



Biological and Water Quality Survey of the St. Joseph River and Selected Tributaries

Williams and Defiance Counties Counties, Ohio



Division of Surface Water
May 31, 2013

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of the
St Joseph River
and
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Division of Surface Water Lazarus Government Center
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Introduction

As part of the TMDL process and in support of the basin approach for NPDES permitting, an intensive ambient assessment will be conducted during the 2013 field sampling season within the St Joseph River basin. The study area is composed of all or portions of 17 HUC12 watershed assessment units (Table 1). A total of 35 sampling stations are allocated to this effort and will provide for the assessment of 11 named streams. Ambient biology, macrohabitat quality, water column chemistry, and bacteriological data will be collected concurrently from most of these sites. Diel water quality (DO, pH, conductivity, and temperature), sediment chemistry (metals, organics, and particle size), nutrients, and fish tissue will be evaluated at selected sampling locations.

Sampling Objectives

- 1) Systematically sample and assess the principal drainage network of the St. Joseph River in support of both the TMDL process and NPDES permits,
- 2) Gather ambient environmental information (biological, chemical, and physical) from undesignated water bodies, so as to recommend an appropriate suite of Beneficial Uses (e.g., aquatic life, recreational, water supply),
- 3) Verify the appropriateness of or recommend changes to existing, unverified, Beneficial Use Designations,
- 4) Establish and evaluate baseline ambient biological conditions at selected reference stations to evaluate the effectiveness of past, on-going and future pollution abatement efforts,
- 5) Document any changes in the biological, chemical, and physical conditions of the study areas where historical information exists, thus expanding the Ohio EPA data base for statewide trends analysis (e.g., 305[b]), and
- 6) Monitor and assess Nettle Lake.

Issues

Total Maximum Daily Load (TMDL)

Information collected as part of this survey will support TMDL development for the study area. The objectives of the TMDL process are to estimate pollutant loads from the various sources within the basin, define or characterize allowable loads to support the various beneficial uses, and to allocate pollutant loads among different pollutant sources through appropriate controls (e.g., NPDES permitting, storm water management, 319 proposals, NPS controls or other abatement strategies).

The components of the TMDL process supported by this survey are primarily the identification of impaired waters, verification (and redesignation if necessary) of beneficial use designations, gathering ambient information that will factor into the

wasteload allocation, and ascribing causes and sources of use impairment. These data are necessary precursors to the development of effective control or abatement strategies.

Aquatic Life Use Designations

Designated aquatic life uses for over half of the streams contained within the study area were made prior to standardized approaches to the collection of instream biological data or numerical biological criteria. As a result, most of the existing aquatic life use designations for streams within the study area are classified as unverified. The Ohio EPA is obligated to review, evaluate, or recommend (where appropriate) beneficial uses prior to basing any permitting actions on existing, unverified designations, or wholly unclassified water bodies. Much of the sampling effort for this survey is allocated to fulfill this obligation.

NPDES Permits

Significant, major and minor NPDES permitted facilities will be evaluated as part of this study. These include both publically owned treatment works and private entities. A list of selected permitted facilities is presented in Table 2.

Nutrients and Productivity

In support of the ongoing process of nutrient criteria development and to provide more objective and robust characterization of the sources and effects of nutrient loads on both the St. Joseph mainstem and Maumee River, limited monitoring is scheduled for St. Joseph River mainstem.

Lakes

One public lake contained within the St Joseph basin is scheduled for monitoring and assessment in 2013: Nettle Lake. Northwest district office staff is solely responsible for the development of plan of work and supporting field sampling efforts.

Sampling Effort

Field and Laboratory Load

Summarized field and laboratory load (stations, number of samples, and parameters for analysis, etc.) can be found in Table 3. All scheduled locations and necessary stipulations are provided in Table 4.

Water Quality

Water column chemistry samples will be collected from 34 ambient stations within the study areas. Water column grab samples and standard field parameters will be collected/measured five times from all locations. The collection of water samples for bacteriological analysis is scheduled for 27 stations (Table 4).

DataSonde® deployment is requested for 18 locations: six sentinel, four nutrient, and seven ambient monitoring sites. The deployment of continuous monitors should coincide with typical low summer/fall flows (i.e., approaching Q₇10). The Modeling section will be responsible for deployment of the sonde units.

