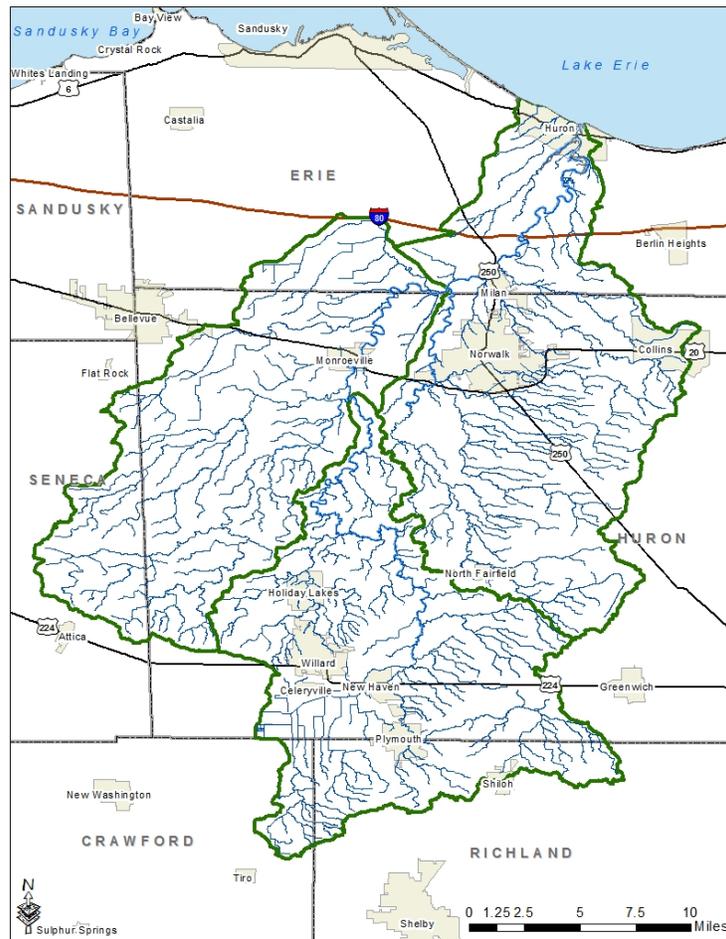




2016 Study Plan for the Huron River Basin

Erie, Huron, Seneca, Crawford and Richland Counties



Division of Surface Water
Ecological Assessment Section
June 6th 2016

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June 6th 2016

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Introduction

As part of Ohio's statewide monitoring strategy, a biological and water quality assessment will be conducted in the Huron River basin during the 2016 field season. The Huron River basin is located within 8-digit hydrologic unit code (HUC) 04100012 and is composed of seventeen 12-digit watershed assessment units (WAUs). The HUCs and their descriptions are listed in Table 1 and schematics are presented in Figures 1 and 2. Ambient biology, macrohabitat quality and water quality data will be collected from the sites listed in Table 2. Details regarding the matrix and parameters to be analyzed are included in the table. Some of the sites are dedicated to evaluating the impact from individual point sources. Facilities with individual permits in the study area are listed in Table 3. An analytical parameter list with associated methods and reporting limits is presented in Table 4.

Sampling Objectives

- 1 Systematically sample and assess biology in principal streams in the Huron River basin in support of Clean Water Act Sections 305(b) and 303(d),
- 2 Gather ambient environmental information (biological, chemical, and physical) from designated water bodies to assess current beneficial uses (aquatic life, recreation and water supply),
- 3 Verify existing uses and recommend appropriate uses for unverified designations,
- 4 Track phosphorus loads to Lake Erie and begin building a database to determine if 40% reduction goals established by the Great Lakes Water Quality Agreement are being achieved,
- 5 Document any changes in 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]),
- 6 Collect fish tissue samples at selected stations in support of the Ohio Sport Fish Health and Consumption Advisory program.

Total Maximum Daily Load (TMDL)

The Huron River basin is considered a "round 2" watershed, meaning a TMDL is already approved. TMDLs were calculated for sedimentation, total phosphorus and nitrate-nitrite and approved by USEPA on September 28, 2005. A copy of the report can found on the Ohio EPA web page at http://epa.ohio.gov/portals/35/tmdl/Huron_Final_Report_080905.pdf

TMDLs were previously calculated for the entire watershed. Information collected as part of this survey will support TMDL and/or nutrient mass balance modeling at a much larger scale, such as the 10-digit HUC level. The Huron River basin has been targeted by the Great Lakes Water Quality Agreement (GLWQA) Nutrients Annex Subcommittee for 40% reductions in spring total phosphorus and soluble reactive phosphorus loads to combat harmful algae blooms in Lake Erie. A larger scale approach to monitoring will help track and report on progress toward this goal.

Beneficial Use Assessment

The status of aquatic life, recreation and water supply uses will be evaluated. Designated uses for principal streams in the Huron River basin are listed in Ohio Administrative Code (OAC) Chapter 3745-1-19, Table 19-1. A total of 28 named and unnamed streams are listed.

A portion of this study is allocated to review existing designations and to recommend designations for unverified and/or unlisted streams. All of the streams listed in the rules are designated as warmwater habitat (WWH) for the aquatic life use. Twenty-four of these designations are based on previous field assessments and are considered verified. The most recent assessments were done in 1998 and 2002. The remaining four streams are designated based on the 1978 water quality standards and considered

unverified. Additionally, the Huron River mainstem is designated as seasonal salmonid habitat (SSH). This use applies Oct.-May in streams capable of supporting the passage of trout/salmon and which are large enough for recreational fishing.

All of the streams listed are designated as primary contact (PCR) for the recreation use. Again, 24 of 28 are considered as verified based on previous field assessments.

Agricultural water supply (AWS) and industrial water supply (IWS) uses apply to all of the streams. The public water supply (PWS) use applies within 500 yards of intakes used to draw drinking water. There are four communities in the watershed that use surface water as their drinking water source. Norwalk uses a combination of in-stream and upground reservoirs (Upper, Lower and Memorial). The city mainly relies on drainage from the watershed to fill the impoundments, but there are also pump stations on Norwalk Creek (RM 0.11) and the East Branch Huron River (RM 6.16). Bellevue uses a series of five upground reservoirs to store raw water. Only Bellevue Reservoir #5 is located in the study area and the raw water source is Frink Run at RM 4.83. Monroeville and Willard both use upground storage reservoirs and pump water from the West Branch Huron River at RMs 8.52 and 33.8, respectively.

Fish tissue samples will be collected to support the Ohio Sport Fish Health and Consumption Advisory. All waters have a statewide/nationwide advisory in place of 1 meal per week for sensitive populations (young children and women of childbearing age) due to mercury. A more restrictive 1 meal per month advisory is in place on the Huron River mainstem for freshwater drum due to mercury and common carp, smallmouth buffalo and steelhead trout due to PCBs.

