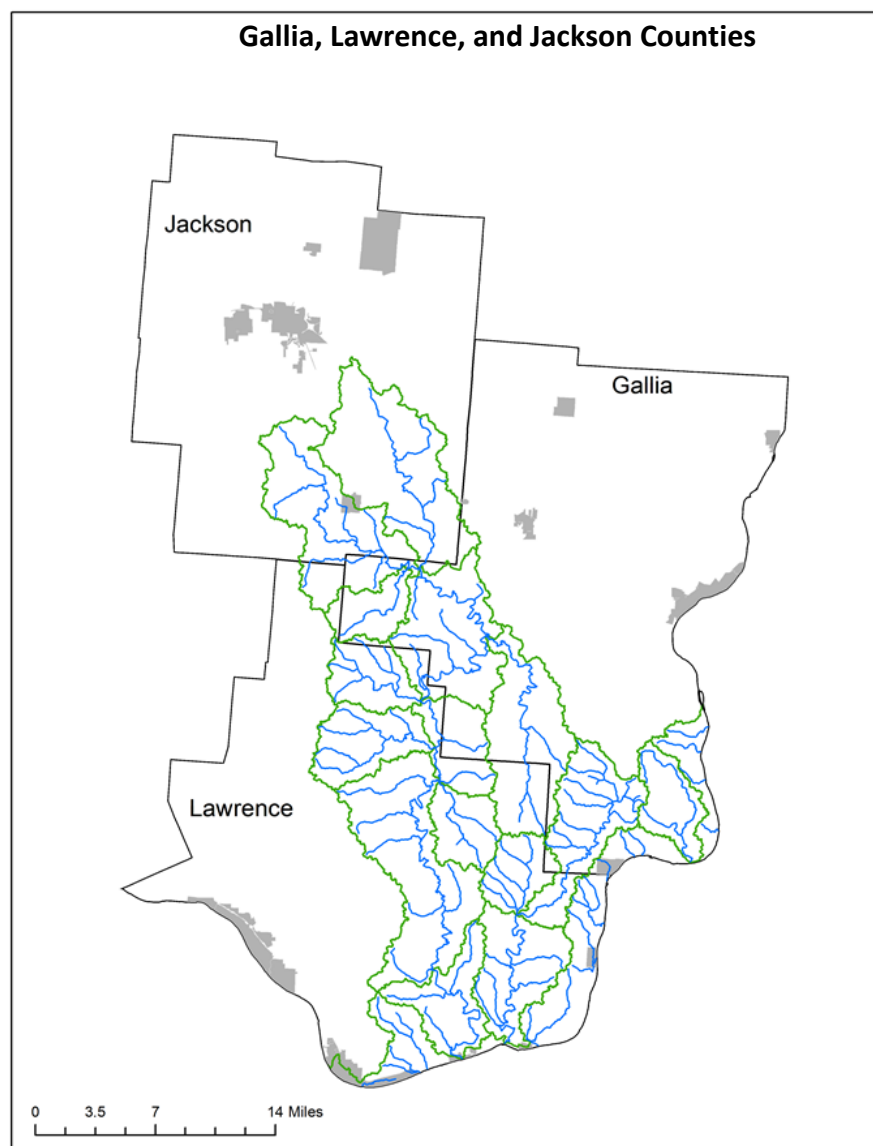


# Study Plan for the Biological and Water Quality Study of the Symmes Creek and Indian Guyan Creek Watersheds and Other Selected Ohio River Tributaries 2016.



# Study Plan for the Biological and Water Quality Study of the Symmes Creek and Indian Guyan Creek Watersheds and Other Selected Ohio River Tributaries 2016

Gallia, Lawrence, and Jackson Counties

June 20, 2016

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## Introduction

As part of the Total Maximum Daily Load (TMDL) process and in support of the basin approach for National Pollution Discharge Elimination System (NPDES) permitting, an intensive ambient assessment will be conducted during the 2016 field sampling season within the Symmes Creek and Indian Guyan Creek watersheds, and several other selected Ohio River tributaries within Ohio (Table 1). The study area is composed of all or portions of 18 HUC12 watershed assessment units (WAUs). Data from a total of 102 sampling stations will be collected in the Symmes Creek, Indian Guyan, and other selected Ohio River tributaries study area. 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 (Table 1).