Nutrients and Productivity

Water column samples in support of nutrient monitoring and assessment efforts will be collected at four locations (Table 4). DSW Modeling staff is responsible for the collection of specific parameters supporting nutrient monitoring and assessment. Substrate and water column samples for the analysis of benthic and sestonic chlorophyll-a, dissolve phosphorus, alkalinity, and BOD₅ must be collected concurrently with either the DataSonde® set or retrieval or the interval between these two activities.

Sediment Chemistry

Sediment samples are to be collected from four locations within the study area. Given the limited laboratory allocation, sediment and metal-organic sampling stations were chosen to evaluate areas likely to demonstrate contamination, aid in elucidating longitudinal trends in sediment contamination relative to a known source(s), characterization of sentinel sites, and characterization of ecoregional sediment reference sites.

Benthic Macroinvertebrate Assessment

The condition of the macrobenthos will be evaluated at 33 locations. Artificial substrate samples (quantitative) will be deployed and retrieved by MEG staff at 27 stations within the study area. Qualitative benthic macroinvertebrate samples (natural substrates) will be collected at six stations. Locations of benthic macroinvertebrate sampling stations and type of sample required are listed in Table 4.

Fish Community Assessment

The condition of the fish assemblages within the study area will be evaluated at 32 locations. Multiple pass fish community samples will be collected at 28 sites by Ohio EPA FEG staff. Single pass fish community samples will be collected at four stations. Single pass evaluations are limited to headwaters, baring reference sites or significant permit issues. The locations of all fish sampling stations are listed in Table 4.

Fish Tissue

In support of the consumption advisory program, fish tissue samples are to be collected from seven of the 32 fish monitoring stations within the St. Joseph River study area. As indicated in Table 4, four tissue stations are allocated to the St. Joseph River mainstem, and single station monitoring is specified for the West Branch St Joseph, Fish Creek and Nettle Creek. Tissue monitoring on the East Branch St. Joseph was completed as part of a supplemental monitoring effort in 2012, and thus revisiting this waterbody was deemed redundant.

Sentinel Sites

To aid in the development of a TMDL models(s), sentinel sites have been established at six designated locations. At each sentinel site, samples are collected monthly beginning prior to the typical onset of field sampling season. Analysis test for routine water chemistry parameters, pesticides (methods 525.2, 531.1, and 547) and stream stage is measured to the nearest 100th of a foot, as the water line against a designated bridge piling or abutment. Sampling events at sentinel sites should cover the range of stream

flow from the 10th to 90th percentiles. If conditions warrant, bacteriological sampling at all sentinel sites may be expanded beyond five runs. The locations of sentinel sites are indicated in Table 4.

QUALITY ASSURANCE

Ohio EPA Manuals

All biological, chemical, data processing, and data analysis methods and procedures adhere to those specified in the Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2013a), Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio EPA 1987, 1989a, 1989b, 2013b, 2013c), and The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Ohio EPA 1989c, 2006) for habitat assessment. Specific and approved laboratory methods are itemized in Table 5.

Use Attainment

Attainment/non-attainment of aquatic life uses will be determined by using biological criteria codified in Ohio Administrative Code (OAC) 3745-1-07, Table 7-17. Numerical biological criteria are based on multimetric biological indices including the Index of Biotic Integrity (IBI) and modified Index of Well-Being (MIwb), indices measuring the response of the fish community, and the Invertebrate Community Index (ICI), which indicates the response of the macroinvertebrate community.

Performance expectations for the basic aquatic life uses (Warmwater Habitat [WWH], Exceptional Warmwater Habitat [EWH], and Modified Warmwater Habitat [MWH] were developed using the regional reference site approach (Hughes et al. 1986; Omernik 1987). This fits the practical definition of biological integrity as the biological performance of the natural habitats within a region (Karr and Dudley 1981). Attainment of an aquatic life use is FULL if all three indices (or those available) meet the applicable criteria, PARTIAL if at least one of the indices did not attain and performance did not fall below the fair category, and NON if all indices either fail to attain or any index indicates poor or very poor performance.