SAMPLING ACTIVITIES

Chemical/Physical Water and Sediment

Chemical sampling locations within the study area are listed in Table 2. Conventional chemical/physical water quality samples will be collected 6 times at each designated location. More frequent sampling will be done at sentinel sites, especially the USGS gage on the Huron River. These sites will also have organic compounds tested. Sediment samples will be collected at 4 locations. Chemical parameters to be tested are listed in Table 4. Surface water sampling will occur across a variety of flow conditions, from lower flows to moderate and higher flows.

Bacteriological Sampling

Water samples for bacteriological analyses will be collected to determine PCR use status. Each WAU will have at least 1 site sampled. Most effort will focus on streams with public access that are more highly used for recreation. These include the Huron River mainstem, the West Branch Huron River and the East Branch Huron River. Each site will have at least 5 sets of *Escherichia coli* (*E. coli*) samples tested within a 90-day period that falls between the Memorial Day and Labor Day holidays.

Stream Nutrient Assessment

Specialized sampling will be done at locations designated as nutrient sites in Table 2. This is being done to help with cause of impairment determinations using the stream nutrient assessment protocol (SNAP). A combination of benthic and sestonic chlorophyll-*a* samples are to be collected. Benthic chlorophyll samples are to be collected at least once and should be timed to coincide with deployment of automated data logger sondes during stable, baseflow conditions.

Biological Assemblage and Habitat

Fish and macroinvertebrate assemblage samples will be collected as listed in Table 2. Qualitative Habitat Evaluation Index (QHEI) scores will be calculated by evaluating habitat at all fish sampling locations.

Fish Tissue

Sampling locations may vary based on the availability of sport fish collected at each location. Fillet samples of edible size sport fish will be tested and the results will be used in the Ohio Sport Fish Health and Consumption Advisory Program. Sampling locations are listed in Table 2 and the parameters to be analyzed are listed in Table 4. Fish tissue specimens from the lake affected segment of the Huron River were submitted for analysis in 2015, but the results are not available. Depending on the outcome it may not be necessary to collect these samples as allocated in this plan.

QUALITY ASSURANCE/SAMPLING METHODS**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 2015c), Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio EPA 1987, 1989a, 1989b, 2015a, 2015b), The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Ohio EPA 1989b, 2006) for habitat assessment, Ohio EPA Sediment Sampling Guide and Methodologies (Ohio EPA 2015e) and Ohio EPA Fish Tissue Collection Guidance Manual (Ohio EPA 2012b).

Use Attainment

Attainment/non-attainment of aquatic life uses will be determined by using biological criteria codified in OAC 3745-1-07, Table 7-17. Numerical biological criteria are based on multi-metric 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. The results will be compared to the appropriate tiered WWH biocriteria based on ecoregion.

Attainment/non-attainment of recreational uses will be determined using *E. coli* criteria codified in OAC 3745-1-07, Table 7-13. Water quality must meet a 90-day geometric mean and a statistical threshold not to be exceeded more than 10% of the time.

Stream Habitat Evaluation

Physical habitat is evaluated using the QHEI developed by the Ohio EPA for streams and rivers in Ohio (Ohio EPA 1989b, 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 instream cover, channel morphology, extent of riparian canopy, pool and riffle development and quality and 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

A combination of quantitative and qualitative methods will be employed to monitor benthic macroinvertebrate communities. Quantitative collections are made through the use of modified Hester-Dendy multiple-plate artificial substrate samplers, deployed at all biomonitoring sites draining more than 20 mi², or at reference sites regardless of size. Once deployed, artificial substrates are left to colonize, in-stream, for a six-week period. Qualitative sampling will be conducted at all biomonitoring stations. This sampling method consists of a basic inventory of macroinvertebrate taxa from natural substrates, noting dominant taxa among major habitat types (e.g., riffle, run, pool, and margin. Macroinvertebrate sampling protocols are detailed in Ohio EPA (2015b).

Fish will be sampled at each sampling location using pulsed DC headwater, wading, or boat electrofishing methods depending on watershed size at each sampling zone. Sites with drainage areas greater than 20 mi² or at reference site locations will be sampled twice during the sampling index period. The number of passes may be adjusted as necessary based on best professional judgment of the fish crew leader. Reasons for a single pass monitoring at sites otherwise identified as needing multiple passes may include, extremely difficult and time consuming access, work delays related to weather, or the emergence of alterations (natural or otherwise) to the point of access or sampling reach, rendering replication of the initial effort hazardous or costly, or both. Fish are 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 external abnormalities. Fish sampling protocols are detailed in Ohio EPA (2015b).

Surface Water

Surface water grab samples will be collected and preserved using appropriate methods as outlined in the Surface Water Field Sampling Manual (Ohio EPA 2015c) and delivered to the Ohio EPA Division of Environmental Services (DES) for analyses. Field measurements of dissolved oxygen, pH, temperature and conductivity will be made using YSI Professional Plus meters along with all grab samples for surface water chemistry. Datasonde® continuous recorders will be placed at select locations to evaluate 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 the Jones & Henry Laboratories Inc. laboratory in Northwood, Ohio within 6 hours of sample collection. All samples will be analyzed for *E. coli* bacteria using U.S.EPA approved methods.

Chlorophyll

Benthic and sestonic chlorophyll-*a* samples will be collected and preserved using appropriate methods, as outlined in Appendix II of the Surface Water Field Sampling Manual (Ohio EPA 2015d) and delivered to the Ohio EPA DES 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.

Sediment

Fine grained multi-incremental sediment samples will be collected in the upper 4 inches of bottom material using either decontaminated stainless steel scoops or dredges. Collected sediment will be placed into appropriate containers, placed on ice (to maintain 4°C) and shipped to the Ohio EPA Division of Environmental Services (DES) for analysis. Sampling and decontamination protocols will follow those listed in Appendix III of the Surface Water Field Sampling Manual (Ohio EPA 2015e).

Fish Tissue

Tissue fillet samples will be collected from fish of edible size and species preferred for analysis may include spotted bass, largemouth bass, smallmouth bass, flathead catfish, walleye, saugeye, white bass, common carp, freshwater drum, buffalo, and channel catfish. When possible, composite samples (by species) should include a minimum of three fish, yielding at least 150 grams of tissue. At each sampling location, an attempt will be made to collect five fish species for analysis. Fish will be collected using standard electrofishing methods (Ohio EPA 1987). Sampling locations are listed in Table 2 and the parameters to be analyzed are listed in Table 4. Fish used for tissue analysis will be filleted in the field using decontaminated stainless steel fillet knives. Samples will be wrapped in aluminum foil, placed in a sealed plastic bag, along with necessary site documentation. Temporary storage in the field may take one of two forms. Samples may be stored on wet ice for a period not exceeding 48 hours. For longer periods of field storage, samples must be placed on dry ice. Collection, decontamination, and field processing of tissue samples will follow protocols listed in the Ohio EPA Fish Collection Guidance Manual (2012b). From the field, fish tissue samples will be stored and inventoried in chest freezers at the Ohio EPA Groveport Field Facility prior to delivery to DES.