## Sampling Objectives

- 1 Systematically sample and assess the principal drainage networks of the Symmes Creek and Indian Guyan Creek watersheds, and several other selected Ohio River tributaries in support of the TMDL process,
- 2 Gather ambient environmental information (biological, chemical, and physical) from designated water bodies, to assess current beneficial uses (e.g., aquatic life, recreational, water supply),
- 3 Verify the appropriateness of existing or unverified beneficial use designations,
- 4 Assign appropriate beneficial use designations for those streams that do not have existing uses or those streams whose existing use has not been evaluated by standardized field sampling methods,
- 5 Collect fish tissue samples at selected stations as listed under sample types in Table 1,
- 6 Establish baseline ambient biological conditions at stations to evaluate the effectiveness of future pollution abatement efforts, and
- 7 Document any changes in biological, chemical, and physical conditions of the study areas where historical information exists, thus expanding the Ohio EPA database for statewide trends analysis (e.g., 305[b]).

## ***Total Maximum Daily Load***

Information collected as part of this survey will support TMDL development for this 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, non-point pollution controls or other abatement strategies).

The components of the TMDL process supported by this survey are primarily the identification of impaired waters, verification (and re-designation if necessary) of beneficial use designations, and sources of use impairment. These data are necessary precursors to the development of effective control or abatement strategies.

### ***Aquatic Life Use Designations (ALU)***

The vast majority of the streams contained within the study area are designated Warmwater Habitat (WWH), while numerous other streams are not currently assigned an aquatic life use. For most streams within the basin, this will be the first time that assigned aquatic life uses will be assessed and verified using a standardized approach to the collection of biological field data. Ohio EPA is obligated to review, evaluate, or recommend (where appropriate) beneficial uses prior to basing any permitting actions on existing, unverified designations, or entirely unclassified water bodies. Much of the sampling effort for this survey is allocated to fulfill this obligation.

## **SAMPLING ACTIVITIES**

### ***Chemical/Physical Water and Sediment***

Chemical sampling locations will be collected at 96 locations within the study area and are listed in Table 2. Conventional chemical and physical water quality samples will be collected 3-5 times at each designated location. Sediment samples will be collected at nine locations. A total of 10 water quality sondes will be deployed at designated locations, nine of which will overlap with sentinel sites. 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 will be collected at 17 sites for bacteriological analyses to determine the attainment status of the Primary Contact recreational use of streams in the study area. Testing will include *Escherichia coli* (*E. coli*) bacteria. Each site will be sampled at least five times, while sentinel sites may have 5-10 bacteriological samples.

### ***Chlorophyll***

Benthic and sestonic chlorophyll-*a* samples are to be collected at 10 designated wadeable and headwater sites noted in Table 1, nine of which overlap with sentinel sites. Benthic chlorophyll samples are to be collected at least once, and should be timed to coincide with deployment of sonde automated data loggers during stable, baseflow conditions (typically the second deployment).

### ***Biological Assemblage and Physical Habitat***

Fish and macroinvertebrate assemblage samples will be collected as listed in Tables 1. Qualitative Habitat Evaluation Index (QHEI) scores will be calculated by evaluating habitat at all fish sampling locations.

### ***Fish Tissue***

Fish tissue samples will be collected from six potential locations as part of the Ohio Fish Tissue Consumption Monitoring Program. 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 for organochlorinated pesticides, PCBs, mercury, lead, cadmium, arsenic, and selenium. Results will be used in the Ohio Sport Fish Consumption Advisory Program.

## 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 2015a), Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio EPA 1987, 1989a, 2015b), 2015 Updates to the Biological Criteria for the Protection of Aquatic Life, Volume II (Ohio EPA 2015c), The Qualitative Habitat Evaluation Index (QHEI) - Rationale, Methods, and Application (Ohio EPA 1989b, 2006) for habitat assessment, Surface Water Field Sampling Manual – Appendix III for sediment sampling (Ohio EPA 2015a), and Ohio EPA Fish Tissue Collection Guidance Manual (Ohio EPA 2012) for fish tissue sampling.

### ***Use Attainment***

The attainment status 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 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 within the poor or very poor 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 WWH biocriteria for the Western Allegheny Plateau (WAP) ecoregion.

Recreational use attainment will be determined using *E. coli* bacteria, which are indicator organisms for the potential presence of pathogens in surface water. *E. coli* can originate from untreated human or animal wastes, and they are the basis for recreational use water quality criteria in Rule 3745-1-07 of the (OAC).

