

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER RESOURCES DIVISION
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STAFF REPORT

A BIOLOGICAL SURVEY OF SITES IN THE LOWER ST. JOSEPH RIVER WATERSHED
BERRIEN, CASS, AND VAN BUREN COUNTIES, MICHIGAN
AUGUST 2011

INTRODUCTION

Staff of the Surface Water Assessment Section (SWAS), Water Resources Division, Michigan Department of Environmental Quality (MDEQ), conducted qualitative biological surveys during the summer of 2011 to assess point and nonpoint source (NPS) pollution throughout the lower St. Joseph River Watershed (Figure 1). The specific objectives addressed by this monitoring effort were to: (1) support and/or evaluate the effectiveness of the NPS Program, (2) assess the current status and condition of individual waters of the state and determine whether Michigan Water Quality Standards are being met, (3) evaluate biological integrity temporal trends, and (4) satisfy water monitoring requests submitted by internal and external customers.

The St. Joseph River Watershed is located in the Southern Michigan/Northern Indiana Till Plain ecoregion. Wesley and Duffy (1999) provided a comprehensive review 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 sites 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 report details options for consideration addressing geology and hydrology, channel morphology, soils and land use patterns, dams and barriers, water quality, special jurisdictions, biological communities, fishery management, recreational use, and citizen involvement. The management options are based upon a watershed approach that is consistent with the goal of maintaining biotic integrity.

The Friends of the St. Joseph River Association, Inc. was established in April 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 all tributaries in the St. Joseph River watershed. 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, 2009). Kieser & Associates of Kalamazoo, Michigan, provided the technical services and Web site design and programming for the watershed project.

Watershed management plans have also been developed for the Dowagiac River and Paw Paw River watersheds. The watershed management plans for these sub-watersheds of the lower

St. Joseph River watershed serve as guides for communities to protect and improve the water quality. Additional information regarding the watershed management plans for these areas of the lower St. Joseph River watershed can be found on the State of Michigan's web page (www.michigan.gov/deq) by linking to Water, Surface Water, and Nonpoint source pollution (MDEQ, n.d.).

Sampling was conducted by SWAS biologists at select sites throughout the lower St. Joseph River Watershed in 1991 (Heaton, 1992; 1997a), 1994 (Heaton, 1995a; 1995b), 1996 (Heaton, 1997b; Roush, 2001; Walterhouse, 1997), 2001 (Rockafellow, 2002a; 2002b), and 2006 (Walterhouse, 2007). 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 26 of 27 locations throughout the watershed in 2006, 29 locations throughout the watershed in 2001, 13 locations in 1996, and 28 locations in 1991/1994, 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.

METHODS

Two site selection methods were used to assess the lower St. Joseph River watershed in 2011: (1) stratified random; and (2) targeted. Thirty-one randomly selected sites within the lower St. Joseph River Watershed (including the Paw Paw River watershed) were assigned to support the Section's Status and Trend Program (MDEQ, 2011a). These sites will be used to estimate the watershed and statewide attainment status for the "other indigenous aquatic life" designated use component of R 323.1100(e) of the Michigan Water Quality Standards (WQS), and will be used to measure spatial and temporal trends. Lipsey (2012) reported the results of the sampling efforts at nine of the status and trend sites which were in the Paw Paw River watershed. The sampling results at the other 22 status and trend sites along with the survey results from 5 targeted sites are presented in this report.

Macroinvertebrate community and habitat evaluations conducted during this survey at nonwadeable sites were completed by staff of the Great Lakes Environmental Center (GLEC) with funding from MDEQ. GLEC staff conducted the monitoring according to a draft SWAS Procedure (MDEQ, 2011b). The nonwadeable macroinvertebrate communities were scored with metrics that rate water bodies from excellent (76 to 100) to poor (0 to 25).

The surveys described in this report at wadeable sites were conducted according to the guidelines of the SWAS Procedure 51 (MDEQ, 1990). The macroinvertebrate communities were scored with metrics that rate water bodies from excellent (+5 to +9) to poor (-5 to -9). 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). Stream habitat was qualitatively evaluated at each station using a scoring system, which ranged in value from 0 to 135.

Sampling locations are shown in Figure 1. The nonwadeable macroinvertebrate community sampling results, scores, and ratings are presented in Table 1. The Procedure 51 macroinvertebrate community scores and ratings, and habitat evaluations are given in Tables 2a, 2b and 3, respectively. A summary of the station locations and sampling results from this survey are presented in Table 4.

Digital images were taken upstream and downstream at each of the sites that were surveyed during this investigation and are available upon request.

RESULTS

Status and Trend, Stratified Random Sample Results

In 2011, all of the 22 randomly selected sites, 19 status and 3 trend sites, in lower St. Joseph River watershed (excluding the Paw Paw River watershed) were documented as supporting the other indigenous aquatic life designated use component of R 323.1100(1) (e) of Michigan's WQS. One of the sites was randomly selected as both a status and a trend site. Lipsey (2012) reported that all nine of the randomly selected sites in the Paw Paw River watershed that were surveyed in 2011 were also supporting the other indigenous aquatic life designated use component of Michigan's WQS. Details of these results along with statewide random sampling results will be available in a separate report at a later date.

Macroinvertebrate Communities at Randomly Selected Nonwadeable Sites

The macroinvertebrate scores ranged from 69 (good) to 40 (marginal) at the four nonwadeable sites which were evaluated in the watershed (Table 1). All of the nonwadeable sites were on the St. Joseph River. Three of the four sites were rated as good.

Stream Habitat at Randomly Selected Nonwadeable Sites

Stream habitat at each of the nonwadeable sites was evaluated as detailed in the draft nonwadeable procedure (MDEQ, 2011b). No obvious problems were documented. The habitat raw data sheets are available upon request.

Macroinvertebrate Communities at Randomly Selected Wadeable Sites

The macroinvertebrate community scores ranged from 7 (excellent) to -4 (acceptable) at the 16 randomly selected sites which were evaluated throughout the watershed (Table 2a). Two sites were rated as excellent and the other 14 sites were rated as acceptable. Of the 14 sites which were rated as acceptable, seven of the sites scored in the negative range. The 7 sites with negative scores, tending toward poor that would be considered moderately impaired, were located at the following locations: Hickory Creek at West Snow Road (Station 7), Lemon Creek at Lauer Road (Station 8), Big Meadow Drain at John Beers Road (Station 9), Lemon Creek upstream of Dairy Road (Station 10), Pipestone Creek at Hochberger Road (Station 12), Dowagiac River at Indian Lake Road (Station 16), Dowagiac Drain at County Road 215 (Station 18). The abundance of sites throughout the watershed that support macroinvertebrate communities that rate either excellent or acceptable with minimal impairment demonstrates the attainment of WQS throughout the watershed.

Stream Habitat at Randomly Selected Wadeable Sites

Overall stream habitat scores, which consider in-stream habitat as well as the adjacent stream banks and riparian habitat at the 16 randomly selected sites in the lower St Joseph River Watershed, ranged from 66 (marginal) to 160 (excellent) (Table 3). Glide/pool metrics were used to evaluate habitat at 12 of the sites and riffle/run metrics were used at the remaining four sites. None of the sites in the watershed were rated as poor with the stream habitat rating protocol. Overall, stream habitat at one of the sites was rated as excellent, 10 sites were rated as good, and 5 were rated as marginal. Pokagon Creek at Anderson Road (Station 23) was the only site where overall habitat was scored excellent. The five sites where overall habitat was rated as marginal included: Hickory Creek at Holden Road (Station 6), Hickory Creek at West Snow Road (Station 7), Eau Claire Drain Extension at Linn Street (Station 13), Dowagiac River at Indian Lake Road (Station 16), and Dowagiac Drain at County Road 215 (Station 18). 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.

Ten of the sites had been dredged to facilitate drainage in the respective watersheds. At 5 of the 10 dredged sites the habitat was scored as marginal. These dredged stream reaches were the only sites in the watershed where habitat was scored as marginal. The other five dredged sites had not recently been maintained and were scored as good. The macroinvertebrate communities at all 10 of the dredged sites were rated as acceptable which indicates that despite overall stream habitat deficiencies, water quality is good throughout the lower St. Joseph River watershed.

Targeted Monitoring Results

Dowagiac River meander restoration at Dodd Park

After nearly fifteen years of planning, securing permits, and obtaining funding, the meander at Dodd Park was reconnected in 2007. In short, the project reconnected one of the many meanders that were lost when the Dowagiac River was dredged and straightened around 1920 to facilitate drainage for agriculture upstream in the watershed. The historic dredging left spoil piles along both banks which disconnected the adjacent floodplain and produced relatively homogenous stream habitat in terms of width, depth and current velocities. The Dowagiac River is a designated coldwater stream with significant groundwater inputs and a flow regime that is stable and comparable to northern Michigan's well known trout streams (Wesley and Duffy, 1999). Riffle habitat in the dredged channel is absent and current velocities coupled with water depth have historically limited safely wading across the stream channel, particularly in the vicinity of Dodd Park.