Based upon the results of prior fish tissue sampling on the Huron River mainstem, field investigators in 2016 are to focus on two target species: flathead catfish and freshwater drum. Three samples (SFFC or SFF) of each species are needed to allow for delisting/listing determinations per the fish consumption advisory program. This is not to say that field staff should forgo the collection of other “preferred” fish species if encountered; rather, it is intended to communicate that every practical effort should be made to capture an adequate number of these target species.

Lake Sampling

Sampling will be done over two field seasons at lakes listed in Table 2. 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 0.5 m below the surface and 0.5 m 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 reading profiles (temperature, dissolved oxygen, pH and conductivity) will be done in the water column at the location of chemistry grab samples and at roughly 1m depths in-between. Lakes used to store public drinking water will have samples analyzed for atrazine. Samples for identification of phytoplankton species, cell counts and bio-volume estimates will be submitted and analysis of cyanotoxins will also be done. Other pollutants outside the standard assessment (i.e. glyphosate, carbomates) will be done 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. 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 Surface Water Field Sampling Manual (Ohio EPA 2015c) and the Inland Lakes Sampling Procedure Manual (Ohio EPA 2016). 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 Quality Control Samples

Ten percent of the total water samples will be submitted to the lab as field quality control samples. About 5% will be duplicates, including replicates if necessary, and about 5% will be blanks, including equipment blanks. Matrix spike duplicates will be collected for organic water samples at a minimum of 5%. Field instruments will be calibrated daily using manufacturer guidelines. One sonde recorder site will have two instruments placed in the river as a duplicate. All field quality control requirements and data validation methods are detailed in the Surface Water Field Sampling Manual (Ohio EPA 2015c).

Table 1. Description of Huron River basin watershed assessment units (12-digit HUCs)

Watershed Assessment Unit	Description
04100012-04-01	Marsh Run (West Branch Huron River tributary at RM 35.84)
04100012-04-02	West Branch Huron River headwaters to above Marsh Run (RM 35.85)
04100002-04-03	West Branch Huron River below Marsh Run to near Willard (RM 31.30)
04100012-04-04	Holiday Lake drainage (West Branch Huron River tributary at RM 23.09)
04100012-04-05	West Branch Huron River from near Willard to above Slate Run (RM 10.57)
04100012-05-01	Mud Run (Slate Run tributary at RM 10.37)
04100012-05-02	Slate Run (West Branch Huron River tributary at RM 10.56)
04100012-05-03	Frink Run (West Branch Huron River tributary at RM 9.83)
04100012-05-04	Seymour Creek (West Branch Huron River tributary at RM 3.57)
04100012-05-05	Clayton Ditch, a.k.a. Creek C (West Branch Huron River tributary at RM 0.40)
04100012-05-06	West Branch Huron River below Slate Run to Huron River (RM 14.71)
04100012-06-01	East Branch Huron River headwaters to above State Route 61 (RM 14.56)
04100012-06-02	Cole Creek (East Branch Huron River tributary at RM 6.35)
04100012-06-03	Norwalk Creek (East Branch Huron River tributary at RM 6.28)
04100012-06-04	East Branch Huron River below State Route 61 to Huron River (RM 14.70)
04100012-06-05	Rattlesnake Creek, a.k.a. Creek B (East Branch Huron River tributary at RM 12.96)
04100012-06-06	Huron River

Table 2. Huron River basin sampling stations (^R reference site)

<i>STATION</i>	<i>NAME</i>	<i>RM</i>	<i>Area</i>	<i>HUC12</i>	<i>USGS Quad</i>	<i>Latitude</i>	<i>Longitude</i>	<i>SAMPLING</i>
Huron River (12-001-000)								
K01W01	Milan Wildlife Area (dst. East/West Br.)	14.65 ^R	350	04100012-06-06	Kimball	41.2908	-82.6375	F2, FT, MQ, C, N, B
501030	US 250 (ust. Milan WWTP)	12.30	371	04100012-06-06	Milan	41.3017	-82.6069	F2, MQ, CMO, N, Sn
501050	Adj. Mud Brook Rd. (dst. Milan WWTP)	11.85	383	04100012-06-06	Milan	41.3067	-82.6058	F2, FT, MQ, C, N
K01K03	Ohio Turnpike (start of lake affect)	9.10	386	04100012-06-06	Milan	41.3256	-82.5883	FT
501040	Mason Rd. (ust. Huron Basin WWTP)	8.01	386	04100012-06-06	Milan	41.3350	-82.5772	CM, B, Sd
K01K02	Ust. SR 2	3.4	394	04100012-06-06	Milan	41.3644	-82.5497	FT
K01W31	US 6 (dst. Huron Basin WWTP)	0.70	406	04100012-06-06	Huron	41.3900	-82.5533	CM, B, Sd
K01S01	Mouth	0.01	406	04100012-06-06	Huron	41.3970	-82.5503	FT
Rattlesnake Creek (12-001-003)								
K01W34	Old State Rd.	2.37	8.3	04100012-06-05	Milan	41.2769	-82.5922	F, Mq, CM, N
K01W36	Shaw Mill Rd. (dst. W.Br. Rattlesnake Ck.)	0.23	17.7	04100012-06-05	Milan	41.2944	-82.6122	F, Mq, CM, N, B
West Branch Rattlesnake Creek (12-001-004)								
501080	Lais Rd. (dst. Norwalk WWTP)	1.38	3.4	04100012-06-05	Milan	41.2767	-82.6219	F, Mq, CM
Village Creek (12-001-001)								
K01G19	Berlin St.	1.12	10.5	04100012-06-06	Milan	41.2963	-82.5946	F, Mq
Mud Brook (12-002-000)								
K01W28	Scheid Rd.	3.01	4.8	04100012-06-06	Huron	41.3581	-82.5853	F, Mq
East Branch Huron River (12-100-000)								
K01W22	Old State Rd.	24.67	7.8	04100012-06-01	Greenwich	41.0897	-82.5872	F, Mq
K01G21	Hanville Corners Rd.	19.11	16.7	04100012-06-01	Monroeville	41.1221	-82.6253	F, Mq, B
K01W19	Geiger Rd.	13.66	32	04100012-06-04	Monroeville	41.1769	-82.6531	F2, MQ, C
K01S11	Brown Rd.	6.85	37	04100012-06-04	Monroeville	41.2267	-82.6517	F2, FT, MQ, C, N, B
K01S10	SR 61 (Norwalk WTP Intake)	6.13	83.9	04100012-06-04	Monroeville	41.2306	-82.6456	DW
501070	Schaefer Rd.	1.47	87	04100012-06-04	Kimball	41.2756	-82.6369	F2, FT, MQ, C, N, B