Recreational use attainment will be determined using *E. coli* bacteria. *E. coli* is now the primary indicator organism for the potential presence of pathogens in surface water resulting from the presence of untreated human or animal wastes, and is the basis for recreational use water quality criteria in Rule 3745-1-07 of the Ohio Administrative Code (OAC)

Stream Habitat Evaluation

Physical habitat is evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Ohio EPA 1989c, 2006). Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Evaluations of type and quality of substrate, amount of in-stream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site. As such, individual sites may have much poorer physical habitat

due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments around the state have indicated that values higher than 60 were generally conducive to the establishment of warmwater faunas while those which scored in excess of 75-80 often typify habitat conditions which have the ability to support exceptional faunas.

Biological Community Assessment

Macroinvertebrates will be collected from artificial substrates and from the natural habitats. Quantitative sampling will be conducted at reference sites and at sites with drainage areas in excess of 20 mi². Qualitative sampling will be conducted in headwater sites with drainages smaller than 20 mi². The artificial substrate collection provides quantitative data and consists of a composite sample of 5 modified Hester-Dendy (HD) multiple-plate samplers colonized for six weeks. At the time of the artificial substrate collection, a qualitative multi-habitat composite sample is also collected. This sampling effort consists of an inventory of all observed macroinvertebrate taxa from the natural habitats at each site with no attempt to quantify populations other than notations on the predominance of specific taxa or taxa groups within major macrohabitat types (e.g., riffle, run, pool, and margin). Detailed macroinvertebrate assemblage sampling protocols are documented in Biological Criteria for the Protection of Aquatic Life, Volume III (1989b, 2013c).

Fish will be sampled at each sampling location with pulsed DC current. Two passes will be conducted at sites larger than 20 mi² and at reference sites. The catch is processed in the field which includes identifying each individual to species, counting individuals at all sites, weighing individuals at wading and boat sites, and recording any external abnormalities. Detailed fish assemblage sampling protocols are documented in Biological Criteria for the Protection of Aquatic Life, Volume III (1989b, 2013c).

Fish Tissue

The collection, field processing, and short-term storage of fish tissue samples shall adhere to the methods and protocols specified in the agency's current fish tissue guidance manual (Ohio EPA 2012a).

Sediment

One set of sediment samples will be collected at each of the specified stations, using procedures outlined in the Ohio EPA Sediment Sampling Guide and Methodologies, 3rd edition (Ohio EPA, 2012b). Fine grained multi-incremental sediment samples will be collected in the upper four inches of bottom material using either clean stainless steel scoops or dredges. Samples will be homogenized and split into 500 ml amber glass jars with Teflon lined lids for organic compound testing and 250 ml HPDE containers for metals testing. They will then be secured inside coolers with wet ice and delivered to the Ohio EPA Division of Environmental Services for analysis. Pollutants to be tested and their analytical methods are listed in the table of chemical/physical parameters (Table 5).

Data will primarily be used as a resource to help determine causes and sources of aquatic life impairment. More detailed follow up studies may be recommended in some instances. To determine the potential for sediment contaminants to exert adverse effects the data will first be compared to Ohio sediment reference values and consensus based sediment quality guidelines. This constitutes a Tier I assessment as described in *Guidance on Evaluating Sediment Contaminant Results* (Ohio EPA, 2010). No further assessment is needed if the sediment passes the screening. If not, it's considered above levels of concern and further evaluation is needed using the Tier II process. This process estimates bioavailability using total organic carbon to normalize pollutant concentrations.

Surface Water

Surface water grab samples will be collected from the upper 12 inches of river water into appropriate containers. Collected water will be preserved using appropriate methods, as outlined in Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2013a) and shipped overnight via courier to the Ohio EPA lab for analysis. Field measurements of dissolved oxygen, pH, temperature, and conductivity will be made using YSI 556MPS meters along with all grab samples for surface water chemistry. Datasonde[®] continuous recorders will be placed at select make to diel measurements of dissolved oxygen, pH, temperature, and conductivity.

Bacteria

Water samples will be collected into appropriate containers, cooled to 4°C, and transported to and submitted to the lab for analysis within 6 hours of collection. All samples will be analyzed for *E. coli* bacteria using U.S.EPA approved methods (STORET Parameter Code 31648).

Chlorophyll

Benthic chlorophyll a samples will be collected and preserved using appropriate methods, as outlined in Appendix II of Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2013a) and delivered to the Ohio EPA Division of Environmental Services lab for analyses. Alkalinity must be requested as a routine water quality parameter at all study sites along with the routine field parameters, especially temperature and pH.