### ***Stream Habitat Evaluation***

Physical habitat is evaluated using the QHEI developed by the Ohio EPA for streams and rivers in Ohio (Ohio EPA 1989b). Various attributes of the available habitat are scored based on their overall importance to the establishment of viable and diverse aquatic faunas. Evaluations of the type and quality of substrate, amount of instream 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. 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**

Quantitative macroinvertebrate sample will be collected from artificial substrates, and qualitative samples from natural stream habitats. Artificial substrate collections will be collected at all sites with greater than 20 mi<sup>2</sup> drainage areas, or at reference site locations. This sample provides quantitative data and consists of a composite sample of five modified Hester-Dendy multiple-plate artificial substrate samplers which are allowed to colonize for six weeks. Qualitative sampling will be conducted at all sampling locations. This sampling effort consists of an inventory of all observed macroinvertebrate taxa from the natural stream 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 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 location. Sites with drainage areas greater than 20 mi<sup>2</sup>, and at reference site locations, will be sampled twice during the sampling index period. 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 any external abnormalities. Detailed fish assemblage sampling protocols are documented in Ohio EPA (2015b).

**Sediment**

Fine-grained multi-incremental sediment samples will be collected in the upper four inches of bottom material using either decontaminated stainless steel scoops or Ekman 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) lab. Sampling and decontamination protocols will follow those listed in Ohio EPA (2015a Appendix III).

**Chlorophyll**

Benthic and sestonic chlorophyll-*a* samples will be collected and preserved using appropriate methods, as outlined in Ohio EPA (2015a Volume II), and delivered to the Ohio EPA DES lab for analysis. Alkalinity must be requested as a routine water quality parameter at all study sites along with the routine field parameters, especially temperature and pH.

**Surface Water**

Surface water grab samples will be collected and preserved using appropriate methods, as outlined in Ohio EPA (2015a), and delivered to the Ohio EPA Division of Environmental Services lab for analyses. Field measurements of dissolved oxygen, pH, temperature, and conductivity will be made using YSI 556 meters along with all grab samples for surface water chemistry. Continuous sonde water quality 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 Ohio EPA DES lab in Reynoldsburg, Ohio within six hours of sample collection. All samples will be analyzed for *E. coli* bacteria using U.S.EPA approved methods (STORET Parameter Code 31648).

***Fish Tissue***

Fish tissue fillet samples will be collected from fish of edible size; species preferred for analysis may include, but are not limited to, spotted bass, largemouth bass, smallmouth bass, flathead catfish, walleye, saugeye, white bass, common carp, freshwater drum, buffalo, various sunfish species, and channel catfish. When possible, composite samples (by species) will be collected using more than one fish and a minimum of 150 grams of material. At each sampling location, an attempt will be made to collect five fish of each different species for fillet tissue analysis. Fish will be collected via electrofishing samplers. Sampling locations are listed in Table 1. Fish used for tissue analysis will be filleted in the field using decontaminated stainless steel fillet knives. Filleted samples will be wrapped in aluminum foil, placed in a sealed plastic bag, and placed on wet or dry ice. Sampling and decontamination protocols will follow those listed in the *Ohio EPA Fish Collection Guidance Manual* (2012). Fish tissue samples will be stored in chest freezers at the Ohio EPA Groveport Field Facility prior to delivery to DES.

***Field Quality Control Samples***

Ten percent of the sediment, water, and bacteria samples will be submitted to the lab as field duplicates and field blanks; approximately 5% will be duplicates and 5% will be blanks. One sonde recorder site will have two instruments placed in the river as field duplicates. Field blanks will occur at a minimum of five percent of the water samples. Field instruments will be calibrated daily, using manufacturer guidelines and requirements noted in Ohio EPA (2015a). Matrix spike duplicates will be collected for organic water samples at a minimum of five percent of the samples.

