6
Stratiomyidae			2	
Syrphidae		4	2	
Tabanidae		2	2	
Tipulidae			3	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	2	5		3
Physidae		2		
Pleuroceridae		1		1
Pelecypoda (bivalves)				
Corbiculidae	10			32
Sphaeriidae (clams)	6			5
TOTAL INDIVIDUALS	289	275	305	330

Table 2B (cont.). Macroinvertebrate metric evaluation of select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

METRIC	McCoy Creek 729 E 3rd St. 8/14/2006 STATION 9 Value	Score	McCoy Creek Bakertown Rd 8/14/2006 STATION 10 Value	Score	Walton Creek Walton Rd 8/14/2006 STATION 11 Value	Score	Dowagiac River 1803 Pucker Dr 8/16/2006 STATION 12 Value	Score
TOTAL NUMBER OF TAXA	20	0	26	1	27	1	27	1
NUMBER OF MAYFLY TAXA	2	0	2	0	1	0	4	1
NUMBER OF CADDISFLY TAXA	5	1	6	1	7	1	6	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	2	1
PERCENT MAYFLY COMP.	3.46	0	9.45	0	6.23	0	13.03	0
PERCENT CADDISFLY COMP.	27.34	0	13.45	0	15.74	0	40.30	1
PERCENT DOMINANT TAXON	37.02	0	17.45	1	43.28	-1	22.12	0
PERCENT ISOPOD, SNAIL, LEECH	1.38	1	8.00	0	12.79	-1	1.52	1
PERCENT SURF. AIR BREATHERS	0.69	1	14.55	0	2.30	1	3.03	1
TOTAL SCORE	2		2		0		7	
MACROINV. COMMUNITY RATING	ACCEPT.		ACCEPT.		ACCEPT.		EXCELLENT	

Table 2A (cont.). Qualitative macroinvertebrate sampling results for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

TAXA	Dowagiac River Mead Rd 8/16/2006 STATION 13	Dowagiac River Kinzie Rd 8/10/2006 STATION 14	Dowagiac River d/s Dodd Park 8/15/2006 STATION 15	Dowagiac River Indian Lake Rd 8/15/2006 STATION 16
PLATYHELMINTHES (flatworms)				
Turbellaria		2	1	
ANNELIDA (segmented worms)				
Hirudinea (leeches)		1	1	9
Oligochaeta (worms)		1	23	11
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	4	43	13	23
Decapoda (crayfish)	1	1	1	1
Isopoda (sowbugs)	1	1		2
Insecta				
Ephemeroptera (mayflies)				
Baetidae	17	2	6	17
Heptageniidae	8	14	4	1
Isonychiidae		1		
Tricorythidae	1			
Odonata				
Anisoptera (dragonflies)				
Aeshnidae			1	1
Gomphidae			1	3
Zygoptera (damselflies)				
Calopterygidae	2	3	2	2
Coenagrionidae				1
Plecoptera (stoneflies)				
Perlidae	10	16	5	2
Pteronarcyidae	4	1		
Hemiptera (true bugs)				
Belostomatidae				1
Corixidae	2		14	55
Gerridae	1	1	1	1
Notonectidae				1
Veliidae	1	1		1
Megaloptera				
Corydalidae (dobson flies)				1
Trichoptera (caddisflies)				
Brachycentridae	140	43	88	96
Glossosomatidae		4	2	
Helicopsychidae			1	
Hydropsychidae	63	64	75	23
Leptoceridae		14	3	18
Limnephilidae			1	1
Philopotamidae				1
Phryganeidae				3
Polycentropodidae			1	
Uenoidae	2	11	4	
Coleoptera (beetles)				
Haliplidae (adults)			5	
Psephenidae (adults)	1			1
Scirtidae (adults)		1		
Elmidae	5	11	7	4
Diptera (flies)				
Chironomidae	12	15	13	9
Simuliidae	4	24	13	4
Tabanidae				1
Tipulidae			1	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	16			9
Physidae			1	1
Pleuroceridae		6	3	3
Pomatiopsidae		1		
Pelecypoda (bivalves)				
Corbiculidae	2	15	11	8
Sphaeriidae (clams)	2		7	
TOTAL INDIVIDUALS	299	297	309	315

Table 2B (cont.). Macroinvertebrate metric evaluation of select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