Field Quality Control Samples

Five percent of water column will be submitted to the lab as field duplicates. One DataSonde[®] recorder site will have two instruments placed in the river as field duplicates. Field blanks will occur at a minimum of 5 percent of the water samples. Field instruments will be calibrated daily, using manufacturer guidelines and requirements noted in the Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2013a). Matrix spike duplicates will be collected for organic water samples at a minimum of 5 percent.

Lake Monitoring

Sampling will be done over two field seasons on Nettle Lake as listed in the table of sampling locations (Table 7). A total of five sampling events will be done per season at a frequency of roughly once per month May – September. At a minimum, grab samples for chemical analysis will be collected at 0.5m below the surface and 0.5m above the bottom from the deepest portion of the lake. Additional sites will be added if the lake is >20 km long, clearly divided into sub-basins, has major inflows or has a beach. Field readings (temperature, dissolved oxygen, pH and conductivity) will be done in the water column at roughly 1m increments between the chemistry samples and secchi depth will also be measured. Lakes used to store public drinking water will have samples analyzed for atrazine. Lakes that develop a visual harmful algae bloom or those with phytoplankton communities dominated by *Cyanobacteria* will have samples analyzed for *Microcystins*. A list of pollutants to be tested with their analytical methods and reporting limits (RL) are summarized below. Other pollutants will be added if they are known or suspected to be a problem. A sediment sample will be collected if none has been done within the last 10 years and analyzed for the parameters listed in Table 5. Fish tissue specimens will be collected in lakes selected by a multi-agency committee with a priority given to those commonly used for sport fishing.

All field practices will follow guidelines in the Ohio EPA Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2013a) and the Inland Lakes Sampling Procedure Manual (Ohio EPA 2010b). Data will be used to assess use designations previewed in the Ohio 2012 Integrated Water Quality Monitoring and Assessment Report. The uses, criteria and assessment methods described are considered draft until they are adopted into the Ohio Water Quality Standards. The strategy generally focuses on water quality conditions in the epilimnion of lakes, although the entire water column is examined when the lake is un-stratified.

Field Staff and Other Contacts

<p>Ohio EPA-Central Office Charles Boucher: (614) 836-8776 Mike Bolton: (614) 836-8781 Laura Hughes: (614) 836-8783 Paul Gledhill: (614) 644-2881 Sarah Becker: (614) 728-2385 Jeff DeShon: (614) 836-8780 Holly Tucker: (614) 836-8777 Beth Risley: (614) 728-2384 Chris Skalski: (614) 644-2144</p>	<p>County Wildlife Officers</p> <p><u>District 2</u> 952 Lima Avenue Findlay, OH 45840 (419) 424-5000</p> <p>Williams Co.: Thomas Kochert, (419) 429-8396 Defiance Co.: Matthew Smith, (419) 429-8381</p>
<p>Ohio EPA-NWDO Dan Glomski: (419) Ben Smith: (419) 373-3027 Chris Riddle: (419) 373-3101</p>	<p>County Sheriffs</p> <p><u>Williams County</u> 218 W Bryan St. Bryan, OH 43506 (419) 636-3151</p> <p><u>Defiance County</u> 113 Biede Ave. Defiance, OH 43512 (419) 784-1592</p>
<p>Hospitals (see attached maps)</p> <p><u>Montpelier Hospital</u> 909 E Snyder St. Montpelier, OH 43543 (419) 485-3154</p>	<p>Police Departments</p> <p><u>Montpelier</u> 221 Empire St. Montpelier, OH 43543 (419) 485-3121</p> <p><u>Edgerton</u> 104 E Indiana St Edgerton, OH 43517 (419) 298-2343</p> <p><u>Pioneer</u> 205 S. State Street PO Box 426 Pioneer, OH 43554 419-737-3129</p> <p><u>Edon</u> 108 E Indiana St Edon, OH 43518 (419)272-3333</p>