The monitoring was requested by Michigan Department of Natural Resources (MDNR), Fisheries Division and district Water Resource Division staff. Baseline data were collected in 2001 (Rockafellow, 2002) and 2006 (Walterhouse, 2007) upstream and downstream of the meander reconnection.

The macroinvertebrate community sampling results from 2001, 2006 and 2011 are presented in Table 5. The sampling in 2011 documented an excellent macroinvertebrate community at station 15 in the restored meander. Macroinvertebrate communities downstream of the meander at station 14 and upstream of the meander at station 16 were rated as acceptable.

Compared to upstream and downstream, the riffle habitat created in the meander supported more macroinvertebrate taxa as well as more macroinvertebrates in terms of overall abundance. Abundance is not directly measured with Procedure 51 but is something that is readily apparent during collection efforts.

The historic sampling efforts downstream of the meander at station 14 in 2001 and 2006 had produced macroinvertebrate communities that were rated as excellent during both investigations. The sampling in 2011 produced fewer taxa of macroinvertebrates and a greater number of snails which detracted from the overall score and produced an acceptable rating. The difference in macroinvertebrate scores and ratings before and after the meander was reconnected are not considered significant. The diversity and abundance of sensitive macroinvertebrates (mayflies, caddisflies and stoneflies) has remained fairly high which is considered indicative of excellent water quality. The increase in the relative abundance of snails was likely related to an increase in large woody debris in the sample area. Recent storms and high water events caused several large trees to fall into the channel providing ideal habitat for snails.

Sampling upstream of the meander at station 16 in 2011 produced a macroinvertebrate community score of -2 and a rating of acceptable. Historic sampling at this site also produced acceptable ratings with scores of +1 and +4 in 2001 and 2006, respectively. The historic sampling at this site was difficult because of stream depth but sampling all available habitats was possible. The downstream reconnection of the meander caused the low flow water levels at this site to increase about 15 inches (Wesley, personal comm.). The increased water depth made it impossible to wade all the way across the stream channel and sample all available habitats. Consequently, sampling was restricted mostly to the margins of the stream channel where fine substrates were predominate. The decrease in the macroinvertebrate score from +4 in 2006 to -2 in 2011 likely reflects the decrease in diversity of in stream habitat that was accessible to sampling with Procedure 51 methodology. The decrease in habitat suitability is also reflected in the Procedure 51 habitat rating which decreased from good (121) in 2006 to marginal (99) in 2011 (Table 6). The increased water levels also created more depositional area at this site and the sediments are loose and unconsolidated compounding the difficulty of wading and sampling at this site. Also of note was the submergent aquatic vegetation that was relatively abundant in 2006 is now practically absent.

Fish sampling was conducted by MDEQ and MDNR, Fisheries Division staff on the Dowagiac River at Dodd Park in 2006 with an electrofishing boat. Multiple pass depletion sampling was conducted to estimate trout abundance and characterize the fish community in the dredged reach of the Dowagiac River that was bypassed and filled in when the meander at Dodd Park was reconnected. In 2011, MDEQ and MDNR staff once again joined forces and sampled the fish community in the newly created meander segment of the Dowagiac River. The current velocities, depth, and width of the Dowagiac River create challenges for effective sampling of the fish community. The riffle habitat created in the meander required wading with a stream shocker unit and sampling the deeper upper portion of the meander necessitated the use of an electrofishing boat. The fisheries data collected during the sampling efforts can be obtained from MDNR Fisheries Division staff at the Plainwell District Office. A fisheries report that presents an analysis of the data is anticipated in the future.

Dowagiac Creek prior to agricultural best management practice implementation

The Dowagiac Creek sampling was conducted at the request of district Water Resource Division staff. Visual observations indicate that sedimentation from agricultural land use runoff in the

vicinity of McKenzie Street is problematic and can be solved with adoption of proper NPS best management practices. District staff is working with local residents and anticipate solving the problems in the near future.

Surveys were conducted downstream at Dutch Settlement Road (Station 20), at McKenzie Street (Station 21), and upstream at Marcellus Highway in Russ Forest (Station 22) in 2011. The macroinvertebrate communities were rated as excellent at station 20 (+5) and acceptable at station 21 (+2) and station 22 (+2). Glide/pool habitat metrics were used at all three stations and stream habitat was rated as good at each of the stations. Historic sampling was conducted in 2006 at Dutch Settlement Road (Walterhouse, 2007) and also at McKenzie Street in 1991 (Heaton, 1997a) and 1996 (Heaton, 1997b). The 2011 survey results along with the historic sample results will serve as baseline information for comparison purposes after NPS best management practices are adopted.

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). The 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 two documents form a solid foundation for guiding 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.

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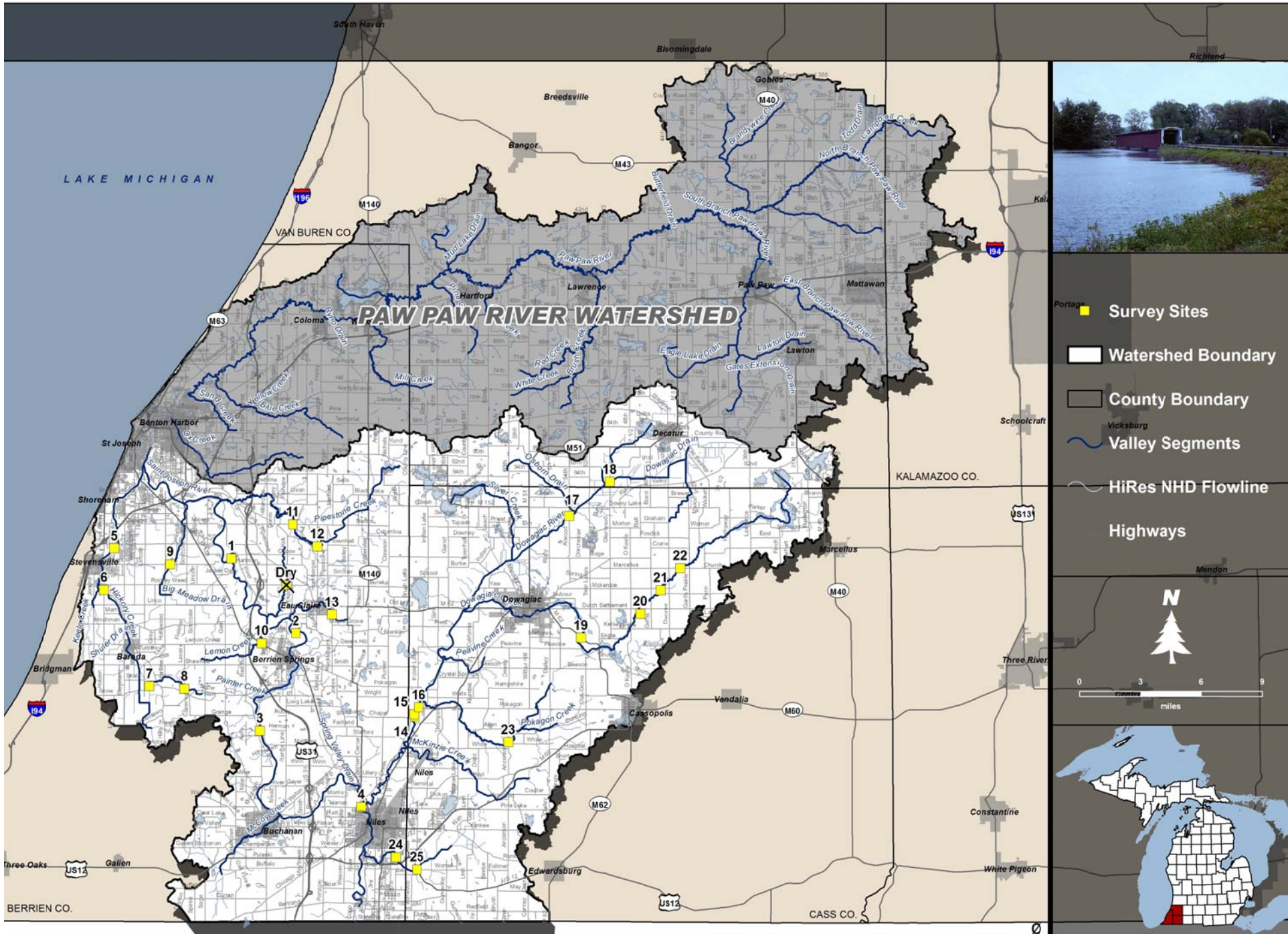


Figure 1. LOWER ST. JOSEPH RIVER WATERSHED, 2011 Survey Site Locations

Table 1. Qualitative macroinvertebrate sampling results for non-wadeable sites in the lower St. Joseph River Watershed, Berrien County, 2011.