Table 2. Continued

<i>STATION</i>	<i>NAME</i>	<i>RM</i>	<i>Area</i>	<i>HUC12</i>	<i>USGS Quad</i>	<i>Latitude</i>	<i>Longitude</i>	<i>SAMPLING</i>
Norwalk Creek (12-103-000)								
K01W23	Laylin Rd.	5.56	6.4	04100012-06-03	Norwalk	41.2344	-82.5664	DW, C
204705	Norwalk Memorial Reservoir	--	--	04100012-06-03	Norwalk	41.2344	-82.5903	L, Sd
204706	Norwalk Lower Reservoir	--	--	04100012-06-03	Norwalk	41.2389	-82.5881	DW
K01P03	SR 61 (Norwalk WTP intake)	0.13	20.8	04100012-06-03	Monroeville	41.2286	-82.6431	DW, F2, MQ, CMO, N, B, Sn
UT (0.38) to Norwalk Creek (12-103-001)								
K01G20	Ridge Rd.	1.62	8.3	04100012-06-03	Monroeville	41.2203	-82.6211	F, Mq
Cole Creek (12-101-001)								
K01W20	New State Rd.	6.52	7.7	04100012-06-02	Norwalk	41.1647	-82.6133	F, Mq
K01P04	SR 61	0.14	23.2	04100012-06-02	Monroeville	41.2281	-82.6425	F2, MQ, C, N, B
West Branch Huron River (12-200-000)								
K01G10	Old State Rd.	47.47	10.8	04100012-04-02	Greenwich	41.0153	-82.5838	F, Mq
K01W11	Baseline Rd. (ust. Plymouth WWTP)	42.23	18.5	04100012-04-02	Shelby	40.9950	-82.6517	F, Mq, CM, N
K01P06	Skinner Rd. (dst. Plymouth WWTP)	38.40	27.2	04100012-04-02	Willard	41.0211	-82.6667	F2, MQ, CM, N, B
K01G12	Green Bush Rd.	35.34	64	04100012-04-03	Willard	41.0455	-82.6580	F2, FT, MQ, C, B
303473	Willard WTP Intake	33.80	70.3	04100012-04-03	Willard	41.0640	-82.6540	DW
204708	Willard Upground Reservoir	--	--	04100012-04-03	Willard	41.0625	-82.6631	L, Sd
K01W18	SR 162	29.18	88	04100012-04-05	Willard	41.1047	-82.6692	F2, MQ, C
K01P05	Bauman Rd.	22.73	120	04100012-04-05	Monroeville	41.1317	-82.7097	F2, FT, MQ, C
K01W17	Snyder Rd.	16.59	124	04100012-04-05	Monroeville	41.1656	-82.7100	F2, MQ, C
K01K16	Terry Rd.	13.34	131	04100012-04-05	Monroeville	41.1919	-82.6882	F2, FT, MQ, C, N, B
303472	Monroeville WTP Intake	8.52	215.3	04100012-05-06	Monroeville	41.2420	-82.7010	DW
303354	Monroeville Upground Reservoir	--	--	04100012-05-06	Monroeville	41.2331	-82.7111	DW
K01W25	River Rd. (ust. Monroeville WWTP)	7.60 ^R	217	04100012-05-06	Monroeville	41.2456	-82.6914	F2, FT, MQ, CM, N
K01S12	Lamereaux Rd. (dst. Monroeville WWTP)	3.67 ^R	220	04100012-05-06	Kimball	41.2808	-82.6756	F2, FT, MQ, CM, N, B
UT (48.05) to W.Br. Huron R. (12-200-008) a.k.a. Hale's Ditch, a.k.a. Shiloh Ditch								
K01G09	Plymouth East Rd. (dst. Shiloh WWTP)	0.12	6.2	04100012-04-02	Greenwich	41.0096	-82.5761	F, Mq, CM, N

Table 2. Continued

<i>STATION</i>	<i>NAME</i>	<i>RM</i>	<i>Area</i>	<i>HUC12</i>	<i>USGS Quad</i>	<i>Latitude</i>	<i>Longitude</i>	<i>SAMPLING</i>
Marsh Run (12-210-000)								
K01G13	Kenestrick Rd.	7.53	6.6	04100012-04-01	Shelby	40.9744	-82.7343	F, Mq
K01K18	SR 61	0.20	31.2	04100012-04-01	Willard	41.0428	-82.6683	F2, MQ, CMO, N, B, Sn
UT (3.12) to Marsh Run (12-210-001)								
K01G14	May Rd.	0.28	7.8	04100012-04-01	Willard	41.0186	-82.7071	F, Mq
Walnut Creek (12-200-006)								
K01P13	Walnut Rd.	0.98	9.6	04100012-04-03	Willard	41.0750	-82.6425	F, Mq
Holiday Lake Tributary (12-200-002)								
K01P10	SR 162 (dst. Holiday Lake spillway)	2.97	14.1	04100012-04-04	Willard	41.1053	-82.7292	F, Mq, C, N, B
UT (2.80) to Holiday Lake Tributary (12-200-003)								
K01G22	SR 162	0.17	5.8	04100012-04-04	Willard	41.1055	-82.7304	F, Mq
Jacobs Creek (12-200-004)								
K01P11	Egypt Rd. (dst. W.Br. Jacobs Ck./Willard)	0.62	1.9	04100012-04-04	Willard	41.0794	-82.7233	CM, N
Slate Run (12-206-000)								
K01W16	Section Line Rd.	10.42	12.2	04100012-05-02	Flat Rock	41.1333	-82.7858	F, Mq
K01S03	Townline Rd.	4.10 ^R	38.4	04100012-05-02	Monroeville	41.1858	-82.7383	F2, MQ, C, N, B
West Branch Mud Run (12-208-000) a.k.a. Shriner Ditch								
K01W14	TR 197	0.52	5.7	04100012-05-02	Centerton	41.1161	-82.8422	F, Mq
East Branch Mud Run (12-207-000)								
K01W15	North Greenfield Rd.	1.38	15.1	04100012-05-01	Flat Rock	41.1275	-82.7681	F, Mq, C, B
303491	Daniels Rd.	6.42	5.9	04100012-05-01	Centerton	41.0843	-82.8000	F, Mq
Frink Run (12-203-000)								
303492	Section Line Rd.	7.15	9.3	04100012-05-03	Flat Rock	41.1945	-82.7882	F, Mq
303471	Dogtown Rd. (Bellevue WTP Intake)	4.80	25.4	04100012-05-03	Flat Rock	41.2162	-82.7651	DW
204709	Bellevue Upground Reservoir #5			04100012-05-03	Flat Rock	41.2144	-82.7764	DW
K01P08	SR 99	0.09	29.8	04100012-05-03	Monroeville	41.2244	-82.7039	F2, MQ, CMO, N, B, Sn
UT (5.83) to Frink Run (12-203-001)								
303493	Pontiac Rd.	2.01	9.0	04100012-05-03	Flat Rock	41.1793	-82.7843	F, Mq