HUC12	Sites	Name	Drain. Area ^a	Waterbodies ^{b,c}
41000030104	-	Bird Creek-East Br. St. Joseph River	0.3 mi ²	b
41000030106	5	Clear Frk.-East Br. St. Joseph River	24.0 mi ²	East Br. St Joseph Clear Fork Silver Creek
41000030204	4	West Branch St. Joseph River	14.8 mi ²	West Br. St Joseph
41000030301	4	Nettle Creek	22.0 mi ²	Nettle Creek
41000030302	1	Cogswell Cemetery-St. Joseph River	9.7 mi ²	St. Joseph River ^c
41000030303	4	Eagle Creek	35.0 mi ²	Eagle Creek North Br. Eagle Creek
41000030304	2	Montpelier-St. Joseph River	20.8 mi ²	St. Joseph River
41000030305	3	Bear Creek	22.4 mi ²	Bear Creek
41000030306	1	W. Buffalo-St. Joseph River	13.7 mi ²	St Joseph River ^c
41000030402	1	Headwaters Fish Creek	7.8 mi ²	Upper Fish Creek ^c
41000030405	-	Alvarado-Fish Creek	2.6 mi ²	b
41000030406	2	Cornell Ditch-Fish Creek	6.2 mi ²	Lower Fish Creek
41000030501	1	Bluff Run-St. Joseph River	23.7 mi ²	St. Joseph River
41000030502	1	Big Run	3.0 mi ²	Big Creek
41000030503	3	Russell Run-St. Joseph River	18.0 mi ²	St. Joseph River
41000030505	1	Willow Run-St. Joseph River	12.4 mi ²	St. Joseph River ^c
41000030506	-	Sol Shank-St. Joseph River	1.2	b

a - HUC12 drainage area within political boundaries of Ohio.
b - HUC12s so identified do not contain waterbodies meeting the minimum drainage area assessment criterion, and thus will not be evaluated as part of the St. Joseph River survey.
c - HUC12s so identified are either small or shared with adjacent state (Indiana or Michigan) or both, thus only one monitoring station was allocated for assessment.

Facility Name	NPDES Permit No.	County	River Mile	Comments
Montpelier WWTP (major)	2PD0003	Williams	74.25	St. Joseph River
Edgerton WWTP (major)	2PB00047	Williams	52.1	St. Joseph River
Edgerton Metals	NA	Williams	50.9	Tied into POTW, presently NCC water only
Pioneer WWTP (minor)	2PB00006	Williams	3.18	E. Br. St. Joseph River
Edan (minor)	2PA00031	Williams	~7.6-7.0	Bear Creek
<u>Unsewered Communities</u>				
• Blakeslee	NA	Williams	~1.2-0.5	Bear Creek
• Columbia	NA	Williams	~1.0	Upper Fish Creek Basin (UN Trib.)
• Lake Seneca	NA	Williams	NA	Seneca Lake
<u>CAFO</u>				
• Bridgewater Dairy	-	Williams	NA	Nettle Creek (3900 head)

Table 3. Ohio EPA laboratory and field sampling load for the 2013 St. Joseph River survey. Total number of water column analytes does not include field parameters.				
Sample Type	No. of Lab Parameters	No. Sites	Passes	Total Samples/Parameters
Conventional Water Quality (total)	35	34	5	170/5,950
Pathogen (<i>E. coli</i>)^a	1	27	5+	135
Nutrients/Productivity^b	4	4	1	16
Water Column Organics				-/-
BNA, Pesticides (including chlordane) and PCBs	-	-	-	-/-
Datasonde[®]	-	18	1	NA
Sediment	-	4	1	-/-
Sediment Metals**	11	4	1	-/44
Sediment Organic	(Full Scan)#	4	1	-/Full Scan
Fish Tissue				
Metals, including Hg	(FT Suite)	7	1	-/-
Organics	(Full Scan)	7	1	-/Full Scan
Lake Monitoring				
Water Column	36	1(2x)	5	10/360
Sediment	11	1	1	1/11
Pathogens	1	1	5	1/5
Fish Stations (total)	-	32	1-2	60/-
2x	-	28	2	56/-
1x	-	4	1	4/-
Macrobenthos (total)[†]	-	33	NA	29 (HDs and Equivalents)/-
Quantitative (Hester Dendy)	-	27	NA	27/-
Qualitative (Natural Substrates)	-	6	NA	6 (2 HD Equivalents)/-

a - Bacteriological measures will include a minimum of five *E. coli* runs for all stations.
b - Nutrient analysis shall include, dissolved phosphorus, alkalinity, BOD5, and sestonic chlorophyll-a. Furthermore, water column sample for these parameters must be concurrent with either the set or retrieval of the Datasonde, continuous monitor.
** - Ohio EPA sediment samples will be analyzed for the following metals: Cd, Ag, Cu, Pb, Mn, Ni, and Zn.
- Full Scan includes BNAs, PCBs, Pesticides, and TOC.
† - The ratio of HD Equivalents and HD is 3:1.