TAXA	St. Joseph River Jasper Dairy Rd 7/26/2011 STATION 1	St. Joseph River Appian Way 7/28/2011 STATION 2	St. Joseph River Red Bud Tr/L. Glendora 7/27/2011 STATION 3	St. Joseph River Niles WWTP 7/27/2011 STATION 4
PLATYHELMINTHES (flatworms)				
Turbellaria				1
ANNELIDA (segmented worms)				
Oligochaeta (worms)				7
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	1	4	15	54
Isopoda (sowbugs)		1	1	2
Arachnoidea				
Hydracarina	1	9	25	58
Insecta				
Ephemeroptera (mayflies)				
Baetidae	4	3	2	9
Caenidae	1	1	1	6
Ephemeridae		2		
Heptageniidae	1	6	3	
Isonychiidae	2	1		
Leptohyphidae (Trico.)	1	2	1	7
Odonata				
Anisoptera (dragonflies)				
Gomphidae		2		
Zygoptera (damselflies)				
Coenagrionidae		1	2	24
Hemiptera (true bugs)				
Corixidae	3	35	3	18
Gerridae	5	54	17	4
Nepidae				1
Pleidae	1			8
Veliidae		1		
Trichoptera (caddisflies)				
Brachycentridae				5
Hydropsychidae	1	7		
Leptoceridae	2	23	4	4
Coleoptera (beetles)				
Gyrinidae (adults)	4			4
Halplidae (adults)		1		2
Hydrophilidae (total)		1		
Elmidae (total)		6	1	14
Diptera (flies)				
Ceratopogonidae			1	1
Chironomidae	12	32	21	76
Ephydriidae				1
MOLLUSCA				
Gastropoda (snails)				
Hydrobiidae				1
Physidae				6
Pleuroceridae				18
Pelecypoda (bivalves)				
Corbiculidae (Asiatic)				2
Sphaeriidae (fingernail clams)				1

METRIC	Jasper Dairy Rd Value	Appian Way/Berrian Sprngs Value	Red Bud Tr/Little Glendora Value	Niles wwtp Value
TOTAL ABUNDANCE	39	192	97	334
TOTAL RICHNESS	14	20	14	26
NUMBER OF EPHEMEROPTERA FAMILIES	5	6	4	3
NUMBER OF PLECOPTERA FAMILIES	0	0	0	0
NUMBER OF TRICHOPTERA FAMILIES	2	2	1	2
NUMBER OF DIPTERA TAXA	1	1	2	3
TRICHOPTERA ABUNDANCE	3	30	4	9
ABUNDANCE OF DOMINANT TAXON	12	54	25	76
SHREDDER ABUNDANCE	3	29	20	63
SCRAPER ABUNDANCE	1	6	3	25
COLL-FILTERER ABUNDANCE	3	8	0	8
COLL-GATH ABUNDANCE	21	81	29	138
PREDATOR ABUNDANCE	11	68	45	100

Metric Calculations	Value	Score	Value	Score	Value	Score	Value	Score
FFG Diversity (25)	1.70	25	1.81	25	1.66	16	1.91	25
Habitat Stability FFG Surrogate (25)	0.17	8	0.13	8	0.06	0	0.16	8
% Trichoptera (20)	7.69	20	15.63	20	4.12	14	2.69	7
EPT Richness (8)	7.00	6	8.00	6	5.00	3	5.00	3
Total Richness (7)	14.00	0	20.00	5	14.00	0	26.00	7
Diptera Richness (5)	1.00	0	1.00	0	2.00	2	3.00	2
Plecoptera Richness (5)	0.00	0	0.00	0	0.00	0	0.00	0
% Dominance (5)	30.77	5	28.13	5	25.77	5	22.75	5

Total Score	64	69	40	57
Macroinvertebrate Community Rating	GOOD	GOOD	MARGINAL	GOOD
SURVEY PURPOSE	Status	Status	Status	Status

Table 2A. Qualitative macroinvertebrate sampling results for sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

TAXA	Hickory Creek Roosevelt Road 8/16/2011 STATION 5	Hickory Creek Holden Road 8/16/2011 STATION 6	Hickory Creek Upstream Snow Road 8/16/2011 STATION 7	Lemon Creek Lauer Road 8/16/2011 STATION 8
ANNELIDA (segmented worms)				
Oligochaeta (worms)	2	6		2
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	64	183	94	201
Decapoda (crayfish)	2	1	1	2
Isopoda (sowbugs)	2	1	24	
Arachnoidea				
Hydracarina		1	11	
Insecta				
Ephemeroptera (mayflies)				
Baetidae	5	4	11	3
Caenidae		1		
Heptageniidae	14	1	1	1
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	4	3		5
Gomphidae	4			
Libellulidae				1
Zygoptera (damsel flies)				
Calopterygidae	15	20		19
Coenagrionidae		3	1	1
Hemiptera (true bugs)				
Belostomatidae			1	
Corixidae	1		137	
Gerridae	1	1		2
Notonectidae		1	1	2
Pleidae	1		3	1
Veliidae	1	1		14
Megaloptera				
Corydalidae (dobson flies)	2	1		
Sialidae (alder flies)	3	1	4	
Trichoptera (caddisflies)				
Brachycentridae	40	24		
Hydropsychidae	17	17		19
Leptoceridae			1	
Limnephilidae		1		
Phryganeidae			3	
Lepidoptera (moths)				
Noctuidae	1			
Coleoptera (beetles)				
Dytiscidae (total)			1	
Haliplidae (adults)	1		5	
Hydrophilidae (total)		2		1
Elmidae	12	8		
Diptera (flies)				
Ceratopogonidae		1	4	6
Chironomidae	30	29	46	13
Simuliidae	6	17		6
Stratiomyidae				1
Tipulidae		3		2
MOLLUSCA				
Gastropoda (snails)				
Physidae		2	15	8
Planorbidae		1	20	6
Viviparidae				1
Pelecypoda (bivalves)				
Sphaeriidae (clams)		1		3
TOTAL INDIVIDUALS	228	335	384	320

Table 2B. Macroinvertebrate metric evaluation of sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

METRIC	Hickory Creek Roosevelt Road 8/16/2011 STATION 5		Hickory Creek Holden Road 8/16/2011 STATION 6		Hickory Creek Upstream Snow Road 8/16/2011 STATION 7		Lemon Creek Lauer Road 8/16/2011 STATION 8	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	22	0	28	1	20	0	24	0
NUMBER OF MAYFLY TAXA	2	0	3	0	2	0	2	0
NUMBER OF CADDISFLY TAXA	2	0	3	0	2	0	1	-1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	8.33	0	1.79	-1	3.13	0	1.25	-1
PERCENT CADDISFLY COMP.	25.00	0	12.54	0	1.04	-1	5.94	0
PERCENT DOMINANT TAXON	28.07	0	54.63	-1	35.68	0	62.81	-1
PERCENT ISOPOD, SNAIL, LEECH	0.88	1	1.19	1	15.36	-1	4.69	0
PERCENT SURF. AIR BREATHERS	2.19	1	1.49	1	38.54	-1	6.56	1
TOTAL SCORE		1		0		-4		-3
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.
SURVEY PURPOSE		Status		Status		Trend		Status

Table 2A(cont). Qualitative macroinvertebrate sampling results for sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