METRIC	Dowagiac River Mead Rd 8/16/2006 STATION 13 Value	Score	Dowagiac River Kinzie Rd 8/10/2006 STATION 14 Value	Score	Dowagiac River d/s Dodd Park 8/15/2006 STATION 15 Value	Score	Dowagiac River Indian Lake Rd 8/15/2006 STATION 16 Value	Score
TOTAL NUMBER OF TAXA	22	0	26	1	30	1	33	1
NUMBER OF MAYFLY TAXA	3	0	3	0	2	0	2	0
NUMBER OF CADDISFLY TAXA	3	0	5	1	8	1	6	1
NUMBER OF STONEFLY TAXA	2	1	2	1	1	1	1	1
PERCENT MAYFLY COMP.	8.70	0	5.72	0	3.24	0	5.71	0
PERCENT CADDISFLY COMP.	68.56	1	45.79	1	56.63	1	45.08	1
PERCENT DOMINANT TAXON	46.82	-1	21.55	0	28.48	0	30.48	0
PERCENT ISOPOD, SNAIL, LEECH	5.69	0	3.03	1	1.62	1	7.62	0
PERCENT SURF. AIR BREATHERS	1.67	1	1.01	1	6.47	1	19.05	0
TOTAL SCORE	2		6		6		4	
MACROINV. COMMUNITY RATING	ACCEPT.		EXCELLENT		EXCELLENT		ACCEPT.	

Table 2A (cont.). Qualitative macroinvertebrate sampling results for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

TAXA	Dowagiac River u/s of M-62 8/10/2006 STATION 17	Dowagiac River u/s of Atwood Rd 8/9/2006 STATION 18	Dowagiac Creek off Pevine St 8/10/2006 STATION 19	Dowagiac Creek d/s of Dutch Settlement Rd 8/10/2006 STATION 20
PLATYHELMINTHES (flatworms)				
Turbellaria				15
ANNELIDA (segmented worms)				
Hirudinea (leeches)				1
Oligochaeta (worms)	2	3		8
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	41	1	2	51
Decapoda (crayfish)	3			1
Isopoda (sowbugs)	2	4	2	2
Arachnoidea				
Hydracarina				1
Insecta				
Ephemeroptera (mayflies)				
Baetidae	5	4	16	86
Caenidae			1	1
Ephemeridae				1
Heptageniidae	24	7	21	9
Tricorythidae			80	3
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	6	1		
Gomphidae	1	1		1
Zygoptera (damselflies)				
Calopterygidae	8	8	7	15
Coenagrionidae		3		3
Plecoptera (stoneflies)				
Perlidae			1	1
Hemiptera (true bugs)				
Belostomatidae			1	
Corixidae		26		1
Gerridae		1	1	
Mesoveliidae			3	
Veliidae		1	1	
Megaloptera				
Corydalidae (dobson flies)		1		
Trichoptera (caddisflies)				
Brachycentridae	19	147	51	4
Glossosomatidae				10
Helicopsychidae				14
Hydropsychidae	42	27	40	20
Hydroptilidae		1		
Leptoceridae	15			8
Limnephilidae	1	1		5
Phryganeidae	3			
Polycentropodidae	1	1		
Uenoidae	2			17
Lepidoptera (moths)				
Pyralidae			1	
Coleoptera (beetles)				
Haliplidae (adults)		1		
Elmidae	22	4	23	7
Diptera (flies)				
Ceratopogonidae	1			
Chironomidae	10	24	8	33
Dixidae				1
Simuliidae	36	10		24
Tipulidae			1	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	3			
Physidae	1			
Planorbidae				2
Pleuroceridae				4
Pelecypoda (bivalves)				
Corbiculidae				38
Sphaeriidae (clams)		2		
Unionidae (mussels)				1
TOTAL INDIVIDUALS	248	279	260	388

Table 2B (cont.). Macroinvertebrate metric evaluation of select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

METRIC	Dowagiac River u/s of M-62 8/10/2006 STATION 17 Value	Score	Dowagiac River u/s of Atwood Rd 8/9/2006 STATION 18 Value	Score	Dowagiac Creek off Pevine St 8/10/2006 STATION 19 Value	Score	Dowagiac Creek d/s of Dutch Settlement Rd 8/10/2006 STATION 20 Value	Score
TOTAL NUMBER OF TAXA	22	0	23	0	18	0	32	1
NUMBER OF MAYFLY TAXA	2	0	2	0	4	1	5	1
NUMBER OF CADDISFLY TAXA	7	1	5	1	2	0	7	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	1	1	1	1
PERCENT MAYFLY COMP.	11.69	0	3.94	0	45.38	1	25.77	1
PERCENT CADDISFLY COMP.	33.47	1	63.44	1	35.00	1	20.10	0
PERCENT DOMINANT TAXON	16.94	1	52.69	-1	30.77	0	22.16	0
PERCENT ISOPOD, SNAIL, LEECH	2.42	1	1.43	1	0.77	1	2.32	1
PERCENT SURF. AIR BREATHERS	0.00	1	10.39	0	2.31	1	0.26	1
TOTAL SCORE	4		1		6		7	
MACROINV. COMMUNITY RATING	ACCEPT.		ACCEPT.		EXCELLENT		EXCELLENT	

Table 2A (cont.). Qualitative macroinvertebrate sampling results for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