## Field Staff and Other Contacts

<p style="text-align: center;"><b>Ohio EPA</b></p> <p><b><u>DSW Central Office</u></b>  <b><u>EAS</u></b>  Andrew Phillips: (614)-836-8773-Fish  Edward Moore: (614) 836-8785-Macrobenthos  Jeff DeShon: (614) 836-8780 (Manager)  Angela Dripps: (614) 836-8798 (Supervisor)  <b><u>TMDL</u></b>  Gregg Sablak: (614) 644-4132  <b><u>Modeling</u></b>  Mohammad Assasi: (614) 644-2882  <b><u>Standards</u></b>  Chris Skalski: (614) 644-2144 - Rules  Gary Klase: (614) 644-2865 - Fish Tissue</p> <p><b><u>DSW Southeast District Office</u></b>  Kelly Capuzzi: (740) 380-5283-Water Quality  Maggie Selbe: (740) 380-5226-Water Quality  Rachel Taulbee (740) 380-5433 - Supervisor</p> <p><b><u>*Contact Andrew Phillips regarding study plan.*</u></b></p>	<p style="text-align: center;"><b>Ohio DNR</b>  <b><u>District 4:</u></b>  360 E. State Street  Athens, OH 45701  (740) 589-9930</p> <hr/> <p><b><u>Wildlife Officers</u></b>  <i>Jackson:</i> Allen Patton  (740) 589-9980  <i>Gallia:</i> Roy Rucker  (740) 589-9983  <i>Lawrence:</i> Darin Abbott  (740) 589-9987</p> <hr/> <p style="text-align: center;"><b>County Sheriffs</b></p> <hr/> <p><b><u>Jackson County</u></b>  Tedd E. Frazier  350 Portsmouth St.  Jackson OH 45640  (740) 286-3616  <b><u>Gallia County</u></b>  Joseph R. Browning  18 Locust St.  Gallipolis, OH 45631  (740) 446-1221  <b><u>Lawrence County</u></b>  Jeff Lawless  115 S. Fifth St.  Ironton OH 45638  (740) 532-3525</p>
<p style="text-align: center;"><b>Hospitals</b></p> <p>(see attached maps)</p> <p><b><u>Holzer Medical Center-Jackson</u></b>  500 Burlington Rd  Jackson, OH 45640  (740) 288-4625  <b><u>Southern Ohio Medical Center</u></b>  1805 27th St  Portsmouth, OH 45662  (740) 356-5000  <b><u>St. Mary's Medical Center</u></b>  2900 1st Ave  Huntington, WV 25702  (304) 526-1234  <b><u>Holzer Medical Center</u></b>  90 Jackson Pike  Gallipolis, OH 45631  (740) 446-5002  <b><u>Doctor's Hospital Nelsonville</u></b>  1950 Mount Saint Marys Dr  Nelsonville, OH 45764  (740) 753-1931</p>	



### Sampling Locations

Table 1. Sampling locations for the 2015 Southeast Ohio River Tributaries survey.

SYMMES CREEK							
Station	Name	River Mile	Drainage Area	Latitude	Longitude	River Code	Sampling Type
303584	SYMMES CREEK @ VEGA AND C-H-D RD.	70.0	14.8	38.939303	-82.523140	09-700-000	F,Mq,C
300158	SYMMES CREEK @ JENKINS ALBEN RD. (TWP. RD. 102)	62.8	45.8	38.870300	-82.478600	09-700-000	F2,MQ,C,SN,B,S
200754	SYMMES CREEK DST COAL BRANCH @ SYMMES CREEK RD.	56.7	125.0	38.818100	-82.464700	09-700-000	F2,MQ,C,SN,B,S
200753	SYMMES CREEK @CADMUS @ ST. RT. 141	47.1	182.0	38.767200	-82.436900	09-700-000	F2,MQ,C
303500	SYMMES CREEK @ WATERLOO-MT VERNON RD	38.7	201.9	38.730818	-82.492679	09-700-000	F2,MQ,C,SN,B,S
303533	SYMMES CREEK @ ST. RT. 141 AT ARABIA	31.7	255.3	38.632602	-82.290653	09-700-000	F2,MQ,C
300151	SYMMES CREEK @ ST. RT. 141 AT AID	22.6	300.0	38.596200	-82.495100	09-700-000	F2,MQ,C,SN,B,S
303534	SYMMES CREEK @ SR 217 AT LINNVILLE	17.5	313.2	38.663613	-82.472991	09-700-000	F2,MQ,C,B,T
200746	SYMMES CREEK E OF GETAWAY, ADJ. S.R. 243, DST MCKINNEY CREEK	8.4	346.0	38.484700	-82.455000	09-700-000	F2,MQ,C,T,D
303535	SYMMES CREEK @ CR104 BOOTHE EATON RD N OF CHESAPEAKE	2.9	350.5	38.441953	-82.435806	09-700-000	F2,MQ,C,B,T
303577	TRIB. TO SYMMES CREEK (73.07) @ C,H & D RD.	0.1	5.7	38.971900	-82.540300	09-700-001	F,Mq,C
200756	SUGAR RUN NE OF OAK HILL @ MOUTH, ADJ. CO. RD. 2	0.1	4.7	38.933200	-82.519400	09-741-000	F, Mq Only
303705	CHERRY FORK @ CHERRY FORK RD.	0.4	2.51	38.896088	-82.48693	09-739-000	F,Mq,C
303576	BLACK FORK SYMMES CREEK DST. JACKSON LAKE SPILLWAY	11.0	18.7	38.892376	-82.603307	09-730-000	F2,MQ,C,D
W02502	BLACK FORK SYMMES CREEK S OF OAK HILL @ BLACKFORK RD.	5.8	28.3	38.856700	-82.559700	09-730-000	F2,MQ,C
303501	BLACK FORK @ ST. RT. 233 N.OF GALLIA	2.4	47.6	38.841407	-82.516048	09-730-000	F2,MQ,C,SN,B,S