TAXA	Big Meadow Drain John Beers Road 8/16/2011 STATION 9	Lemon Creek upstream Dairy Road 8/17/2011 STATION 10	Pipestone Creek Naomi Road-West Crossing 8/17/2011 STATION 11	Pipestone Creek Hochberger Road 8/17/2011 STATION 12
ANNELIDA (segmented worms)				
Hirudinea (leeches)	1			
Oligochaeta (worms)	4		1	6
ARTHROPODA				
Crustacea				
Amphipoda (scuds)		126	95	1
Decapoda (crayfish)	3	1	11	8
Isopoda (sowbugs)	32		1	19
Arachnoidea				
Hydracarina	2			
Insecta				
Ephemeroptera (mayflies)				
Baetidae	4	26	33	1
Heptageniidae		1	39	8
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	6	3	3	7
Zygoptera (damselflies)				
Calopterygidae	98	13	15	65
Coenagrionidae	8			3
Hemiptera (true bugs)				
Gerridae	2	1		
Mesoveliidae			1	1
Veliidae	1			
Megaloptera				
Corydalidae (dobson flies)			3	
Trichoptera (caddisflies)				
Hydropsychidae	11	12	15	132
Leptoceridae	16			
Limnephilidae			9	1
Molannidae			1	
Philopotamidae				2
Phryganeidae	5			
Uenoidae			6	
Coleoptera (beetles)				
Hydrophilidae (total)				
Elmidae	55	1	45	18
Diptera (flies)				
Athericidae		14		
Chironomidae	63	15	14	70
Culicidae	2			
Simuliidae		13	14	6
Tabanidae				1
Tipulidae		5	1	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	9		3	1
Hydrobiidae			1	
Physidae	4	2	1	
Planorbidae	1			
Pleuroceridae			40	
Pelecypoda (bivalves)				
Sphaeriidae (clams)	1		5	
Unionidae (mussels)			2	
TOTAL INDIVIDUALS	328	233	360	350

Table 2B(cont). Macroinvertebrate metric evaluation of sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

METRIC	Big Meadow Drain John Beers Road 8/16/2011 STATION 9		Lemon Creek upstream Dairy Road 8/17/2011 STATION 10		Pipestone Creek Naomi Road-West Crossing 8/17/2011 STATION 11		Pipestone Creek Hochberger Road 8/17/2011 STATION 12	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	21	0	14	0	25	1	18	0
NUMBER OF MAYFLY TAXA	1	0	2	0	2	0	2	0
NUMBER OF CADDISFLY TAXA	3	0	1	-1	4	0	3	0
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	1.22	-1	11.59	0	20.00	1	2.57	-1
PERCENT CADDISFLY COMP.	9.76	0	5.15	0	8.61	0	38.57	1
PERCENT DOMINANT TAXON	29.88	0	54.08	-1	26.39	0	37.71	-1
PERCENT ISOPOD, SNAIL, LEECH	14.33	-1	0.86	1	12.78	-1	5.71	0
PERCENT SURF. AIR BREATHERS	1.52	1	0.43	1	0.56	1	0.29	1
TOTAL SCORE		-2		-1		1		-1
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.
SURVEY PURPOSE		Status		Status		Status		Status

Table 2A(cont). Qualitative macroinvertebrate sampling results for sites in the Lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

TAXA	Eau Claire Drain Linn Street 8/17/2011 STATION 13	Dowagiac River d/s Dodd Park @ Sumnerville 8/18/2011 STATION 14	Dowagiac River Dodd Park meander 8/18/2011 STATION 15	Dowagiac River Indian Lake Road 8/18/2011 STATION 16
ANNELIDA (segmented worms)				
Hirudinea (leeches)	32	3		14
Oligochaeta (worms)	2			14
ARTHROPODA				
Crustacea				
Amphipoda (scuds)		17	42	97
Decapoda (crayfish)			1	1
Isopoda (sowbugs)	14	1	1	1
Arachnoidea				
Hydracarina	5		2	
Insecta				
Ephemeroptera (mayflies)				
Baetidae	1	6	13	
Ephemerellidae			1	
Heptageniidae		8	31	6
Isonychiidae			1	
Tricorythidae			1	
Odonata				
Anisoptera (dragonflies)				
Aeshmidae			1	
Gomphidae		1	2	1
Zygoptera (damselflies)				
Calopterygidae	1		1	2
Coenagrionidae				1
Plecoptera (stoneflies)				
Perlidae		3	9	
Pteronarcyidae		6	1	
Hemiptera (true bugs)				
Corixidae			8	1
Mesoveliidae	2			
Pleidae				15
Veliidae			3	
Megaloptera				
Corydalidae (dobson flies)			2	2
Trichoptera (caddisflies)				
Brachycentridae		59	10	15
Glossosomatidae		3	10	
Helicopsychidae		4	1	
Hydropsychidae	11	14	56	3
Hydroptilidae	5			
Leptoceridae	1	3	4	11
Limnephilidae		3	6	
Phryganeidae	1			
Polycentropodidae				4
Uenoidae		27	42	
Coleoptera (beetles)				
Dytiscidae (total)				1
Halplidae (adults)	1			1
Hydrophilidae (total)	1			
Elmidae	11	11	32	18
Psephenidae (larvae)		3	3	
Diptera (flies)				
Ceratopogonidae	1			2
Chironomidae	251	15	14	43
Simuliidae		5	1	
Tabanidae	1			
Tipulidae	1		3	1
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)		1		4
Physidae	1			
Planorbidae	4			5
Pleuroceridae		37	13	7
Pelecypoda (bivalves)				
Corbiculidae		13	1	
Sphaeriidae (clams)	37		5	1
TOTAL INDIVIDUALS	384	243	321	271

Table 2B(cont). Macroinvertebrate metric evaluation of sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

METRIC	Eau Claire Drain Linn Street 8/17/2011 STATION 13		Dowagiac River d/s Dodd Park @ Sumnerville 8/18/2011 STATION 14		Dowagiac River Dodd Park meander 8/18/2011 STATION 15		Dowagiac River Indian Lake Road 8/18/2011 STATION 16	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	21	1	22	0	32	1	26	1
NUMBER OF MAYFLY TAXA	1	1	2	0	5	1	1	-1
NUMBER OF CADDISFLY TAXA	4	1	7	1	7	1	4	0
NUMBER OF STONEFLY TAXA	0	-1	2	1	2	1	0	-1
PERCENT MAYFLY COMP.	0.26	-1	5.76	0	14.64	0	2.21	-1
PERCENT CADDISFLY COMP.	4.69	0	46.50	1	40.19	1	12.18	0
PERCENT DOMINANT TAXON	65.36	-1	24.28	0	17.45	1	35.79	0
PERCENT ISOPOD, SNAIL, LEECH	13.28	-1	17.28	-1	4.36	0	11.44	-1
PERCENT SURF. AIR BREATHERS	1.04	1	0.00	1	3.43	1	6.64	1
TOTAL SCORE	0		3		7		-2	
MACROINV. COMMUNITY RATING	ACCEPT.		ACCEPT.		EXCELLENT		ACCEPT.	
SURVEY PURPOSE	Status		Targeted		Targeted		Status and Targeted	

Table 2A(cont). Qualitative macroinvertebrate sampling results for sites in the lower St. Joseph River Watershed, Berrein and Cass Counties, 2011.

TAXA	Dowagiac River Upstream of Atwood Road 8/18/2011 STATION 17		Dowagiac Drain County Road 215 8/19/2011 STATION 18		Dowagiac Creek M-62 8/19/2011 STATION 19		Dowagiac Creek D/S of Dutch Settlement Rd 8/24/2011 STATION 20	
	Value	Score	Value	Score	Value	Score	Value	Score
PORIFERA (sponges)			1					
ANNELIDA (segmented worms)								
Hirudinea (leeches)			7		1		1	
Oligochaeta (worms)	2		2		1			
ARTHROPODA								
Crustacea								
Amphipoda (scuds)	28		7		16		61	
Decapoda (crayfish)	1		1		1		4	
Isopoda (sowbugs)	8				3		1	
Arachnoidea								
Hydracarina					5		1	
Insecta								
Ephemeroptera (mayflies)								
Baetiscidae					1		1	
Baetidae	4		3		8		18	
Ephemerellidae					14			
Ephemeridae					1			
Heptageniidae	10				18		19	
Tricorythidae							2	
Odonata								
Anisoptera (dragonflies)								
Aeshnidae	10		7		2		2	
Gomphidae	2				3		2	
Zygoptera (damselflies)								
Calopterygidae	56		5		1		19	
Coenagrionidae	1		23					
Plecoptera (stoneflies)								
Perlidae							1	
Pteronarcyidae							2	
Hemiptera (true bugs)								
Belostomatidae			2					
Corixidae	1		7		5			
Gerridae	1				1			
Mesoveliidae			1				1	
Nepidae	1							
Notonectidae	2		7					
Pleidae	1		5		2		3	
Veliidae	1		4					
Megaloptera								
Corydalidae (dobson flies)					1			
Trichoptera (caddisflies)								
Brachycentridae	58				38		5	
Glossosomatidae					5		3	
Helicopsychidae					3		79	
Hydropsychidae	50		28		36		10	
Hydroptilidae	5				3		11	
Leptoceridae	12				14		4	
Limnephilidae	1		1		4			
Phryganeidae	3		1		1			
Polycentropodidae	1				2			
Uenoidea					38		4	
Coleoptera (beetles)								
Dytiscidae (total)			13		1		2	
Gyrinidae (adults)			8					
Haliplidae (adults)			4					
Hydrophilidae (total)	1		5		1			
Elmidae	11		1		40		8	
Gyrinidae (larvae)			1					
Psephenidae (larvae)					1			
Diptera (flies)								
Ceratopogonidae			3					
Chironomidae	52		40		37		14	
Simuliidae	10		6		2		9	
Tabanidae			1					
MOLLUSCA								
Gastropoda (snails)								
Ancylidae (limpets)	5		85		8		16	
Physidae			6				15	
Planorbidae	3		3		1		13	
Pleuroceridae							19	
Viviparidae							1	
Pelecypoda (bivalves)								
Corbiculidae	2		2		2		18	
Sphaeriidae (clams)			1					
TOTAL INDIVIDUALS	343		291		321		369	

Table 2B(cont). Macroinvertebrate metric evaluation of sites in the lower St. Joseph River Watershed, Berrein and Cass Counties, 2011.