Table 2. Continued

STATION	NAME	RM	Area	HUC12	USGS Quad	Latitude	Longitude	SAMPLING
Seymour Creek (12-201-000)								
K01W27	Lamereaux Rd.	0.13	16.4	04100012-05-04	Kimball	41.2806	-82.6783	F, Mq, C, N, B
Megginson Creek (12-202-000)								
K01W24	Sand Hill Rd.	0.59	8.2	04100012-05-04	Bellevue	41.2589	-82.7644	F, Mq
Clayton Ditch (12-200-001)								
K01G17	Strecker Rd.	4.09	7.9	04100012-05-05	Kimball	41.3230	-82.6787	F, Mq
K01G16	Adj. Lovers Lane at mouth	0.01	16.3	04100012-05-05	Kimball	41.2869	-82.6435	F, Mq, CMO, N, B, Sn

Sample Type Key		# Sites	# Passes
Stream Water Chemistry Totals	C	32	192
• subset with nutrient protocol (Chl. a, datasonde®)	N	22	
• subset with metals	M	16	
• subset with organics	O	5	
Macroinvertebrate Totals		47	
• Quantitative	MQ	19	
• Qualitative	Mq	27	
Fish Totals		47	66
• Fish 2 pass	F2	19	38
• Fish 1 pass	F	27	28
Drinking Water Assessments (atrazine, NH ₃ , NO ₃ +NO ₂ , TKN, TP)	DW	9	54
• Upground Reservoirs (also cyanotoxins)		3	
• Upground Reservoir Intakes		5	
• Impoundment Tributaries		1	
Inland Lake Assessments (include drinking water parameters)	L	2	10
Fish Tissue (potential)	FT	12	
E. coli	B	20	100
Sentinel (add ortho-P, measure flow)	Sn	5	
Sediment	Sd	4	

Table 3. Facilities with Individual NPDES permits located in the study area (majors highlighted in red).

Facility Name	Permit No.	Receiving Stream	RM	Description
Wagon Wheel Camp	2PR00187	Marsh Run	9.55	Extended Aeration Package Plant
Huron Valley MHP	2PY00077	UT to Marsh Run	0.7	Extended Aeration Package Plant
Willard MHP	2PY00052	UT to Marsh Run	-	Extended Aeration Package Plant
Coble Village MHP	2PY00030	Marsh Run	1.4	Extended Aeration Package Plant
Branchwood Estates MHP	2PY00086	Marsh Run	1.2	Extended Aeration Package Plant
Shiloh WWTP	2PB00017	Hale's Ditch	3.5	Trickling Filter
Plymouth STP	2PB00014	W.Br. Huron River	38.9	Sequencing Batch Reactor
New Haven Elementary	2PT00013	W.Br. Huron River	37.3	Extended Aeration Package Plant
CSX Transportation Inc.	2IT00020	UT to Jacob's Creek	0.8	Carbon Adsorption
Willard WPCP	2PD00005	W.Br. Jacob's Creek	0.1	Activated sludge
Huron Co. Transfer Station	2IN00135	W.Br. Huron River	25.95	Storm water Sedimentation Pond
Marathon Ashland Pipeline	2IG00023	UT to Meggisson Creek	0.9	Storm water
Monroeville WWTP	2PB00004	W.Br. Huron River	7.45	Oxidation Ditch
Meadowbrook Estates	2PY00054	UT to Cole Creek	0.02	Extended Aeration Package Plant
Fieldcrest MHP	2PY00031	Cole Creek	11.9	Extended Aeration Package Plant
ODOT Huron Co. Garage	2PP00043	UT to Cole Creek	3.8	Extended Aeration Package Plant
Norwalk Elks Lodge #730	2PR00152	North Creek	0.8	Extended Aeration Package Plant
Christie Lane School	2PT00041	North Creek	2.3	Extended Aeration Package Plant
Norwalk WTP	2IV00061	Norwalk Creek	3.7	Sand Filter Backwash
Norwalk American Legion	2PR00183	E.Br. Huron River	6.14	Extended Aeration Package Plant
Huron County Airport	2PG00116	Rattlesnake Creek	6.3	Package Plant
Sunrise Cooperative Inc.	2IN00130	Willow Brook	2.6	Storm water Sedimentation Pond
Eagles Wing WWTP	2PY00080	E.Br. Rattlesnake Ck.	0.4	Extended Aeration Package Plant
Will-O-Brook MHP	2PY00053	Willow Brook	1.73	Extended Aeration Package Plant
Norwalk WWTP	2PD00024	W.Br. Rattlesnake Ck.	2.42	Trickling Filter
Tenneco Inc.	2IR00006	Brewery Creek	0.5	Storm Water
Milan WTP	2IY00050	Village Creek	1.9	Backwash Water
Edison High School	2PR00174	UT to Huron River	2.3	Extended Aeration Package Plant
Milan WWTP	2PB00037	Huron River	12.06	Trickling Filter
Homestead Inn	2PR00087	UT to Mud Brook	1.4	Package Plant
CertainTeed- Avery Plant	2IA00002	Mud Brook	6.67	Sedimentation Pond
Freudenberg - NOK Milan	2IN00001	UT to Mud Brook	2.9	Package Plant
Hampton Inn	2PR00073	UT to Mud Brook	1.2	Extended Aeration Package Plant
Days Inn Motel Milan	2PR00060	UT to Mud Brook	0.6	Extended Aeration Package Plant
Super 8 Motel	2PR00058	Mud Brook	6.5	Extended Aeration Package Plant
Milan Travel Park	2PR00093	UT to Mud Brook	0.6	Package Plant
Riverview Manor Apts.	2PW00012	Huron River	7.6	Extended Aeration Package Plant
Alpine Trail MHP	2PY00040	Huron River	7.24	Extended Aeration Package Plant
Erie County Landfill	2IN00137	Mud Brook	4.23	Storm water Sedimentation Pond
Huron River Valley Camp	2PR00091	Huron River	4.77	Package Plant
Huron River Estates	2PR00069	Huron River	4.4	Extended Aeration Package Plant
Huron Basin WWTP	2PC00001	Huron River	1.03	Rotating Biological Contactor
Huron WTP	2IV00040	Washburn Ditch	0.04	Backwash Water/Settling Pond

Table 4. List of parameters that will be analyzed by matrix with analytical method and reporting limits presented. Temperature, dissolved oxygen, pH and conductivity will be measured in the field.