SYMMES CREEK							
Station	Name	River Mile	Drainage Area	Latitude	Longitude	River Code	Sampling Type
303575	BLACK FORK SYMMES CREEK @ CANOE LAUNCH OFF GALLIA RD.	0.3	62.6	38.841538	-82.497828	09-730-000	F2,MQ,C,T,D
303636	HEWITT RUN @ FRANKLIN VALLEY RD.	0.8	4.6	38.911600	-82.614400	09-738-000	F,Mq,C
W02506	HUNTINGCAMP CREEK JUST UPST. OAK HILL WWTP	1.7	1.8	38.882200	-82.576700	09-735-000	MQ,C,D
W02503	HUNTINGCAMP CREEK DST. OAK HILL WWTP @ DICKENS RD.	1.2	2.4	38.874400	-82.576700	09-735-000	F,MQ,C,N
303574	CAMBRIA CREEK (A.K.A. LEFTHAND FORK) @ POTTS RD.	1.7	7.2	38.847120	-82.571408	09-734-000	F,Mq,C,D
303573	DICKS CREEK @ SARDIS RD.	0.3	3.0	38.858917	-82.537027	09-733-000	F,Mq,C,D
303572	CLEAR FORK @ SHAFER RD.	0.7	3.1	38.845171	-82.538638	09-732-000	F,Mq,C3
303571	DIRTYFACE CREEK ADJ. C,H & D RD. NEAR PIPELINE CROSSING	4.7	3.0	38.805580	-82.546144	09-731-000	F,Mq,C
300156	DIRTYFACE CREEK @ CH & D RD.	1.8	12.0	38.824200	-82.518900	09-731-000	F,Mq,C,SN
303637	SWEETBIT CREEK @ PUMPKINTOWN RD	0.3	2.0	38.832925	-82.49786	09-700-003	F,Mq,C
303570	WOLF RUN @ SYMMES CREEK RD.	0.1	0.9	38.814879	-82.435175	09-729-000	F,Mq,C
303569	SAND FORK @ PALESTINE-OKEY CHURCH RD. (TWP. 217)	15.1	3.0	38.651215	-82.377996	09-727-000	F,Mq,C
303568	SAND FORK @ DRIVE TO TIMBER RIDGE LAKE	14.9	8.9	38.654911	-82.379309	09-727-000	F,Mq,C
301798	SAND FORK AT LECTA @ ST. RT. 775	13.4	13.8	38.674300	-82.377500	09-727-000	F,Mq,C,SN,B,S
303567	SAND FORK @ PETERS CAVE RD.	10.3	28.3	38.711039	-82.385827	09-727-000	F2,MQ,C
300154	SAND FORK @ PATRIOT-CADMUS RD.	2.7	40.4	38.770200	-82.396800	09-727-000	F2,MQ,C,SN,B,S
303566	TRIB. TO SAND CREEK @ PULLOFF ADJ. PALESTINE-OKEY CHURCH RD.	0.4	3.5	38.648300	-82.382000	09-727-001	C Only
303565	PETERS CAVE CREEK ADJ. PETERS CAVE RD.	0.2	5.2	38.705649	-82.380344	09-728-000	F,Mq Only
303564	TRACE CREEK @ PRIVATE DRIVE OFF ST. RT. 141	0.6	2.7	38.774536	-82.439949	09-726-000	F,Mq,C
303563	CAMP CREEK @ PENIEL RD.	0.7	4.5	38.768197	-82.463437	09-725-000	F,Mq,C