TAXA	McKenzie Creek 2271 Thunderbird 8/15/2006 STATION 21	Brandywine Creek County Club Rd 1550-1563 8/16/2006 STATION 22	Brandywine Creek US-12 8/16/2006 STATION 23	St. Joseph River u/s US 12 8/17/2006 STATION 24
PLATYHELMINTHES (flatworms)				
Turbellaria	1	2		
ANNELIDA (segmented worms)				
Hirudinea (leeches)			1	2
Oligochaeta (worms)	4	4	22	4
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	117	100	27	44
Decapoda (crayfish)	1	1	1	
Isopoda (sowbugs)		1	4	3
Arachnoidea				
Hydracarina	1	1		
Insecta				
Ephemeroptera (mayflies)				
Baetidae	2	3		2
Caenidae				4
Ephemerellidae				1
Ephemeridae	1			
Heptageniidae	13	8	1	3
Tricorythidae				11
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	3	2	1	
Gomphidae	9			2
Libellulidae				5
Zygoptera (damselflies)				
Calopterygidae	6	7	1	1
Coenagrionidae				37
Plecoptera (stoneflies)				
Perlidae	5			
Perlodidae		1		
Pteronarcyidae	1			
Hemiptera (true bugs)				
Corixidae			1	
Gerridae	1	1		2
Veliidae	1			4
Megaloptera				
Sialidae (alder flies)				1
Trichoptera (caddisflies)				
Brachycentridae	4	2	32	
Glossosomatidae	1	8		
Helicopsychidae	1			1
Hydropsychidae	19	68	30	1
Hydroptilidae		1	3	
Leptoceridae	1	2		5
Limnephilidae	4	1		3
Molannidae		1		
Philopotamidae	1			
Phryganeidae				2
Uenoidae	9	1		
Coleoptera (beetles)				
Dytiscidae (total)				1
Gyrinidae (adults)				1
Haliplidae (adults)			2	21
Hydrophilidae (total)		1	1	
Psephenidae (adults)	17			
Elmidae	58	1	1	8
Diptera (flies)				
Athericidae		1		
Ceratopogonidae		1		2
Chironomidae	7	22	42	65
Simuliidae	6	71	75	
Tabanidae				1
Tipulidae		4		
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	2	1	1	
Physidae	3		17	16
Planorbidae		13		27
Pleuroceridae	30			74
Viviparidae	3			9
Pelecypoda (bivalves)				
Corbiculidae	15			22
Sphaeriidae (clams)	10	1	36	
TOTAL INDIVIDUALS	357	331	299	385

Table 2B (cont.). Macroinvertebrate metric evaluation of select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

METRIC	McKenzie Creek 2271 Thunderbird 8/15/2006 STATION 21 Value	Score	Brandywine Creek County Club Rd 1550-1563 8/16/2006 STATION 22 Value	Score	Brandywine Creek US-12 8/16/2006 STATION 23 Value	Score	St. Joseph River Upsteam US 12 8/17/2006 STATION 24 Value	Score
TOTAL NUMBER OF TAXA	33	1	30	1	20	0	33	1
NUMBER OF MAYFLY TAXA	3	0	2	0	1	-1	5	1
NUMBER OF CADDISFLY TAXA	8	1	8	1	3	0	5	1
NUMBER OF STONEFLY TAXA	2	1	1	1	0	-1	0	-1
PERCENT MAYFLY COMP.	4.48	0	3.32	0	0.33	-1	5.45	0
PERCENT CADDISFLY COMP.	11.20	0	25.38	0	21.74	0	3.12	-1
PERCENT DOMINANT TAXON	32.77	0	30.21	0	25.08	0	19.22	1
PERCENT ISOPOD, SNAIL, LEECH	10.64	-1	4.53	0	7.69	0	34.03	-1
PERCENT SURF. AIR BREATHERS	5.32	1	0.60	1	1.34	1	7.53	0
TOTAL SCORE	3		4		-2		1	
MACROINV. COMMUNITY RATING	ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.	

Table 2A (cont.). Qualitative macroinvertebrate sampling results for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

TAXA	St. Joseph River Bertrand Park 8/17/2006 STATION 25
PLATYHELMINTHES (flatworms)	
Turbellaria	1
ANNELIDA (segmented worms)	
Oligochaeta (worms)	1
ARTHROPODA	
Crustacea	
Amphipoda (scuds)	8
Decapoda (crayfish)	1
Insecta	
Ephemeroptera (mayflies)	
Baetidae	3
Ephemerellidae	1
Heptageniidae	5
Leptophlebiidae	6
Tricorythidae	22
Odonata	
Anisoptera (dragonflies)	
Gomphidae	1
Libellulidae	1
Zygoptera (damselflies)	
Calopterygidae	2
Coenagrionidae	29
Hemiptera (true bugs)	
Gerridae	3
Veliidae	1
Megaloptera	
Sialidae (alder flies)	1
Trichoptera (caddisflies)	
Brachycentridae	11
Helicopsychidae	1
Hydropsychidae	3
Leptoceridae	6
Phryganeidae	2
Polycentropodidae	1
Coleoptera (beetles)	
Dytiscidae (total)	1
Haliplidae (adults)	1
Dryopidae	1
Elmidae	20
Diptera (flies)	
Chironomidae	47
MOLLUSCA	
Gastropoda (snails)	
Physidae	15
Planorbidae	27
Pleuroceridae	55
Viviparidae	3
Pelecypoda (bivalves)	
Corbiculidae	47
Pisidiidae	1
Sphaeriidae (clams)	3
TOTAL INDIVIDUALS	331