Parameter	Method	Stream	Lake	Sediment	Fish Tissue
Oxygen Demand					
BOD, 5-day	SM 5210B	2 mg/L			
cBOD, 20-day	OEPA 310.2	2 mg/L			
Chemical Oxygen Demand	SM 5220D	20 mg/L			
Physical Properties					
Alkalinity	USEPA 310.1	5 mg/L	5 mg/L		
Hardness	USEPA 200.7	10 mg/L	10 mg/L		
Specific Conductance	SM 2510B	1 μ S/cm	1 μ S/cm		
Total Dissolved Solids	SM 2540C	10 mg/L	10 mg/L		
Total Suspended Solids	SM 2540D	5 mg/L	5 mg/L		
Turbidity	OEPA 180.1	2 NTU	2 NTU		
% Solids	SM 2540G			0 %	
% Lipids	OEPA 581.5				0 %
Nutrients					
Ammonia	USEPA 350.1	0.05 mg/L	0.05 mg/L		
Nitrate-Nitrite	USEPA 350.1	0.5 mg/L	0.5 mg/L		
Nitrite	USEPA 353.2	0.02 mg/L	0.02 mg/L		
Total Kjeldahl Nitrogen	USEPA 351.2	0.2 mg/L	0.2 mg/L		
Total Phosphorus	USEPA 365.4	0.01 mg/L	0.01 mg/L	50 mg/kg	
Orthophosphate	USEPA 365.4	0.01 mg/L	0.01 mg/L		
Total Organic Carbon	SM 5310B	2 mg/L	2 mg/L	0.1 %	
Anions					
Carbonate/Bicarbonate	SM 2320B	5 mg/L	5 mg/L		
Chloride	USEPA 325.1	5 mg/L	5 mg/L		
Sulfate	USEPA 375.2	10 mg/L	10 mg/L		
Cations					
Aluminum	USEPA 200.7	200 μ g/L	200 μ g/L		
Barium	USEPA 200.7	15 μ g/L	15 μ g/L		
Calcium	USEPA 200.7	2 mg/L	2 mg/L		
Iron	USEPA 200.7	50 μ g/L	50 μ g/L		
Magnesium	USEPA 200.7	1 mg/L	1 mg/L		
Manganese	USEPA 200.7	10 μ g/L	10 μ g/L		
Potassium	USEPA 200.7	2 mg/L	2 mg/L		
Sodium	USEPA 200.7	5 mg/L	5 mg/L		
Strontium	USEPA 200.7	30 μ g/L	30 μ g/L		
Toxic Metals					
Zinc	USEPA 200.7	10 μ g/L	10 μ g/L	8 mg/kg	
Arsenic	USEPA 200.8/SM 3113B	2 μ g/L	2 μ g/L	0.8 mg/kg	0.05 mg/kg
Cadmium	USEPA 200.8/SM 3113B	0.2 μ g/L	0.2 μ g/L	0.08 mg/kg	.004 mg/kg
Chromium	USEPA 200.8	2 μ g/L	2 μ g/L	0.8 mg/kg	
Copper	USEPA 200.8	2 μ g/L	2 μ g/L	0.8 mg/kg	
Lead	USEPA 200.8/SM 3113B	2 μ g/L	2 μ g/L	0.8 mg/kg	0.04 mg/kg
Nickel	USEPA 200.8	2 μ g/L	2 μ g/L	0.8 mg/kg	

Parameter	Method	Stream	Lake	Sediment	Fish Tissue
Selenium	USEPA 200.8/SM 3113B	2 µg/L	2 µg/L	0.8 mg/kg	0.05 mg/kg
Silver	USEPA 200.8			0.08 mg/kg	
Mercury	USEPA 245.1/SM 3113B			0.02 mg/kg	0.02 mg/kg
Bacteria					
Escherichia coliform	USEPA 1603	2 CFU	2 CFU		
Algal Biomass/Toxins					
Chlorophyll a	USEPA 445.0	0.3 µg/L	0.3 µg/L		
Microcystins	OEPA 701.0		0.3 µg/L		
Saxitoxin	OEPA 702.0		0.022 µg/L		
Cylindrospermopsin	OEPA 703.0		0.05 µg/L		
Organic Compounds					
Atrazine	OEPA 704.0	0.2 µg/L	0.2 µg/L		
Semi-volatile organics	USEPA 625	2-20 µg/L			
Semi-volatile organics	USEPA 8270C			.4-2 mg/kg	
Aldrin	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
a-BHC	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
b-BHC	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
d-BHC	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
γ-BHC	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
4,4'-DDD	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
4,4'-DDE	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
4,4'-DDT	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Dieldrin	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Endosulfan I	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Endosulfan II	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Endosulfan Sulfate	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Endrin	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Endrin Aldehyde	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Heptachlor	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Heptachlor Epoxide	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Methoxychlor	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Mirex	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
Hexachlorobenzene	USEPA 8082A/OEPA 590.1			4 µg/kg	10 µg/kg
PCB-1016	USEPA 8082A/OEPA 590.1			20 µg/kg	50 µg/kg
PCB-1221	USEPA 8082A/OEPA 590.1			20 µg/kg	50 µg/kg
PCB-1232	USEPA 8082A/OEPA 590.1			20 µg/kg	50 µg/kg
PCB-1242	USEPA 8082A/OEPA 590.1			20 µg/kg	50 µg/kg
PCB-1248	USEPA 8082A/OEPA 590.1			20 µg/kg	50 µg/kg
PCB-1254	USEPA 8082A/OEPA 590.1			20 µg/kg	50 µg/kg
PCB-1260	USEPA 8082A/OEPA 590.1			20 µg/kg	50 µg/kg

Figure 1. Schematic of the Huron River and East Branch Huron River with 12-digit HUC boundaries.