SYMMES CREEK							
Station	Name	River Mile	Drainage Area	Latitude	Longitude	River Code	Sampling Type
303562	LITTLE BUFFALO CREEK @ CARPENTER RD. (TWP. 182)	1.2	2.6	38.750556	-82.495944	09-724-000	F,Mq,C
200752	BUFFALO CREEK ADJ. BUFFALO OLIVE RD. DST. INDIAN CK.	5.0	3.1	38.752968	-82.558694	09-719-000	F,Mq Only
W02509	BUFFALO CREEK @ CO. RD. 14	1.9	8.5	38.738600	-82.522200	09-719-000	F,Mq,C,B
303560	INDIAN CREEK NEAR MOUTH OFF BUFFALO- OLIVE RD. (TWP. 129)	0.1	0.8	38.756323	-82.562395	09-723-000	F,Mq Only
W02501	CAULLEY CREEK NEAR MOUTH @ CO. RD. 46	0.15	4.9	38.737800	-82.519700	09-720-000	F,Mq,C,R
303559	MILLER CREEK @ CAULLEY CREEK RD.	0.05	1	38.754765	-82.524636	09-721-000	F,Mq,C
303558	PIGEON CREEK @ WEBSTER RD.	0.55	3.2	38.695475	-82.459002	09-718-000	F,Mq,C
303557	JOHNS CREEK @ ETNA-WATERLOO RD.	5.35	9.4	38.687497	-82.53529	09-714-000	F,Mq,C
300153	JOHNS CREEK S OF WATERLOO @ ST. RT. 141	0.07	22.7	38.690300	-82.479200	09-714-000	F2,MQ,C,B,S,D
303556	SLAB FORK @ ETNA-WATERLOO RD.	0.1	2.57	38.675489	-82.560562	09-717-000	F,Mq,C
303555	BUCKEYE CREEK (TRIB. TO JOHNS. CK.) ADJ. BUCKEYE RD.	1.4	3.4	38.706281	-82.549588	09-715-000	F,Mq,C
303554	BRUSHY BUCKEYE CREEK @ BUCKEYE RD.	0.1	1.9	38.707908	-82.546111	09-716-000	F,Mq,C
303553	HANDLEY BRANCH NEAR MOUTH OFF HANDLEY BRANCH RD.	0.1	1.7	38.70339	-82.504746	09-714-001	F,Mq Only
303552	BUCK CREEK @ ST. RT. 141	0.35	5	38.660259	-82.466477	09-713-000	F,Mq,C
303551	LONG CREEK @ ST. RT. 775	4.3	5.3	38.617447	-82.448515	09-711-000	F,Mq,C
303536	LONG CREEK AT ZALMON RD SE OF ARABIA	0.86	14.7	38.651824	-82.465795	09-711-000	F,Mq,C,B,D
303550	BUCKEYE CREEK (TRIB TO LONG) @ ST. RT. 775	0.9	3.8	38.63138	-82.448339	09-712-000	F,Mq,C
303549	AARON CREEK @ ELKINS CREEK RD.	0.65	8.3	38.662200	-82.490600	09-710-000	F,Mq,C,D
303548	ELKINS CREEK @ NATIONAL FOREST PULLOFF ADJ. ELKINS CREEK RD.	1.8	3.3	38.632695	-82.530994	09-709-000	F,Mq,C
303547	SHARPS CREEK NEAR MOUTH	0.2	4.6	38.614549	-82.495453	09-708-000	F,Mq,C
303546	VENISONHAM CREEK @ ST. RT. 217	0.95	3.9	38.555939	-82.454028	09-705-000	F,Mq,C

SYMMES CREEK							
Station	Name	River Mile	Drainage Area	Latitude	Longitude	River Code	Sampling Type
200747	LEATHERWOOD CREEK NW OF GETAWAY @ ST. RT. 243	0.8	4	38.495800	-82.488100	09-704-000	F,Mq,C
303545	RANKIN CREEK @ PRIVATE DRIVE OFF RANKINS CREEK RD.	0.55	3.9	38.480099	-82.471624	09-703-000	F,Mq,C
303544	MCKINNEY CREEK @ ST. RT. 243	0.35	5	38.485602	-82.461746	09-702-000	F,Mq,C
303540	BIG BRANCH CREEK @ HENSON HOLLOW RD (CO. RD. 158)	0.55	3	38.439714	-82.465202	09-701-000	F,Mq,C