Table 2B (cont.). Macroinvertebrate metric evaluation of select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

METRIC	St. Joseph River Bertrand Park 8/17/2006 STATION 25 Value	Score
TOTAL NUMBER OF TAXA	34	1
NUMBER OF MAYFLY TAXA	5	1
NUMBER OF CADDISFLY TAXA	6	1
NUMBER OF STONEFLY TAXA	0	-1
PERCENT MAYFLY COMP.	11.18	0
PERCENT CADDISFLY COMP.	7.25	0
PERCENT DOMINANT TAXON	16.62	1
PERCENT ISOPOD, SNAIL, LEECH	30.21	-1
PERCENT SURF. AIR BREATHERS	1.81	1
TOTAL SCORE	3	

MACROINV. COMMUNITY RATING ACCEPT.

Table 2A (cont) Qualitative macroinvertebrate sampling results for select waterbodies in the St. Joseph River Watershed, Berrien and Cass Counties, September 2006.

TAXA	St. Joseph River Off Indian Springs Road STATION 26	St. Joseph River Off Mocassin Path STATION 27
PORIFERA (sponges)	1	
PLATYHELMINTHES (flatworms)		
Turbellaria		1
ANNELIDA (segmented worms)		
Oligochaeta (worms)	2	3
ARTHROPODA		
Crustacea		
Amphipoda (scuds)	14	1
Decapoda (crayfish)	1	1
Isopoda (sowbugs)	4	1
Arachnoidea		
Hydracarina	1	
Insecta		
Ephemeroptera (mayflies)		
Baetiscidae	1	
Baetidae		3
Caenidae	1	
Ephemeridae	1	
Heptageniidae	4	3
Isonychiidae		1
Potamanthidae		1
Siphlonuridae	2	
Tricorythidae		1
Odonata		
Anisoptera (dragonflies)		
Aeshnidae	1	
Gomphidae		1
Zygoptera (damselflies)		
Calopterygidae	1	
Coenagrionidae	16	1
Hemiptera (true bugs)		
Corixidae		37
Gerridae	3	1
Mesoveliidae		1
Veliidae		1
Megaloptera		
Sialidae (alder flies)		1
Trichoptera (caddisflies)		
Brachycentridae	1	1
Hydropsychidae		5
Leptoceridae	1	1
Limnephilidae	1	
Molannidae	1	
Polycentropodidae	1	
Coleoptera (beetles)		
Gyrinidae (adults)		2
Haliplidae (adults)	1	
Elmidae	1	6
Diptera (flies)		
Ceratopogonidae	1	
Chironomidae	34	33
Simuliidae		1
Tipulidae		1
MOLLUSCA		
Gastropoda (snails)		
Ancylidae (limpets)	1	
Physidae		3
Pleuroceridae		3
Pelecypoda (bivalves)		
Corbiculidae	2	4
Sphaeriidae (clams)		3
TOTAL INDIVIDUALS	98	122

Table 2B (cont). Macroinvertebrate metric evaluation of select waterbodies in the St. Joseph River Watershed, Berrien and Cass Counties, September 2006.

METRIC	St. Joseph River Off Indian Springs Road STATION 26 Value	Score	St. Joseph River Off Mocassin Path STATION 27 Value	Score
FFG Diversity (25)	1.9	25	1.4	8
Habitat Stability FFG Surrogate (25)	0.16	8	0.28	8
% Trichoptera (20)	5.1	14	5.7	14
EPT Richness (8)	10	8	8	6
Total Richness (7)	26	7	29	7
Diptera Richness (5)	2	2	3	2
Plecoptera Richness (5)	0	0	0	0
% Dominance (5)	35	5	30	5
TOTAL SCORE (100)	69		50	
MACROINV. COMMUNITY RATING	Good		Fair	

Table 3. Habitat evaluation for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