METRIC	Dowagiac River Upstream of Atwood Road 8/18/2011 STATION 17		Dowagiac Drain County Road 215 8/19/2011 STATION 18		Dowagiac Creek M-62 8/19/2011 STATION 19		Dowagiac Creek D/S of Dutch Settlement Rd 8/24/2011 STATION 20	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	30	1	32	1	37	1	33	1
NUMBER OF MAYFLY TAXA	2	0	1	-1	5	1	4	1
NUMBER OF CADDISFLY TAXA	7	1	3	0	10	1	7	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	2	1
PERCENT MAYFLY COMP.	4.08	0	1.03	-1	13.08	0	10.84	0
PERCENT CADDISFLY COMP.	37.90	1	10.31	0	44.86	1	31.44	1
PERCENT DOMINANT TAXON	16.91	1	29.21	0	12.46	1	21.41	0
PERCENT ISOPOD, SNAIL, LEECH	4.66	0	34.71	-1	4.05	0	17.89	-1
PERCENT SURF. AIR BREATHERS	2.33	1	19.24	0	3.12	1	1.63	1
TOTAL SCORE	4		-3		5		5	
MACROINV. COMMUNITY RATING	ACCEPT.		ACCEPT.		EXCELLENT		EXCELLENT	
SURVEY PURPOSE	Status and Trend		Status		Status		Targeted	

Table 2A(cont). Qualitative macroinvertebrate sampling results for sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

TAXA	Dowagiac Creek McKenzie Street 8/24/2011 STATION 21	Dowagiac Creek Marcellus Highway 8/24/2011 STATION 22	Pokagon Creek Anderson Road 8/18/2011 STATION 23	Brandywine Creek County Club Road 1550-1563 8/17/2011 STATION 24
	NEMATOMORPHA (roundworms)	3		
ANNELIDA (segmented worms)				
Hirudinea (leeches)	15	4		
Oligochaeta (worms)	16	2	2	3
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	32	82	16	29
Decapoda (crayfish)	1	3	1	1
Arachnoidea				
Hydracarina	2	2	1	6
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae	1			
Baetidae	6	2	18	172
Caenidae	1	2		
Ephemerellidae		5		
Ephemeridae	4	4	2	
Heptageniidae	12	6	17	5
Tricorythidae	2	7		
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	1	1	2	2
Gomphidae		4	1	
Zygoptera (damselflies)				
Calopterygidae	1	14	14	5
Coenagrionidae	1			
Plecoptera (stoneflies)				
Perlidae			1	
Hemiptera (true bugs)				
Belostomatidae			1	
Gerridae	1	1	1	1
Notonectidae	1		1	
Pleidae	4			
Megaloptera				
Corydalidae (dobson flies)	1			
Sialidae (alder flies)	1	1		
Trichoptera (caddisflies)				
Brachycentridae	10		9	1
Glossosomatidae				4
Helicopsychidae	26	41		
Hydropsychidae	38	5	130	18
Hydroptilidae				1
Leptoceridae	1	2	34	
Limnephilidae		1	3	1
Phryganeidae	1	1	2	
Uenoidea	4	2		
Coleoptera (beetles)				
Dytiscidae (total)	2	1		
Gyrinidae (adults)	1			
Haliphidae (adults)	1			
Hydrophilidae (total)		1		
Elmidae	3	4	5	4
Psephenidae (larvae)	1			
Diptera (flies)				
Ceratopogonidae				3
Chironomidae	61	42	31	24
Simuliidae	1		10	56
Tabanidae	2	1		
Tipulidae			1	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	12	4	1	2
Lymnaeidae			1	
Physidae	10	8	4	4
Planorbidae	3	23	2	
Pleuroceridae	7	8	2	1
Viviparidae	4			
Pelecypoda (bivalves)				
Corbiculidae	1	19		
Pisidiidae	1			
Sphaeriidae (clams)		2	1	
Unionidae (mussels)	1			
TOTAL INDIVIDUALS	297	305	314	343

Table 2B(cont). Macroinvertebrate metric evaluation of sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

METRIC	Dowagiac Creek McKenzie Street 8/24/2011 STATION 21		Dowagiac Creek Marcellus Highway 8/24/2011 STATION 22		Pokagon Creek Anderson Road 8/18/2011 STATION 23		Brandywine Creek County Club Road 1550-1563 8/17/2011 STATION 24	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	42	1	33	1	29	1	21	0
NUMBER OF MAYFLY TAXA	6	1	6	1	3	0	2	0
NUMBER OF CADDISFLY TAXA	6	1	6	1	5	1	5	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	1	1	0	-1
PERCENT MAYFLY COMP.	8.75	0	8.52	0	11.78	0	51.60	1
PERCENT CADDISFLY COMP.	26.94	0	17.05	0	56.69	1	7.29	0
PERCENT DOMINANT TAXON	20.54	0	26.89	0	41.40	-1	50.15	-1
PERCENT ISOPOD, SNAIL, LEECH	17.17	-1	15.41	-1	3.18	1	2.04	1
PERCENT SURF. AIR BREATHERS	3.37	1	0.98	1	0.96	1	0.29	1
TOTAL SCORE	2		2		5		2	
MACROINV. COMMUNITY RATING	ACCEPT.		ACCEPT.		EXCELLENT		ACCEPT.	
SURVEY PURPOSE	Targeted		Targeted		Status		Status	

Table 2A(cont). Qualitative macroinvertebrate sampling results for sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

Brandywine Creek US-12 8/17/2011 STATION 25	
TAXA	
ANNELIDA (segmented worms)	
Oligochaeta (worms)	1
ARTHROPODA	
Crustacea	
Amphipoda (scuds)	6
Decapoda (crayfish)	1
Isopoda (sowbugs)	1
Arachnoidea	
Hydracarina	4
Insecta	
Ephemeroptera (mayflies)	
Baetidae	151
Heptageniidae	1
Odonata	
Anisoptera (dragonflies)	
Aeshnidae	1
Zygoptera (damselflies)	
Calopterygidae	5
Hemiptera (true bugs)	
Corixidae	1
Gerridae	1
Pleidae	2
Megaloptera	
Corydalidae (dobson flies)	2
Trichoptera (caddisflies)	
Hydropsychidae	26
Hydroptilidae	2
Rhyacophilidae	1
Coleoptera (beetles)	
Dytiscidae (total)	1
Haliplidae (adults)	1
Hydrophilidae (total)	1
Elmidae	3
Diptera (flies)	
Chironomidae	90
Simuliidae	9
Tipulidae	2
MOLLUSCA	
Gastropoda (snails)	
Physidae	13
Planorbidae	3
Pelecypoda (bivalves)	
Sphaeriidae (clams)	3
TOTAL INDIVIDUALS	332

Table 2B(cont). Macroinvertebrate metric evaluation of sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

Brandywine Creek US-12 8/17/2011 STATION 25		
METRIC	Value	Score
TOTAL NUMBER OF TAXA	26	1
NUMBER OF MAYFLY TAXA	2	0
NUMBER OF CADDISFLY TAXA	3	0
NUMBER OF STONEFLY TAXA	0	-1
PERCENT MAYFLY COMP.	45.78	1
PERCENT CADDISFLY COMP.	8.73	0
PERCENT DOMINANT TAXON	45.48	-1
PERCENT ISOPOD, SNAIL, LEECH	5.12	0
PERCENT SURF. AIR BREATHERS	2.11	1
TOTAL SCORE	1	
MACROINV. COMMUNITY RATING	ACCEPT.	