INDIAN GUYAN CREEK							
Station	Name	River Mile	Drainage Area	Latitude	Longitude	River Code	Sampling Type
303663	INDIAN GUYAN CREEK @ MERCERVILLE ROAD	29.05	5.2	38.660882	-82.291173	09-100-000	F,Mq,C
W02K05	INDIAN GUYAN CREEK N OF CROWN CITY ADJ. ST. RT. 218	26.4	16	38.632449	-82.290585	09-100-000	F,Mq,C,D
303539	INDIAN GUYAN CREEK @ SHOAL CREEK RD.	21.7	25.4	38.597159	-82.318971	09-100-000	F2,MQ,C
W02K04	INDIAN GUYAN CREEK @ CR 67 (SCOTTOWN COVERED BRIDGE)	14.7	33.5	38.547693	-82.380379	09-100-000	F2,MQ,C,B,D
303675	INDIAN GUYAN CREEK @ OLD ST. RT. 775	10.6	54.1	38.517331	-82.388188	09-100-000	F2,MQ,C,D
W02S08	INDIAN GUYAN CREEK @ CO. RD. 69	5.76	64	38.478383	-82.398175	09-100-000	F2,MQ,C,SN,B,S,T
609150	INDIAN GUYAN CREEK ADJ. GUYAN-MCKINLEY RD.	2.95	73.3	38.454393	-82.409132	09-100-000	F2,MQ,C,T
303664	PERIGEN CREEK @ MERCERVILLE RD.	0.1	2.1	38.667722	-82.298179	09-115-000	F,Mq,C
303665	COFER HOLLOW RUN @ MERCERVILLE RD.	0.05	0.5	38.662891	-82.296196	09-117-000	F,Mq,C
303669	DRAKE FORK @ ROCKY FORK RD.	0.3	2.5	38.645250	-82.277825	09-114-000	F,Mq,C
303670	TRIB. TO DRAKE FORK (0.55) @ ST. RT. 218	0.05	0.9	38.648961	-82.274609	09-114-001	F,Mq,C
303668	JOHNS CREEK @ ROCKY FORK RD.	0.1	1.9	38.644910	-82.287667	09-113-000	F,Mq,C
303667	ROCKY FORK @ CECIL RD.	0.1	3.4	38.643025	-82.289010	09-112-000	F,Mq,C

<b>INDIAN GUYAN CREEK</b>							
<b>Station</b>	<b>Name</b>	<b>River Mile</b>	<b>Drainage Area</b>	<b>Latitude</b>	<b>Longitude</b>	<b>River Code</b>	<b>Sampling Type</b>
303662	LANES BRANCH ADJ. ST. RT. 218	0.1	1.6	38.633277	-82.289828	09-111-000	F,Mq,C
303659	GEORGES CREEK @ ST. RT. 218	0.05	1.9	38.617444	-82.305414	09-110-000	F,Mq,C
303657	WILLIAMS CREEK @ BERRY RD.	1.55	0.9	38.605272	-82.337841	09-116-000	F,Mq,C
303656	WILLIAMS CREEK @ ST. RT. 218	0.05	3.2	38.602839	-82.313589	09-116-000	F,Mq,C
303655	GARLAND CREEK @ WILLIAMS CREEK RD.	0.05	1	38.607917	-82.331291	09-116-001	C Only
303652	LITTLE INDIAN GUYAN CREEK @ TWP. RD. 122 S	2.7	5.9	38.581354	-82.376985	09-108-000	F,Mq,C
303596	LITTLE INDIAN GUYAN CREEK @ BIG SPRING RD.	1.65	8.5	38.569159	-82.382093	09-108-000	F,Mq,C
303532	LITTLE INDIAN CREEK AT SR 217 AT SCOTTOWN	0.13	14.9	38.550463	-82.390336	09-108-000	F,Mq,C,B,D
303650	WATSON CREEK @ LONG CREEK RD.	0.05	1.7	38.591664	-82.379888	09-108-002	F,Mq,C
303648	TRACE CREEK ADJ. ST. RT. 775 NEAR MOUTH	0.1	3.7	38.552295	-82.390441	09-108-001	F,Mq,C
303676	WOLF CREEK @ ST. RT. 775	0.35	4.7	38.507112	-82.390948	09-106-000	F,Mq,C
303647	SLATE RUN @ TWP. RD. 192 N	0.4	1.1	38.506106	-82.401414	09-105-000	F,Mq,C
303594	FIVEMILE CREEK @ SENECA TRAIL	0.3	3.3	38.488183	-82.388022	09-104-000	F,Mq,C
303593	BEAR CREEK @ INDIAN GUYAN RD.	0.05	2.9	38.457423	-82.404522	09-102-000	F,Mq,C
303592	BENT CREEK @ GREASY RIDGE RD.	0.05	1.9	38.455391	-82.410299	09-101-000	F,Mq,C