HABITAT METRIC	Hickory Creek u/s Cleveland Rd GLIDE/POOL STATION 1	Hickory Creek u/sSnow Rd GLIDE/POOL STATION 2	Pipestone Creek Naomi Rd-West Crossing RIFFLE/RUN STATION 3	Pipestone Creek Naomi Rd-East d/s GLIDE/POOL STATION 4	Eau Claire Drain Off Laberty Rd RIFFLE/RUN STATION 5
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover	8	13	11	6	10
Embeddedness*			15		10
Velocity/Depth Regime*			13		11
Pool Substrate Characterization**	8	11		10	
Pool Variability**	6	3		8	
Channel Morphology					
Sediment Deposition	10	10	15	6	6
Flow Status - Maint. Flow Volume	9	9	8	8	9
Flow Status - Flashiness	5	8	5	6	5
Channel Alteration	10	6	16	15	16
Frequency of Riffles/Bends*			15		13
Channel Sinuosity**	5	1		10	
Riparian and Bank Structure					
Bank Stability (L)	9	9	8	8	6
Bank Stability (R)	8	9	8	8	6
Vegetative Protection (L)	4	5	5	8	8
Vegetative Protection (R)	9	2	9	8	8
Riparian Veg. Zone Width (L)	9	2	5	5	10
Riparian Veg. Zone Width (R)	9	1	10	5	10
TOTAL SCORE (200):	109	89	143	111	128
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY 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:	8/8/2006	8/8/2006	8/9/2006	8/9/2006	8/8/2006
Weather:	Sunny	Sunny	Sunny	Sunny	Sunny
Air Temperature:	75 Deg. F.	77 Deg. F.	78 Deg. F.	75 Deg. F.	67 Deg. F.
Water Temperature:	64 Deg. F.	63 Deg. F.	70 Deg. F.	74 Deg. F.	60 Deg. F.
Ave. Stream Width:	25 Feet	15 Feet	30 Feet	30 Feet	6 Feet
Ave. Stream Depth:	1 Feet	1 Feet	0.4 Feet	1 Feet	0.25 Feet
Surface Velocity:	0.8 Ft./Sec.	0.5 Ft./Sec.	0.9 Ft./Sec.	0.25 Ft./Sec.	0.75 Ft./Sec.
Estimated Flow:	20 CFS	7.5 CFS	10.8 CFS	7.5 CFS	1.125 CFS
Stream Modifications:	Dredged, Snagging	Dredged, snagging	None	Dredged	None
Nuisance Plants (Y/N):	N	N	N	N	N
STORET No.:	110744	110732	110735	110736	110734
Stream Name:	Hickory Creek	Hickory Creek	Pipestone Creek	Pipestone Creek	Eau Claire Drain
Road Crossing/Location:	u/s Cleveland Rd	u/s Snow Rd	Naomi Rd-West Crossing	Naomi Road-East d/s	Off Laberty Rd
County Code:	11	11	11	11	11
TRS:	05S19W03	06S19W25	05S17W18	05S17W16	06S17W05
VSEC:	WS 631	WS 631	CS 639	CS 639	CS 1829
Latitude (dd):	42.06316	41.92741	42.04322	42.04268	41.98189
Longitude (dd):	-86.49499	-86.4704	-86.33345	-86.28461	-86.32038
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4050001	4050001	4050001	4050001	4050001

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

COMMENTS:

Table 3 (cont.). Habitat evaluation for select waterbodies in the St. Josepfh River watershed, Berrien and Cass Counties, August 2006.

HABITAT METRIC	Eau Claire Drain Keigley Rd RIFFLE/RUN STATION 6	Lemon Creek Andrews University Apts RIFFLE/RUN STATION 7	Lemon Creek u/sf Red Bud Trl GLIDE/POOL STATION 8	McCoy Creek 729 E 3rd St RIFFLE/RUN STATION 9	McCoy Creek Bakertown Rd GLIDE/POOL STATION 10
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover	6	8	8	11	11
Embeddedness*	11	11		16	
Velocity/Depth Regime*	10	11		15	
Pool Substrate Characterization**			10		13
Pool Variability**			11		13
Channel Morphology					
Sediment Deposition	13	11	11	18	11
Flow Status - Maint. Flow Volume	8	8	9	9	9
Flow Status - Flashiness	8	4	8	8	9
Channel Alteration	10	16	13	11	11
Frequency of Riffles/Bends*	15	16		20	
Channel Sinuosity**			8		6
Riparian and Bank Structure					
Bank Stability (L)	8	5	8	9	9
Bank Stability (R)	8	5	8	9	9
Vegetative Protection (L)		9	3	5	10
Vegetative Protection (R)		9	7	5	10
Riparian Veg. Zone Width (L)		7	2	2	3
Riparian Veg. Zone Width (R)		7	6	4	10
TOTAL SCORE (200):	97	127	112	142	134
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY 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:	8/9/2006	8/8/2006	8/8/2006	8/14/2006	8/14/2006
Weather:		Sunny	Sunny	Sunny	Partly Cloudy
Air Temperature:	61 Deg. F.	73 Deg. F.	73 Deg. F.	82 Deg. F.	82 Deg. F.
Water Temperature:	62 Deg. F.	61 Deg. F.	66 Deg. F.	68 Deg. F.	68 Deg. F.
Ave. Stream Width:	3 Feet	10 Feet	4 Feet	15 Feet	15 Feet
Ave. Stream Depth:	0.3 Feet	0.3 Feet	0.3 Feet	0.5 Feet	1 Feet
Surface Velocity:	0.75 Ft./Sec.	1 Ft./Sec.	1 Ft./Sec.	1 Ft./Sec.	0.5 Ft./Sec.
Estimated Flow:	0.675 CFS	3 CFS	1.2 CFS	7.5 CFS	7.5 CFS
Stream Modifications:		None	Dredged	Relocated, Bank Stablization	Dredged
Nuisance Plants (Y/N):	N	N	N	N	N
STORET No.:	110635	110668	110733	110743	110663
Stream Name:	Eau Claire Drain	Lemon Creek	Lemon Creek	McCoy Creek	McCoy Creek
Road Crossing/Location:	Keigley Rd	Andrews University Apts	u/s of Red Bud Trl	729 E 3rd St	Bakertown Rd
County Code:	11	11	11	11	11
TRS:	06s17w04	06S18W11	06S18W15	07S18W25	07S18W34
VSEC:	CS 1829	CS 1830	CS 1830	Target	Target
Latitude (dd):	41.98322	41.96583	41.94944	41.83082	41.81293
Longitude (dd):	-86.29821	-86.365	-86.37874	-86.3544	-86.3877
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4050001	4050001	4050001	4050001	4050001