SURVEY PURPOSE

Trend

Table 3. Habitat evaluation for sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

HABITAT METRIC	Hickory Creek Roosevelt Road GLIDE/POOL Station 5	Hickory Creek Holden Road GLIDE/POOL Station 6	Hickory Creek Upstream Snow Road GLIDE/POOL Station 7	Lemon Creek Lauer Road GLIDE/POOL Station 8	Big Meadow Drain John Beers Road GLIDE/POOL Station 9
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	10	6	3	6	11
Embeddedness (20)*					
Velocity/Depth Regime (20)*					
Pool Substrate Characterization (20)**	10	10	8	8	11
Pool Variability (20)**	11	8	5	6	15
Channel Morphology					
Sediment Deposition (20)	13	8	6	10	13
Flow Status - Maint. Flow Volume (10)	9	9	8	9	9
Flow Status - Flashiness (10)	4	2	8	9	5
Channel Alteration (20)	11	10	3	11	10
Frequency of Riffles/Bends (20)*					
Channel Sinuosity (20)**	10	5	3	10	8
Riparian and Bank Structure					
Bank Stability (L) (10)	7	6	7	8	7
Bank Stability (R) (10)	7	6	7	8	7
Vegetative Protection (L) (10)	8	6	5	6	6
Vegetative Protection (R) (10)	3	6	1	6	6
Riparian Veg. Zone Width (L) (10)	8	8	2	8	5
Riparian Veg. Zone Width (R) (10)	2	8	0	4	5
TOTAL SCORE (200):	113	98	66	109	118
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

* Applies only to Riffle/Run stream Survey;

** Applies only to Glide/Pool stream Survey;

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)

	8/16/2011	8/16/2011	8/16/2011	8/16/2011	8/16/2011
Date:	8/16/2011	8/16/2011	8/16/2011	8/16/2011	8/16/2011
Weather:	Sunny	Sunny	Sunny	Sunny	Sunny
Air Temperature:	77 Deg. F.	75 Deg. F.	75 Deg. F.	75 Deg. F.	78 Deg. F.
Water Temperature:	67 Deg. F.	65 Deg. F.	64 Deg. F.	64 Deg. F.	68 Deg. F.
Ave. Stream Width:	30 Feet	20 Feet	15 Feet	7 Feet	10 Feet
Ave. Stream Depth:	1 Feet	0.67 Feet	2 Feet	0.3 Feet	1 Feet
Surface Velocity:	0.6 Ft./Sec.	0.6 Ft./Sec.	0.2 Ft./Sec.	0.6 Ft./Sec.	0.5 Ft./Sec.
Estimated Flow:	18 CFS	8.04 CFS	6 CFS	1.26 CFS	5 CFS
Stream Modifications:	Dredged	Dredged	Dredged	Dredged	Dredged
Nuisance Plants (Y/N):	N	N	N	N	N
STORET No.:	110790	110791	110732	110792	110793
Stream Name:	Hickory Creek	Hickory Creek	Hickory Creek	Lemon Creek	Big Meadow Drain
Road Crossing/Location:	Roosevelt Road	Holden Road	Upstream Snow Road	Lauer Road	John Beers Road
County Code:	11	11	11	11	11
TRS:	05S19W22	05S19W34	06S18W25	06S18W29	05S18W30
Latitude (dd):	42.02576	41.99604	41.92741	41.92589	42.01468
Longitude (dd):	-86.50456	-86.51427	-86.4704	-86.43682	-86.45093
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4050001	4050001	4050001	4050001	4050001

Table 3. Habitat evaluation for sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

HABITAT METRIC	Lemon Creek U/S Dairy Road RIFFLE/RUN Station 10	Pipestone Creek Naomi Road-West Crossing RIFFLE/RUN Station 11	Pipestone Creek Hochberger Road RIFFLE/RUN Station 12	Eau Claire Drain Linn Street GLIDE/POOL Station 13	Dowagiac River D/S Dodd Park RIFFLE/RUN Station 14
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	10	13	10	5	13
Embeddedness (20)*	15	15	16		16
Velocity/Depth Regime (20)*	15	13	15		15
Pool Substrate Characterization (20)**				8	
Pool Variability (20)**				3	
Channel Morphology					
Sediment Deposition (20)	13	15	11	10	12
Flow Status - Maint. Flow Volume (10)	5	9	9	9	9
Flow Status - Flashiness (10)	2	7	5	9	8
Channel Alteration (20)	18	15	15	6	11
Frequency of Riffles/Bends (20)*	16	15	10		11
Channel Sinuosity (20)**				3	
Riparian and Bank Structure					
Bank Stability (L) (10)	5	5	8	9	9
Bank Stability (R) (10)	5	8	8	9	7
Vegetative Protection (L) (10)	9	2	8	4	9
Vegetative Protection (R) (10)	9	7	8	4	8
Riparian Veg. Zone Width (L) (10)	7	2	6	9	9
Riparian Veg. Zone Width (R) (10)	7	8	9	7	5
TOTAL SCORE (200):	136	134	138	95	142
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

* Applies only to Riffle/Run stream Survey;

** Applies only to Glide/Pool stream Survey;

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:	8/17/2011	8/17/2011	8/17/2011	8/17/2011	8/18/2011
Weather:	Sunny	Partly Cloudy	Sunny	Sunny	Partly Cloudy
Air Temperature:	78 Deg. F.	70 Deg. F.	61 Deg. F.	75 Deg. F.	Deg. F.
Water Temperature:	65 Deg. F.	66 Deg. F.	66 Deg. F.	65 Deg. F.	69 Deg. F.
Ave. Stream Width:	14 Feet	25 Feet	20 Feet	3 Feet	50 Feet
Ave. Stream Depth:	0.4 Feet	0.6 Feet	2 Feet	0.2 Feet	2 Feet
Surface Velocity:	0.8 Ft./Sec.	0.75 Ft./Sec.	0.7 Ft./Sec.	0.6 Ft./Sec.	1.2 Ft./Sec.
Estimated Flow:	4.48 CFS	11.25 CFS	28 CFS	0.36 CFS	120 CFS
Stream Modifications:	None	Canopy Removal Bank stabilization	Habitat Improvement	Dredged	Habitat Improvement
Nuisance Plants (Y/N):	N	N	N	N	N
STORET No.:	110668	110735	110794	110638	140154
Stream Name:	Lemon Creek	Pipestone Creek	Pipestone Creek	Eau Claire Drain	Dowagiac River
Road Crossing/Location:	upstream Dairy Road	Naomi Road-West	Crossir Hochberger Road	Linn Street	d/s Dodd Park
County Code:	11	11	11	11	14
TRS:	06S18W11	05S17W18	05S17W20	06S17W 32	06S16W31
Latitude (dd):	41.96583	42.04322	42.0277	41.9793	41.90658
Longitude (dd):	-86.365	-86.33345	-86.31015	-86.2956	-86.2169
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4050001	4050001	4050001	4050001	4050001

COMMENTS:

Table 3(cont). Habitat evaluation for sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011

HABITAT METRIC	Dowagiac River Dodd Park meander RIFFLE/RUN Station 15	Dowagiac River Indian Lake Road GLIDE/POOL Station 16	Dowagiac River Upstream of Atwood Road GLIDE/POOL Station 17	Dowagiac Drain County Road 215 GLIDE/POOL Station 18	Dowagiac Creek M-62 GLIDE/POOL Station 19
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	13	8	8	3	10
Embeddedness (20)*	16				
Velocity/Depth Regime (20)*	15				
Pool Substrate Characterization (20)**		10	8	6	11
Pool Variability (20)**		8	8	4	10
Channel Morphology					
Sediment Deposition (20)	16	3	11	11	8
Flow Status - Maint. Flow Volume (10)	7	9	9	9	8
Flow Status - Flashiness (10)	8	5	5	6	7
Channel Alteration (20)	15	11	11	8	18
Frequency of Riffles/Bends (20)*	15				
Channel Sinuosity (20)**		5	3	1	18
Riparian and Bank Structure					
Bank Stability (L) (10)	9	7	7	6	8
Bank Stability (R) (10)	6	7	7	8	8
Vegetative Protection (L) (10)	5	9	7	3	9
Vegetative Protection (R) (10)	8	5	7	6	9
Riparian Veg. Zone Width (L) (10)	3	9	7	1	9
Riparian Veg. Zone Width (R) (10)	5	3	7	3	9
TOTAL SCORE (200):	141	99	105	75	142
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

* Applies only to Riffle/Run stream Survey;