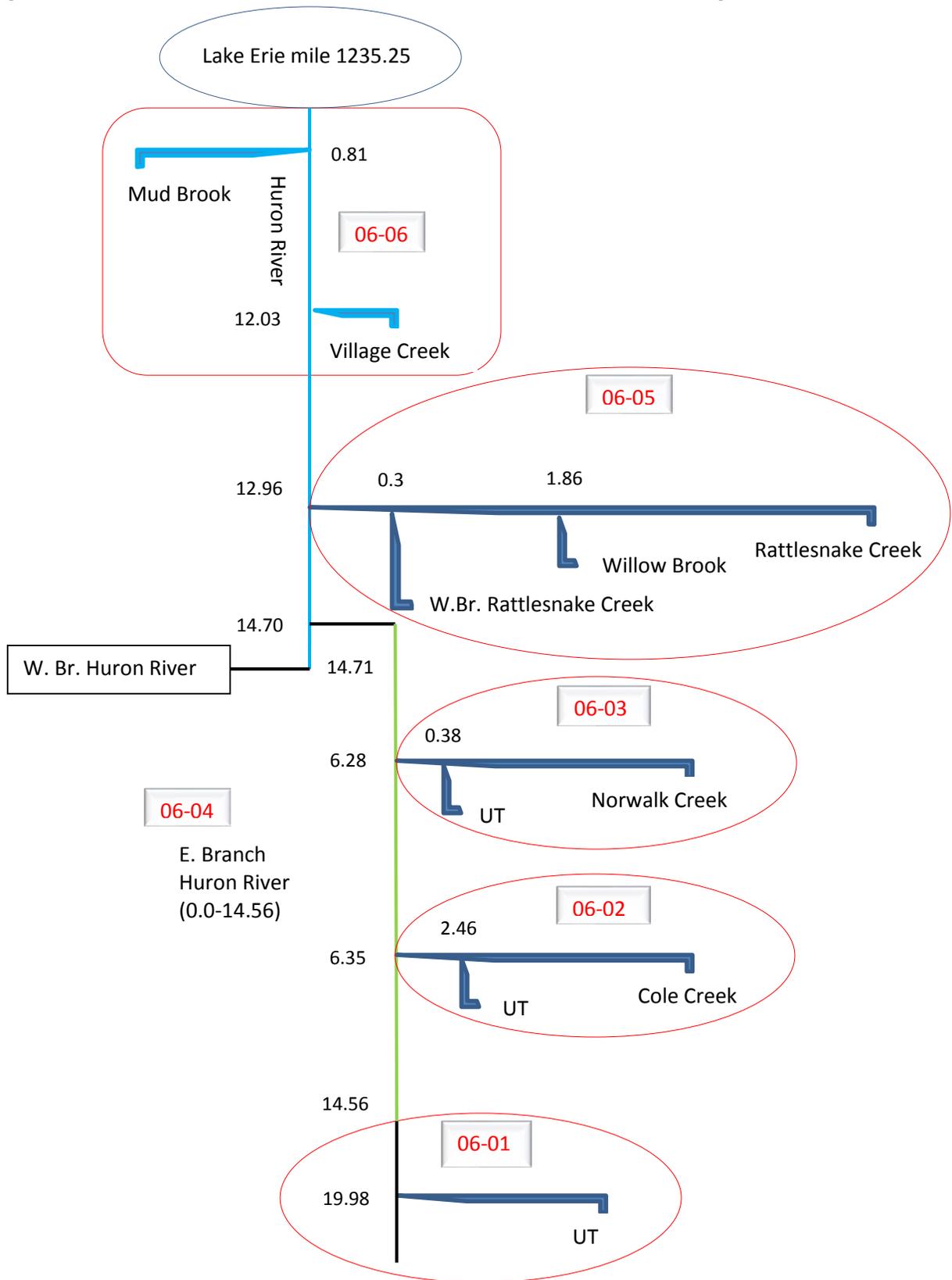
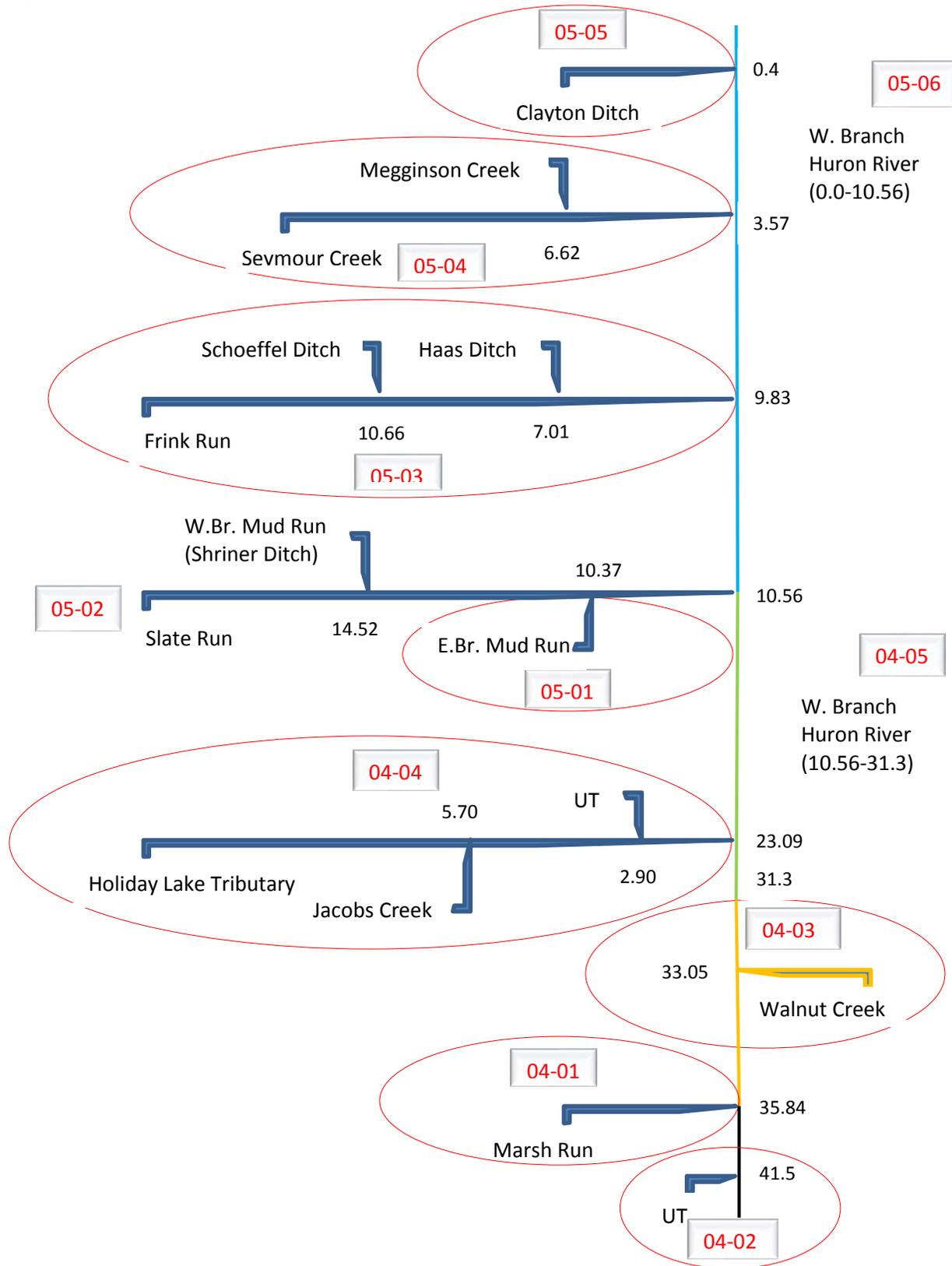


Figure 2 Schematic of the West Branch Huron River with 12-digit HUC boundaries.