Table 4. St. Joseph River basin sampling station, 2013						
River STORET	River Mile	Area (mile ²)	Sample Type	Location	Lat. Long.	USGS 7.5'Quad.
St. Joseph River (04-400) WWH+						
P08S19	81.18	288.0	(F,M,C,B,S,D,N,T)	Ust. Montpelier, CR N	41.619200 -84.588900	Montpelier
302199	76.72	338.0	(F,M,C,B)	CR M dead end, At county fair grounds	41.591306 -84.599014	Montpelier
P08S18	73.24	337.0	(F,M,C,B,D)	Dst Montpelier, CR 10	41.571700 -84.632500	Blakeslee
302200	66.69	391.0	(B)	CR I	41.542370 -84.675247	Blakeslee
P08S17	62.08	394.0	(F,M,C,B,D,S,N,T) ^{SS}	SR 34	41.519200 -84.697500	Blakeslee
P08S16	56.77	435.0	(F,M,C,B)	Ust Edgerton WWTP, CR E-75	41.489200 -84.730600	Butler East
P08K03	51.90	552.0	(D)	Dst. Edgerton WWTP	41.451100 -84.733900	Edgerton
510180	49.75	554.0	(F,M,C,B,D,S,N,T)	Dst. Edgerton, SR 49	41.435398 -84.745640	Edgerton
P08K02	47.30	566.0	(F,M,C)	County Line Rd.	41.422200 -84.773900	Butler East
510220	42.34	609.0	(F,M,C,B,S,D,N,T) ^{SS}	Near Ohio Indiana State Line, SR 249	41.385600 -84.801700	Butler East
Big Run (04-404) WWH*						
P08K08	0.30	30.0	(F,M,C,B)	Edgerton, Conkle Rd.	41.423300 -84.782200	Butler East
Fish Creek (04-405) WWH&EWH+						
P08K12	30.54	8.8 ^{1x}	(F,M,C,B,D) ^a	Ust Columbia, CR P-25	41.652200 -84.796400	Clear Lake
P08K10	5.40	106.0	(F,M,C,B)	Dst. Stateline, TR 171, dst. UN Tributary	41.466100 -84.801400	Butler East
P08K09	2.4	108.0	(M,C)	CR 3	41.472800 -84.767200	Butler East
P08S20	0.38	109.0	(F,M,C,B,D,T) ^{SS}	Edgerton, SR 49	41.464200 -84.748300	Edgerton
Bear Creek (04-409) MWH&WWH+						
P08S13	8.8	4.5 ^{1x}	(C,B)	Ust Edon WWTP, CR 2	41.550800 -84.788300	Edon
P08K18	5.7	13.6	(F,M,C,B) ^a	Dst. Edon WWTP, CR 4	41.555600 -84.750000	Blakeslee
P08K15	2.43	22.0	(F,M,C)	CR I	41.541700 -84.723300	Blakeslee
510150	0.54	24.2	(F,M,C,B,D)	SR 34	41.520600 -84.715800	Blakeslee
Eagle Creek (04-411) WWH*						
P08K22	8.28	21.1	(F,M,C,B)	Dst. North Branch, CR 675	41.606900 -84.695800	Blakeslee
P08K21	4.90	24.2	(F,M,C)	CR M	41.600800 -84.660800	Blakeslee
P08S01	0.50	34.7	(F,M,C,B,D)	CR J	41.557083 -84.676423	Blakeslee

Table 4. continued.