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

COMMENTS:

Table 3 (cont.). Habitat evaluation for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

HABITAT METRIC	Walton Creek Walton Rd RIFFLE/RUN STATION 11	Dowagiac River 1803 Pucker Dr RIFFLE/RUN STATION 12	Dowagiac River Mead Rd GLIDE/POOL STATION 13	Dowagiac River Kinzie Rd RIFFLE/RUN STATION 14	Dowagiac River d/s Dodd Park RIFFLE/RUN STATION 15
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover	11	17	6	16	11
Embeddedness*	13	18		16	18
Velocity/Depth Regime*	10	16		18	15
Pool Substrate Characterization**			11		
Pool Variability**			2		
Channel Morphology					
Sediment Deposition	10	16	1	16	16
Flow Status - Maint. Flow Volume	9	8	9	9	9
Flow Status - Flashiness	9	9	9	9	8
Channel Alteration	20	20	16	15	11
Frequency of Riffles/Bends*	15	18		10	8
Channel Sinuosity**			11		
Riparian and Bank Structure					
Bank Stability (L)	9	7	9	7	8
Bank Stability (R)	9	7	9	9	8
Vegetative Protection (L)	9	9	9	8	9
Vegetative Protection (R)	9	9	9	10	9
Riparian Veg. Zone Width (L)	10	9	3	8	10
Riparian Veg. Zone Width (R)	10	9	6	10	8
TOTAL SCORE (200):	153	172	110	161	148
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON-IMPAIRED)	GOOD (SLIGHTLY 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:	8/14/2006	8/16/2006	8/16/2006	8/10/2006	8/15/2006
Weather:	Partly Cloudy	Sunny	Sunny	Partly Cloudy	Sunny
Air Temperature:	80 Deg. F.	80 Deg. F.	75 Deg. F.	76 Deg. F.	75 Deg. F.
Water Temperature:	60 Deg. F.	66 Deg. F.	67 Deg. F.	67 Deg. F.	66 Deg. F.
Ave. Stream Width:	5 Feet	70 Feet	100 Feet	60 Feet	50 Feet
Ave. Stream Depth:	0.2 Feet	1 Feet	0.75 Feet	1 Feet	2 Feet
Surface Velocity:	0.5 Ft./Sec.	1.5 Ft./Sec.	0.5 Ft./Sec.	1 Ft./Sec.	1 Ft./Sec.
Estimated Flow:	0.5 CFS	105 CFS	37.5 CFS	60 CFS	100 CFS
Stream Modifications:	None	None	Impounded	None	Dredged
Nuisance Plants (Y/N):	N	N	N	N	N
STORET No.:	110738	110742	110661	110737	140154
Stream Name:	Walton Creek	Dowagiac River	Dowagiac River	Dowagiac River	Dowagiac River
Road Crossing/Location:	Walton Rd	1803 Pucker Dr	Mead Rd	Kinzie Rd	d/s Dodd Park
County Code:	11	11	11	11	14
TRS:	07S17W09	07S17W23	07S17W33	07S17W01	06S16W31
VSEC:	Target	CL 127	Target	CL 127	Target
Latitude (dd):	41.87096	41.85109	41.86854	41.88475	41.90658
Longitude (dd):	-86.29281	-86.25721	-86.24209	-86.22522	-86.2169
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4050001	4050001	4050001	4050001	4050001

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

COMMENTS:

Table 3 (cont.). Habitat evaluation for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