Study Team Members and Contact Information

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Chuck McKnight (EAS Macroinvertebrate)	614-836-8784
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Dina Pierce (PIC)	614-728-0029
Chris Skalski (Standards)	614-644-2144
Jeff Reynolds (Quality Management)	614-705-1011
Heather Allamon (401/Wetlands)	419-373-3024
Gary Klase (Fish Tissue)	614-644-2865
Kim Burnham (District Drinking Water)	419-373-3102
Jeff Lewis (CO Drinking Water)	614-644-4902

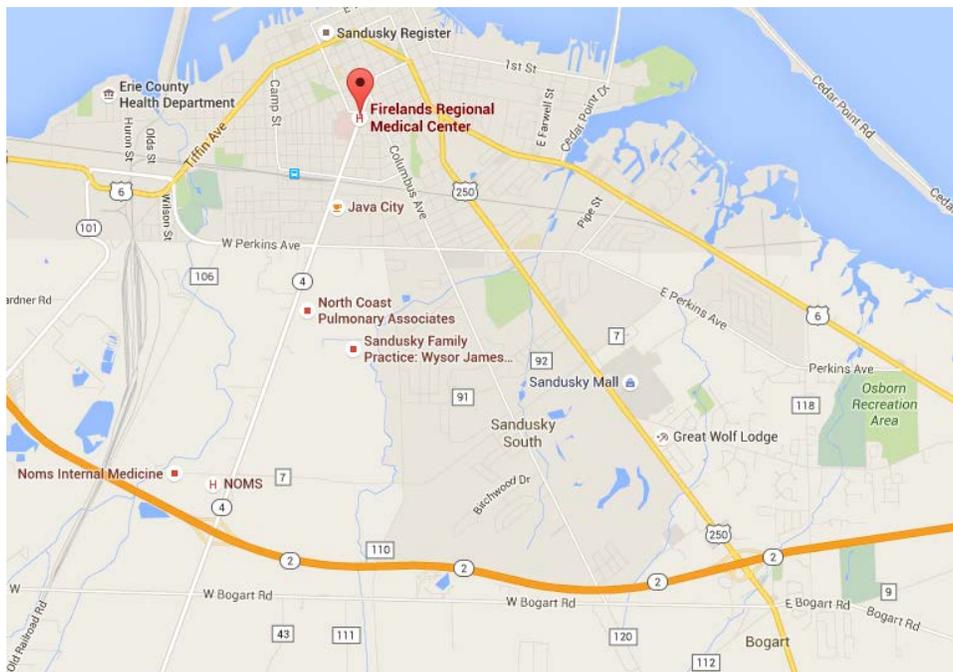
Law Enforcement Contact Information

Erie County Sheriff (419) 625-7951
Huron County Sheriff (419) 668-6912
Richland County Sheriff (419) 774-5881

Erie County Wildlife (419) 429-8381
Huron County Wildlife (419) 429-8387
Richland County Wildlife (419) 429-8392

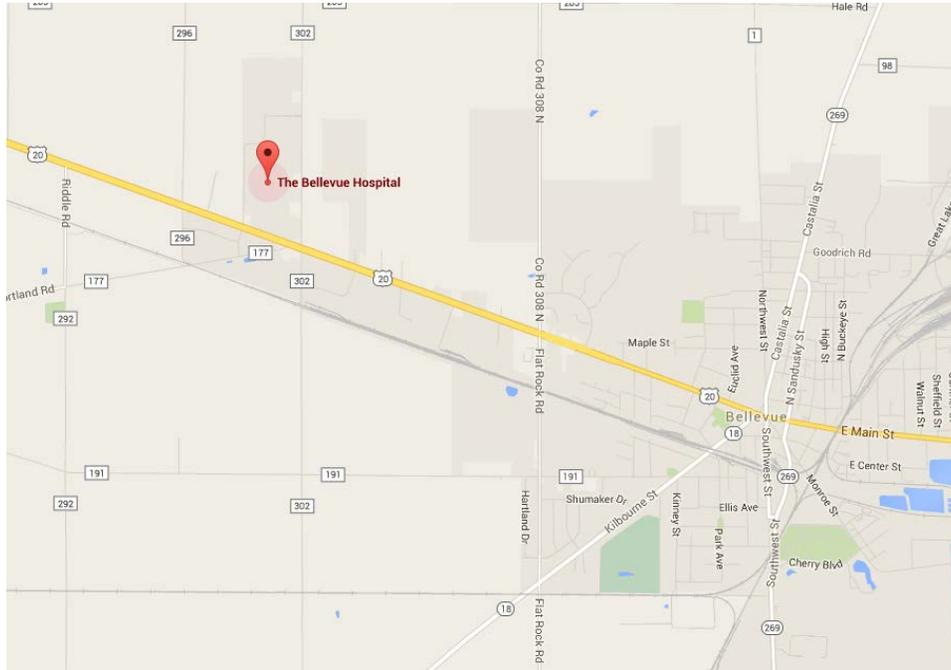
Local Hospitals

Firelands Regional Medical Center, 1111 Hayes Ave. (St. Rt. 4), Sandusky (@Google 2016)

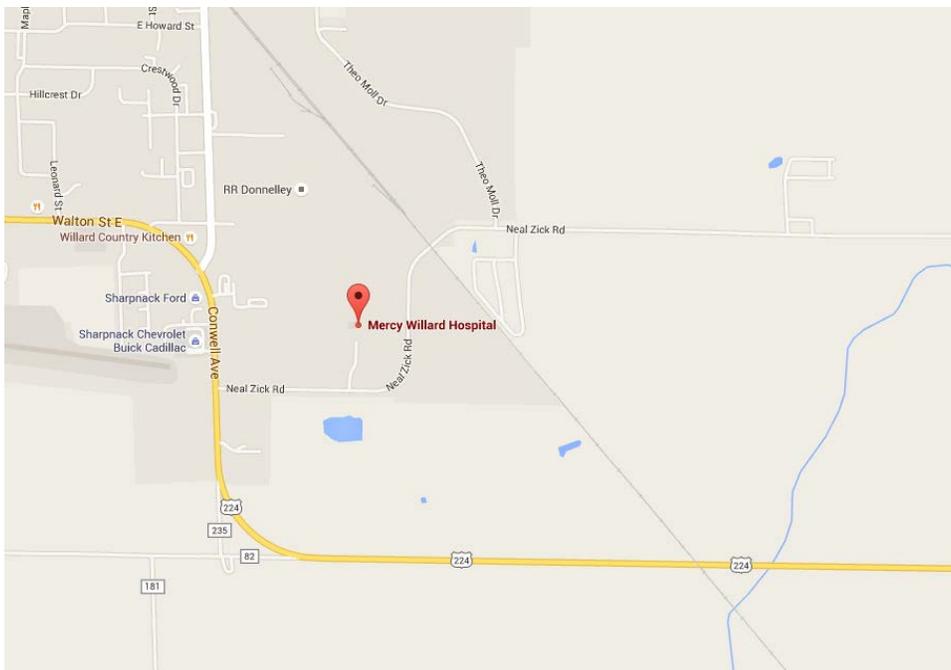


Local Hospitals

Bellevue Hospital, 1400 W. Main Street (US Rt. 20), Bellevue, OH (©Google 2016)



Mercy Willard Hospital, 1100 Neal Zick Road, Willard, OH (©Google 2016)



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