River STORET	River Mile	Area (mile ²)	Sample Type	Location	Lat. Long.	USGS 7.5'Quad.
North Br. Eagle Creek (04-412) WWH*						
P08K23	0.02	12.9 ^{1x}	(F,M,C,B,D) ^a	At mouth, CR M-50	41.609700 -84.703900	Blakeslee
Nettle Creek (04-413) WWH*						
P08S09	14.48	19.1 ^{1x}	(F,M,C,D,B) ^a	Ust. Nettle Lake, TR 72	41.688900 -84.732800	Nettle Lake
P08K25	11.23	25.0	(F,M,C,B)	Dst. Lake La Su An, CR 7	41.672200 -84.688900	Nettle Lake
P08K24	5.08	31.0	(F,M,C)	CR 8.50, adj. Bridgewater Dairy	41.624200 -84.650600	Pioneer
P08S06	1.37	36.0	(F,M,C,B,D,T) ^{SS}	CR N-30	41.621700 -84.606100	Montpelier
W. Br. St. Joseph River (04-414) WWH+						
P08S22	10.48	98.0	(F,M,C)	Near State Line, TR S	41.693900 -84.687500	Nettle Lake
P08K28	8.50	99.0	(F,M,C,B,D)	Ust. Seneca Lake, CR 8	41.683300 -84.684200	Nettle Lake
P08S21	3.13	109.0	(F,M,C,D,T) ^{SS}	Dst, Seneca Lake, TR 115	41.659200 -84.602200	Pioneer
302198	0.7	114.3	(F,M,C,D,B)	US 20, near mouth	41.653972 -84.572333	Pioneer
E. Br. St. Joseph River (04-415) WWH*						
P08K30	4.77	95.0	(F,M,C,D,B)	CR S, ust. Pioneer WWTP	41.694894 -84.510384	Pioneer
P08K29	1.06	163.0	(F,M,C,D,B, ^{SS})	SR 15, dst. Pioneer WWTP	41.659735 -84.553454	Pioneer
Clear Fork (04-416) WWH*						
P08K32	6.22	15.1 ^{1x}	(F,M,C) ^a	SR 576	41.695300 -84.631100	Pioneer
P08K31	2.17	21.1	(F,M,C,B)	CR 13	41.680800 -84.631100	Pioneer
Silver Creek (04-417) WWH+						
P08S23	1.25	31.4	(F,M,C,B,D)	CR 15	41.696100 -84.533900	Pioneer
Nettle Lake – Public Lake						
203925	-	14.1	(L)	Nettle Lake	41.682800 -84.726100	Williams

a - Stations draining an area less than 20 miles²: 1X fish and qualitative Macroinvertebrates sampling. Unless otherwise indicated all other stations drain an area greater than 20 miles², and thus 2X Fish and quantitative Macroinvertebrates sampling is prescribed.

SS - WQ Modeling Sentinel Site

1x - Single pass fish or qualitative benthos or both. Unless otherwise indicated all other biological stations are scheduled for 2 pass fish and quantitative benthos sampling.

F - Fish Community

M - Macroinvertebrates

C - Water Column Chemistry :

- For the St. Joseph River mainstem, analytes shall include those specified in Large River monitoring template (see attached)
- Analytes for all other waters shall include those specified in Stream Monitoring template (see attached)

N - Nutrients: samples in support of nutrient monitoring are the responsibility of DSW Modeling staff and at a minimum must include the following parameters:

- Water Column/Sestonic Chlorophyll-a, Dissolve Phosphorus, Alkalinity, and BOD₅ (P310).

Table 4. continued.

D - DataSonde®

B - Bacteria sampling in support of recreational use assessment.

S - Sediment: Full Organic Scan [Pesticides (including Chlordane), BNAs, TOC and PCBs], Full Metals Scan (excluding Hg), Percent Solids

T - Fish tissue station

L - Lake Monitoring

Table 5. List of chemical/physical water quality parameters to be analyzed/measured in surface water, sediment, and fish tissue samples from the St. Joseph River basin sampling locations. The reporting limit or an "X" is placed in the column where samples will be collected. Not all sites will be sampled for all parameters.