** Applies only to Glide/Pool stream Survey;

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:	8/18/2011	8/18/2011	8/18/2011	8/19/2011	8/19/2011
Weather:	Sunny	Partly Cloudy	Sunny	Partly Cloudy	Sunny
Air Temperature:	76 Deg. F.	78 Deg. F.	81 Deg. F.	Deg. F.	75 Deg. F.
Water Temperature:	67 Deg. F.	69 Deg. F.	72 Deg. F.	60 Deg. F.	64 Deg. F.
Ave. Stream Width:	75 Feet	150 Feet	30 Feet	23 Feet	25 Feet
Ave. Stream Depth:	1 Feet	2.5 Feet	1.5 Feet	1.2 Feet	1.5 Feet
Surface Velocity:	1.2 Ft./Sec.	0.5 Ft./Sec.	0.5 Ft./Sec.	0.5 Ft./Sec.	0.6 Ft./Sec.
Estimated Flow:	90 CFS	187.5 CFS	22.5 CFS	13.8 CFS	22.5 CFS
Stream Modifications:	Relocated	Dredged	Dredged	Dredged	None
Nuisance Plants (Y/N):	N	N	N	Canopy removal N	N
STORET No.:	140191	140155	140168	800588	140131
Stream Name:	Dowagiac River	Dowagiac River	Dowagiac River	Dowagiac Drain	Dowagiac Creek
Road Crossing/Location:	Dodd Park meander	Indian Lake Road	Upstream of Atwood Road	County Road 215	M-62
County Code:	14	14	14	80	14
TRS:	06S16W31	06S16W30	05S15W09	04S15W35	06S15W09
Latitude (dd):	41.90806	41.91329	42.04965	42.07406	41.9628497
Longitude (dd):	-86.21757	-86.21318	-86.06914	-86.03072	-86.0581356
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4050001	4050001	4050001	4050001	4050001

Table 3(cont). Habitat evaluation for sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

HABITAT METRIC	Dowagiac Creek D/S Dutch Settlement Rd GLIDE/POOL Station 20	Dowagiac Creek McKenzie Street GLIDE/POOL Station 21	Dowagiac Creek D/S Marcellus Hwy GLIDE/POOL Station 22	Pokagon Creek Anderson Road GLIDE/POOL Station 23	Brandywine Creek County Club Road RIFLE/RUN Station 24
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	13	15	13	13	8
Embeddedness (20)*					13
Velocity/Depth Regime (20)*					10
Pool Substrate Characterization (20)**	16	15	16	13	
Pool Variability (20)**	11	11	6	13	
Channel Morphology					
Sediment Deposition (20)	16	13	16	15	15
Flow Status - Maint. Flow Volume (10)	9	9	9	9	9
Flow Status - Flashiness (10)	8	8	8	9	9
Channel Alteration (20)	16	16	16	18	16
Frequency of Riffles/Bends (20)*					16
Channel Sinuosity (20)**	15	13	15	16	
Riparian and Bank Structure					
Bank Stability (L) (10)	9	8	9	9	9
Bank Stability (R) (10)	9	8	9	9	9
Vegetative Protection (L) (10)	5	9	9	9	5
Vegetative Protection (R) (10)	3	9	9	9	2
Riparian Veg. Zone Width (L) (10)	5	9	8	8	5
Riparian Veg. Zone Width (R) (10)	1	6	8	10	2
TOTAL SCORE (200):	136	149	151	160	128
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON- IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

* Applies only to Riffle/Run stream Survey;

** Applies only to Glide/Pool stream Survey;

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:	8/24/2011	8/24/2011	8/24/2011	8/18/2011	8/17/2011
Weather:	Sunny	Sunny	Cloudy	Sunny	Partly Cloudy
Air Temperature:	84 Deg. F.	80 Deg. F.	75 Deg. F.	60 Deg. F.	80 Deg. F.
Water Temperature:	72 Deg. F.	68 Deg. F.	66 Deg. F.	64 Deg. F.	65 Deg. F.
Ave. Stream Width:	22 Feet	40 Feet	27 Feet	16 Feet	16 Feet
Ave. Stream Depth:	1 Feet	0.3 Feet	0.4 Feet	1 Feet	0.3 Feet
Surface Velocity:	0.9 Ft./Sec.	0.7 Ft./Sec.	0.7 Ft./Sec.	0.7 Ft./Sec.	1 Ft./Sec.
Estimated Flow:	19.8 CFS	8.4 CFS	7.56 CFS	11.2 CFS	4.8 CFS
Stream Modifications:	None	Bank Stabilization Lunker Structure	Bank Stabilization	None	Canopy Removal
Nuisance Plants (Y/N):	N	N	N	N	N
STORET No.:	140004	140130	140192	140193	110739
Stream Name:	Dowagiac Creek	Dowagiac Creek	Dowagiac Creek	Pokagon Creek	Brandywine Creek
Road Crossing/Location:	Dutch Settlement Rd	McKenzie Street	D/S Marcellus Hwy	Anderson Road	County Club Road
County Code:	14	14	14	14	11
TRS:	06S15W01	05S14W31	05S14W29	07S16W01	08S17W01
Latitude (dd):	41.980004	41.99669	42.01192	41.88841	41.80598
Longitude (dd):	-86.00139	-85.98207	-85.96249	-86.12736	-86.23458
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4050001	4050001	4050001	4050001	4050001

Table 3(cont). Habitat evaluation for sites in the lower St. Joseph River Watershed, Berrien and Cass Counties, 2011.

Brandywine Creek US-12 GLIDE/POOL Station 25	
HABITAT METRIC	
Substrate and Instream Cover	
Epifaunal Substrate/ Avail Cover (20)	11
Embeddedness (20)*	
Velocity/Depth Regime (20)*	
Pool Substrate Characterization (20)**	11
Pool Variability (20)**	11
Channel Morphology	
Sediment Deposition (20)	11
Flow Status - Maint. Flow Volume (10)	9
Flow Status - Flashiness (10)	9
Channel Alteration (20)	10
Frequency of Riffles/Bends (20)*	
Channel Sinuosity (20)**	8
Riparian and Bank Structure	
Bank Stability (L) (10)	9
Bank Stability (R) (10)	9
Vegetative Protection (L) (10)	5
Vegetative Protection (R) (10)	5
Riparian Veg. Zone Width (L) (10)	6
Riparian Veg. Zone Width (R) (10)	9
TOTAL SCORE (200):	123

HABITAT RATING: GOOD
(SLIGHTLY
IMPAIRED)

* Applies only to Riffle/Run stream Survey;

** Applies only to Glide/Pool stream Survey;

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: 8/17/2011
 Weather: Sunny
 Air Temperature: 80 Deg. F.
 Water Temperature: 63 Deg. F.
 Ave. Stream Width: 12 Feet
 Ave. Stream Depth: 2 Feet
 Surface Velocity: 0.7 Ft./Sec.
 Estimated Flow: 16.8 CFS
 Stream Modifications: Dredged
 Nuisance Plants (Y/N): N
 STORET No.: 140111
 Stream Name: Brandywine Creek
 Road Crossing/Location: US-12
 County Code: 14
 TRS: 08S16W06
 Latitude (dd): 41.79694
 Longitude (dd): -86.21472
 Ecoregion: SMNITP
 Stream Type: Coldwater
 USGS Basin Code: 4050001

Table 4. Summary of sites surveyed in the lower St. Joseph River Watershed, excluding the Paw Paw River Watershed, in 2011.