HABITAT METRIC	Dowagiac River Indian Lake Rd GLIDE/POOL STATION 16	Dowagiac River u/s of M-62 GLIDE/POOL STATION 17	Dowagiac River u/s of Atwood Rd GLIDE/POOL STATION 18	Dowagiac Creek Off Pevine St GLIDE/POOL STATION 19	Dowagiac Creek d/s of Dutch Settlement Rd GLIDE/POOL STATION 20
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover	11	9	8	2	10
Embeddedness*					
Velocity/Depth Regime*					
Pool Substrate Characterization**	13	16	8	6	16
Pool Variability**	8	10	8	2	10
Channel Morphology					
Sediment Deposition	10	14	16	0	15
Flow Status - Maint. Flow Volume	9	10	10	5	9
Flow Status - Flashiness	8	6	6	5	9
Channel Alteration	11	13	11	16	16
Frequency of Riffles/Bends*					
Channel Sinuosity**	6	3	3	16	16
Riparian and Bank Structure					
Bank Stability (L)	9	7	8	9	9
Bank Stability (R)	9	7	8	9	9
Vegetative Protection (L)	10	9	9	10	9
Vegetative Protection (R)	4	9	9	10	5
Riparian Veg. Zone Width (L)	10	5	7	10	8
Riparian Veg. Zone Width (R)	3	5	7	10	1
TOTAL SCORE (200):	121	123	118	110	142
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY 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:	8/15/2006	8/10/2006	8/9/2006	8/10/2006	8/10/2006
Weather:		Partly Cloudy	Sunny	Partly Cloudy	Cloudy
Air Temperature:	78 Deg. F.	73 Deg. F.	69 Deg. F.	70 Deg. F.	75 Deg. F.
Water Temperature:	66 Deg. F.	66 Deg. F.	73 Deg. F.	68 Deg. F.	67 Deg. F.
Ave. Stream Width:	70 Feet	36 Feet	30 Feet	35 Feet	33 Feet
Ave. Stream Depth:	1.5 Feet	2.5 Feet	2 Feet	1.4 Feet	1 Feet
Surface Velocity:	0.5 Ft./Sec.	0.75 Ft./Sec.	0.75 Ft./Sec.	0.5 Ft./Sec.	1 Ft./Sec.
Estimated Flow:	52.5 CFS	67.5 CFS	45 CFS	24.5 CFS	33 CFS
Stream Modifications:	Dredged	Dredged	Dredged, Snagging	None	None
Nuisance Plants (Y/N):	N	N	N	N	N
STORET No.:	140155	140142	140168	140169	140004
Stream Name:	Dowagiac River	Dowagiac River	Dowagiac River	Dowagiac Creek	Dowagiac Creek
Road Crossing/Location:	Indian Lake Rd	u/s of M-62	u/sof Atwood Rd	Off Pevine St	d/s of Dutch Settlement Rd
County Code:	14	14	14	14	14
TRS:	06S16W30	05S16W33	05S15W09	06S15W16	06S15W01
VSEC:	Target	CM 151	CM 151	CM 1851	CS 1853
Latitude (dd):	41.91329	41.98413	42.04965	41.95358	41.980004
Longitude (dd):	-86.21318	-86.16609	-86.06914	-86.05404	-86.00139
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Warmwater	Coldwater
USGS Basin Code:	4050001	4050001	4050001	4050001	4050001

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

COMMENTS:

Table 3 (cont.). Habitat evaluation for select waterbodies in the St. Joseph River watershed, Berrien and Cass Counties, August 2006.