Parameters	Test Method	Stream	Sediment	Fish Tissue	Lake
cBOD, 5 day	SM 5210B	2.0 mg/L	-	-	-
cBOD, 20 day	OEPA 310.2	2.0 mg/L	-	-	-
Solids Dissolved (TDS)	USEPA 160.1	10 mg/L	-	-	10 mg/L
Solids Suspended (TSS)	USEPA 160.2	5 mg/L	-	-	5 mg/L
Total Organic Carbon (TOC)	OEPA 335.2	-	0.1 %	-	-
Alkalinity	USEPA 305.1	5 mg/L	-	-	5 mg/L
Chemical Oxygen Demand (COD)	USEPA 410.4	20 mg/L	-	-	-
Ammonia	USEPA 350.1	0.05 mg/L	-	-	0.05 mg/L
Total Kjeldahl Nitrogen (TKN)	USEPA 351.2	0.2 mg/L	-	-	0.2 mg/L
Nitrate + Nitrite	USEPA 353.1	0.5 mg/L	-	-	0.5 mg/L
Nitrite	USEPA 353.2	0.02 mg/L	-	-	0.02 mg/L
Chloride	USEPA 325.1	5 mg/L	-	-	5 mg/L
Phosphorus, Total	USEPA 365.4	0.01 mg/L	50 mg/kg	-	0.01 mg/L
Orthophosphate (as P)	USEPA 365.4	0.01 mg/L	-	-	0.01 mg/L
Aluminum	USEPA 200.7	200 µg/L	-	-	200 µg/L
Barium	USEPA 200.7	15 µg/L	-	-	15 µg/L
Calcium	USEPA 200.7	2 mg/L	-	-	2 mg/L
Iron	USEPA 200.7	50 µg/L	-	-	50 µg/L
Magnesium	USEPA 200.7	1 mg/L	-	-	1 mg/L
Manganese	USEPA 200.7	10 µg/L	-	-	10 µg/L
Sodium	USEPA 200.7	5 mg/L	-	-	5 mg/L
Potassium	USEPA 200.7	2 mg/L	-	-	2 mg/L
Strontium	USEPA 200.7	300 µg/L	-	-	300 µg/L
Zinc	USEPA 200.7	10 µg/L	8 mg/kg	-	10 µg/L
Hardness	USEPA 200.7	10 mg/L	-	-	10 mg/L
Arsenic	USEPA 200.8 / SM 3113B	2.0 µg/L	-	X	2.0 µg/L
Cadmium	USEPA 200.8 / SM 3113B	0.2 µg/L	0.08 mg/kg	X	0.2 µg/L
Chromium	USEPA 200.8	2.0 µg/L	-	-	2.0 µg/L
Copper	USEPA 200.8	2.0 µg/L	0.8 mg/kg	-	2.0 µg/L
Nickel	USEPA 200.8	2.0 µg/L	0.8 mg/kg	-	2.0 µg/L
Lead	USEPA 200.8 / SM 3113B	2.0 µg/L	0.8 mg/kg	X	2.0 µg/L
Selenium	USEPA 200.8 / SM 3113B	2.0 µg/L	-	X	2.0 µg/L
Silver	USEPA 200.8	-	0.08 mg/kg	-	-
Percent Solids	SM 2540G	-	0%	-	-
pH	Field Meter	X	-	-	X
Conductivity	Field Meter / USEPA 120.1	X (2 µs/cm)	-	-	X
Dissolved Oxygen (mg/L and % sat)	Field Meter	X	-	-	X
Temperature	Field Meter	X	-	-	X
Mercury	USEPA 245.1, 7470A, 7471A	-	0.02 mg/kg	X	-
Herbicides	USEPA 525.2	X	-	-	X
SVOCs (BNA)	USEPA 625 / USEPA 8270C	X	0.4-2.0 mg/kg	-	-

Table 5. continued.

Parameters	Test Method	Stream	Sediment	Fish Tissue	Lake
PCBs / Pesticides / Chlordane	USEPA 8082 / OEPA 590.1	-	X (PCB only)	X	-
<i>E. coli</i>	USEPA 1603	2 CFU	-	-	2 CFU
chlorophyll-a	USEPA 445.0	X	-	-	X
microcystins	OEPA 701.0	-	-	-	0.3 µg/L
Turbidity	OEPA 180.1	-	-	-	2 NTU
Volatile Suspended Solids	SM 2540 D/E	-	-	-	5 mg/L
Carbonate / Bicarbonate	SM 2320 B	-	-	-	5 mg/L
Sulfate	USEPA 375.2	10 mg/L	-	-	10 mg/L
Organic Carbon	SM 5310B	-	-	X	-
Percent Lipids	OEPA 581.5	-	-	X	-

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