Report Station Number	Valley Segment Number	Habitat Score & Rating (Riffle/Run or Glide/Pool)	Channel Modifications	Macroinvertebrate Score & Rating	Report Stream Name & Rd Crossing	County	LAT	LONG
1*	147	Non-Wadeable	None	64-good	St. Joseph River u/s Jasper Dairy Rd	Berrien	42.01895	-86.39259
2*	147	Non-Wadeable	None	69-good	St. Joseph Riv Appian Way d/s Ber. Springs	Berrien	41.96574	-86.33062
3*	1921	Non-Wadeable	None	40-marginal	St. Joseph River d/s L. Glendora Rd	Berrien	41.89611	-86.36502
4*	2182	Non-Wadeable	None	57-good	St. Joseph River near Niles WWTP	Berrien	41.84203	-86.26767
5*	631	113-Good (G/P)	Dredged	1-acceptable	Hickory Creek at Roosevelt Rd	Berrien	42.02576	-86.50456
6*	631	98-Marginal (G/P)	Dredged	0-acceptable	Hickory Creek at Holden Rd	Berrien	41.99604	-86.51427
7**	631	66-Marginal (G/P)	Dredged	-4-acceptable	Hickory Creek at W. Snow Rd	Berrien	41.92757	-86.47040
8*	1816	109-Good (G/P)	Dredged	-3-acceptable	Lemon Creek at Lauer Rd	Berrien	41.92589	-86.43682
9*	1817	118-Good (G/P)	Dredged	-2-acceptable	Big Meadow Drain at John Beers Rd	Berrien	42.01468	-86.45093
10*	1830	136-Good (R/R)	None	-1-acceptable	Lemon Creek upstream Dairy Rd	Berrien	41.95867	-86.36359
11*	639	134-Good (R/R)	None	1-acceptable	Pipestone Creek at Naomi Rd (west Xing)	Berrien	42.04349	-86.33366
12*	639	138-Good (R/R)	None	-1-acceptable	Pipestone Creek at Hochberger Rd	Berrien	42.02770	-86.31015
13*	1829	95-Marginal (G/P)	Dredged	0-acceptable	Eau Claire Drain Extension at Linn St.	Berrien	41.97917	-86.29592
14	Targeted	142-Good (R/R)	Hab Improvement	3-acceptable	Dowagiac River d/s Dodd Park meander	Cass	41.90658	-86.21690
15	Targeted	141-Good (R/R)	Hab Improvement	7-excellent	Dowagiac River at Dodd Park meander	Cass	41.90812	-86.21762
16*	151/Targeted	99-Marginal (G/P)	Dredged	-2-acceptable	Dowagiac River at Indian Lake Rd	Cass	41.91308	-86.21308
17*/**	151	105-Good (G/P)	Dredged	4-acceptable	Dowagiac River at Atwood Rd	Cass	42.04969	-86.06932
18*	128	75-Marginal (G/P)	Dredged	-3-acceptable	Dowagiac Drain at County Rd 215	Van Buren	42.07406	-86.03072
19*	1851	142-Good (G/P)	None	5-excellent	Dowagiac Creek at M-62	Cass	41.96282	-86.05812
20*	Targeted	136-Good (G/P)	None	5-excellent	Dowagiac Creek d/s Dutch Settlement Rd	Cass	41.980004	-86.00139
21	Targeted	149-Good (G/P)	Hab Improvement	2-acceptable	Dowagiac Creek at McKenzie Rd	Cass	41.99675	-85.98205
22	Targeted	151-Good (G/P)	Hab Improvement	2-acceptable	Dowagiac Cr d/s Marcellus Hwy(Russ Forest)	Cass	42.01255	-85.96259
23*	1846	160-Excellent (G/P)	None	5-excellent	Pokagon Creek at Anderson Rd	Cass	41.88841	-86.12736
24*	1833	128-Good (R/R)	None	2-acceptable	Brandywine Creek at Country Club Dr.	Berrien	41.80625	-86.23463
25*/**	1833	123-Good (G/P)	Dredged	1-acceptable	Brandywine Creek at US 12	Cass	41.79741	-86.21458
XX	640	DRY	DRY	Not Sampled	Love Creek at Tabor Rd	Berrien	42.00011	-86.34008

* denotes status site

** denotes trend site

Table 5A. Qualitative macroinvertebrate sampling results for sites on the Dowagiac River, Cass County, 2001, 2006, and 2011.

TAXA	Dowagiac River d/s Dodd Park 8/14/2001 STATION 14	Dowagiac River d/s Dodd Park 8/15/2006 STATION 14	Dowagiac River d/s Dodd Park 8/18/2011 STATION 14	Dowagiac River Dodd Park meander 8/18/2011 STATION 15	Dowagiac River Indian Lake Road 8/14/2001 STATION 16	Dowagiac River Indian Lake Road 8/15/2006 STATION 16	Dowagiac River Indian Lake Road 8/18/2011 STATION 16
PLATYHELMINTHES (flatworms)							
Turbellaria		1					
ANNELIDA (segmented worms)							
Hirudinea (leeches)	1	1	3			9	14
Oligochaeta (worms)		23				11	14
ARTHROPODA							
Crustacea							
Amphipoda (scuds)	10	13	17	42	15	23	97
Decapoda (crayfish)	2	1		1	1	1	1
Isopoda (sowbugs)	1		1	1		2	1
Arachnoidea							
Hydracarina				2			
Insecta							
Ephemeroptera (mayflies)							
Baetidae	5	6	6	13	5	17	
Ephemerellidae				1			
Heptageniidae	5	4	8	31	5	1	6
Isonychiidae	1			1			
Tricorythidae				1			
Odonata							
Anisoptera (dragonflies)							
Aeshnidae	1	1		1	1	1	
Gomphidae		1	1	2		3	1
Zygoptera (damselflies)							
Calopterygidae	1	2		1	1	2	2
Coenagrionidae						1	1
Plecoptera (stoneflies)							
Perlidae	4	5	3	9	2	2	
Pteronarcyidae	2		6	1			
Hemiptera (true bugs)							
Belostomatidae					1	1	
Corixidae	2	14		8	20	55	1
Gerridae	1	1			1	1	
Notonectidae						1	
Pleidae							15
Veliidae				3		1	
Megaloptera							
Corydalidae (dobson flies)	1			2	1	1	2
Trichoptera (caddisflies)							
Brachycentridae	10	88	59	10	10	96	15
Glossosomatidae	1	2	3	10			
Helicopsychidae	1	1	4	1			
Hydropsychidae	10	75	14	56	10	23	3
Leptoceridae		3	3	4		18	11
Limnephilidae	2	1	3	6	2	1	
Philopotamidae						1	
Phryganeidae						3	
Polycentropodidae		1					4
Uenoidae	8	4	27	42	1		

TAXA	Dowagiac River d/s Dodd Park 8/14/2001 STATION 14	Dowagiac River d/s Dodd Park 8/15/2006 STATION 14	Dowagiac River d/s Dodd Park 8/18/2011 STATION 14	Dowagiac River Dodd Park meander 8/18/2011 STATION 15	Dowagiac River Indian Lake Road 8/14/2001 STATION 16	Dowagiac River Indian Lake Road 8/15/2006 STATION 16	Dowagiac River Indian Lake Road 8/18/2011 STATION 16
Coleoptera (beetles)							
Dytiscidae (total)							1
Gyrinidae (adults)					1		
Halplidae (adults)		5					1
Elmidae	5	7	11	32	2	4	18
Psephenidae (larvae)			3	3		1	
Diptera (flies)							
Ceratopogonidae							2
Chironomidae	15	13	15	14	30	9	43
Simuliidae	5	13	5	1	2	4	
Tabanidae						1	
Tipulidae		1		3			1
MOLLUSCA							
Gastropoda (snails)							
Ancylidae (limpets)	1		1		1	9	4
Physidae		1				1	
Planorbidae	1						5
Pleuroceridae		3	37	13		3	7
Valvatidae	1						
Pelecypoda (bivalves)							
Corbiculidae	1	11	13	1	1	8	
Sphaeriidae (clams)	1	7		5	1		1
TOTAL INDIVIDUALS	99	309	243	321	114	315	271

Table 5B. Macroinvertebrate metric evaluation of sites on the Dowagiac River, Cass County, 2001, 2006, and 2011.

METRIC	Dowagiac River d/s Dodd Park 8/14/2001 STATION 14		Dowagiac River d/s Dodd Park 8/15/2006 STATION 14		Dowagiac River d/s Dodd Park 8/18/2011 STATION 14		Dowagiac River Dodd Park meander 8/18/2011 STATION 15		Dowagiac River Indian Lake Road 8/14/2001 STATION 16		Dowagiac River Indian Lake Road 8/15/2006 STATION 16		Dowagiac River Indian Lake Road 8/18/2011 STATION 16	
	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	28	1	30	1	22	0	32	1	22	0	33	1	26	1
NUMBER OF MAYFLY TAXA	3	0	2	0	2	0	5	1	2	0	2	0	1	-1
NUMBER OF CADDISFLY TAXA	6	1	8	1	7	1	7	1	4	0	6	1	4	0
NUMBER OF STONEFLY TAXA	2	1	1	1	2	1	2	1	1	1	1	1	0	-1
PERCENT MAYFLY COMP.	11.11	0	3.24	0	5.76	0	14.64	0	8.77	0	5.71	0	2.21	-1
PERCENT CADDISFLY COMP.	32.32	1	56.63	1	46.50	1	40.19	1	20.18	0	45.08	1	12.18	0
PERCENT DOMINANT TAXON	15.15	1	28.48	0	24.28	0	17.45	1	26.32	0	30.48	0	35.79	0
PERCENT ISOPOD, SNAIL, LEECH	5.05	0	1.62	1	17.28	-1	4.36	0	0.88	1	7.62	0	11.44	-1
PERCENT SURF. AIR BREATHERS	3.03	1	6.47	1	0.00	1	3.43	1	20.18	-1	19.05	0	6.64	1
TOTAL SCORE	6		6		3		7		1		4		-2	
MACROINV. COMMUNITY RATING	EXCELLENT		EXCELLENT		ACCEPT.		EXCELLENT		ACCEPT.		ACCEPT.		ACCEPT.	