HABITAT METRIC	McKenzie Creek 2271 Thunderbird RIFFLE/RUN STATION 21	Brandywine Creek County Club Rd 1550-1563 RIFFLE/RUN STATION 22	Brandywine Creek US-12 GLIDE/POOL STATION 23	St. Joseph River u/s US 12 GLIDE/POOL STATION 24	St. Joseph River Bertrand Park GLIDE/POOL STATION 25
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover	11	15	11	11	13
Embeddedness*	16	16			
Velocity/Depth Regime*	15	15			
Pool Substrate Characterization**			11	11	11
Pool Variability**			11	11	11
Channel Morphology					
Sediment Deposition	13	15	11	15	15
Flow Status - Maint. Flow Volume	10	10	9	7	7
Flow Status - Flashiness	9	10	9	5	5
Channel Alteration	16	20	8	20	20
Frequency of Riffles/Bends*	16	16			
Channel Sinuosity**			6	16	16
Riparian and Bank Structure					
Bank Stability (L)	9	10	9	8	7
Bank Stability (R)	9	10	9	8	7
Vegetative Protection (L)	10	8	6	7	6
Vegetative Protection (R)	1	5	6	7	6
Riparian Veg. Zone Width (L)	10	9	8	5	5
Riparian Veg. Zone Width (R)	1	2	10	5	5
TOTAL SCORE (200):	146	161	124	136	134
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:	8/15/2006	8/16/2006	8/16/2006	8/17/2006	8/17/2006
Weather:	Sunny	Sunny	Sunny	Sunny	Sunny
Air Temperature:	75 Deg. F.	65 Deg. F.	53 Deg. F.	65 Deg. F.	Deg. F.
Water Temperature:	70 Deg. F.	58 Deg. F.	56 Deg. F.	71 Deg. F.	71 Deg. F.
Ave. Stream Width:	20 Feet	18 Feet	12 Feet	360 Feet	300 Feet
Ave. Stream Depth:	0.45 Feet	0.4 Feet	1.5 Feet	6 Feet	6 Feet
Surface Velocity:	0.75 Ft./Sec.	0.9 Ft./Sec.	0.5 Ft./Sec.	1 Ft./Sec.	1 Ft./Sec.
Estimated Flow:	6.75 CFS	6.48 CFS	9 CFS	2160 CFS	1800 CFS
Stream Modifications:	None	None	Dredged	None	None
Nuisance Plants (Y/N):	N	N	N	N	N
STORET No.:	140167	110739	140111	110741	110740
Stream Name:	McKenzie Creek	Brandywine Creek	Brandywine Creek	St. Joseph River	St. Joseph River
Road Crossing/Location:	2271 Thunderbird	County Club Rd 1550-1563	US-12	u/s US 12	Bertrand Park
County Code:	14	11	14	11	11
TRS:	07S16W07	08S17W01	08S16W06	08S17W03	08S17W22
VSEC:	Target	CS 1833	CS 1833	WVL 2184	WVL 2184
Latitude (dd):	41.882	41.80598	41.79694	41.80051	41.76488
Longitude (dd):	-86.21682	-86.23458	-86.21472	-86.26751	-86.27295
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Warmwater	Warmwater
USGS Basin Code:	4050001	4050001	4050001	4050001	4050001
* Applies only to Riffle/Run stream Surveys					
** Applies only to Glide/Pool stream Surveys					
COMMENTS:				west bank	east bank

Table 4. Summary of P-51 sampling results in the lower St. Joseph River watershed, 2006, and historic sample results at common sites in 2001.

Station Number	Location	Dredged	2006 Macroinvertebrate Community Rating	2006 Habitat Rating	2001 Macroinvertebrate Community Rating
1	Hickory Creek u/s Cleveland Rd	Yes	Acceptable (-1)	Good (109)	
2	Hickory Creek u/s Snow Rd	Yes	Poor (-7)	Marginal (89)	
3	Pipestone Creek u/s Naomi Rd (west)	No	Acceptable (-1)	Good (143)	
4	Pipestone Creek d/s Naomi Rd (east)	Yes	Acceptable (-2)	Good (111)	
5	Eau Claire Drain off Laberty Rd	No	Acceptable (-2)	Good (128)	
6	Eau Claire Drain u/s Keigley Rd	Yes	Acceptable (-3)	Marginal (97)	Acceptable (0)
7	Lemon Creek at Andrews University	No	Acceptable (-2)	Good (127)	Acceptable (1)
8	Lemon Creek u/s Red Bud Trail	Yes	Acceptable (-3)	Good (112)	
9	McCoy Creek 729 East 3rd Street	Yes	Acceptable (2)	Good (142)	
10	McCoy Creek u/s Bakertown Rd	Yes	Acceptable (2)	Good (134)	Excellent (5)
11	Walton Creek u/s Walton Rd	No	Acceptable (0)	Good (153)	
12	Dowagiac River 1803 Pucker Drive	No	Excellent (7)	Excellent (172)	
13	Dowagiac River at Mead Rd	Impound	Acceptable (2)	Good (110)	Acceptable (2)
14	Dowagiac River u/s Kinzie Rd	No	Excellent (6)	Excellent (161)	
15	Dowagiac River d/s Dodd Park	Yes	Excellent (6)	Good (148)	Excellent (6)
16	Dowagiac River u/s Indian Lake Rd	Yes	Acceptable (4)	Good (121)	Acceptable (1)
17	Dowagiac River u/s M -62	Yes	Acceptable (4)	Good (123)	
18	Dowagiac River u/s Atwood Rd	Yes	Acceptable (1)	Good (118)	
19	Dowagiac Creek off Pevine Street	No	Excellent (6)	Good (110)	
20	Dowagiac Creek d/s Dutch Settlement Rd	No	Excellent (7)	Good (142)	
21	McKinzie Creek 2271 Thunderbird	No	Acceptable (3)	Good (142)	
22	Brandywine Creek 1500-1563 Country Club Rd	No	Acceptable (4)	Excellent (161)	
23	Brandywine Creek u/s US -12	Yes	Acceptable (-2)	Good (124)	Acceptable (3)
24	St. Joseph River at Bertrand Park	No	Acceptable (3)	Good (134)	
25	St. Joseph River u/s US -12	No	Acceptable (1)	Good (136)	
26	St. Joseph River off Indian Springs Rd	No	Good (69)	Data	
27	St. Joseph River off Mocassin Path	No	Fair (50)	Data	

Values in parentheses are the calculated scores.
Stations 26 and 27 are nonwadable sites with scores from 0 (poor) to 100 (excellent)