<b>Direct Ohio River Tributaries</b>							
<b>Station</b>	<b>Name</b>	<b>River Mile</b>	<b>Drainage Area</b>	<b>Latitude</b>	<b>Longitude</b>	<b>River Code</b>	<b>Sampling Type</b>
303531	BUFFALO CREEK @ BUFFALO CREEK RD.	1.1	6.7	38.432428	-82.493628	09-020-000	F,Mq,C,B
303583	SCAREY CREEK @ LICK CREEK RD. (CO. RD. 15)	0.05	2.1	38.446214	-82.504166	09-020-001	F,Mq,C
303591	PADDY CREEK @ PRIVATE RD. 21501	1.65	4.9	38.452440	-82.361560	09-021-000	F,Mq,C

<b>Direct Ohio River Tributaries</b>							
<b>Station</b>	<b>Name</b>	<b>River Mile</b>	<b>Drainage Area</b>	<b>Latitude</b>	<b>Longitude</b>	<b>River Code</b>	<b>Sampling Type</b>
303590	LITTLE PADDY CREEK @ SERVICE ROAD OFF WALNUT ST.	0.4	2	38.444663	-82.379754	09-021-001	F,Mq,C
303645	TWOMILE CREEK @ WYLIE ST.	1.45	3	38.513127	-82.308486	09-022-000	F,Mq,C
303589	FEDERAL CREEK @ FEDERAL CREEK RD.	0.85	4	38.541156	-82.307079	09-023-000	F,Mq,C
303588	CLEAN FORK ADJ. CLEAN FK. RD. UPST. FEDERAL CREEK	0.1	1.7	38.552747	-82.310379	09-024-000	F,Mq,C
303643	BIG CREEK @ FARM ACCESS BRIDGE ADJ. BIG CREEK RD.	0.68	1.6	38.603102	-82.270155	09-095-000	F,Mq,C
303641	SWAN CREEK @ FARM LANE OFF SWAN CREEK RD.	4.25	8.3	38.636070	-82.197817	09-027-000	F,Mq,C
303527	SWAN CR. @ SWAN CR. RD JUST DST L. SWAN NE OF CROWN CITY	2.35	14.7	38.615817	-82.213702	09-027-000	F,Mq,C,B
303638	TRIB. TO SWAN CREEK (5.95) @ HAMILTON RD.	0.5	2.2	38.653479	-82.217357	09-027-001	F,Mq,C,D
303587	LITTLE SWAN CREEK @ PRIVATE BRIDGE OFF SWAN CREEK RD.	0.05	4.2	38.615917	-82.214421	09-028-000	F,Mq,C
303586	TEENS RUN @ BARCUS HOLLOW ROAD	1.2	2.5	38.690088	-82.205701	09-031-000	F,Mq,C
303585	BURRELS RUN @ CLAY CHAPEL RD.	0.9	1.5	38.701080	-82.195079	09-032-000	F,Mq,C
State Resource Water - Supplemental Grant evaluation sites							
Tier 2 provisional sampling locations (lower priority sampling locations to be sampled after data are collected from main survey locations)							

	<b>Sample Type</b>	<b>Count</b>
F	Fish - 1 Pass	79
F2	Fish - 2 Pass	21
T	Fish Tissue	6
MQ	Macro - Quantitative	23
Mq	Macro - Qualitative	78
C	Chemistry	96
N	Chemistry w/ nutrients	1
Sn	Sentinel	9
S	Sediment	9
R	Reference	1
C3	Chemistry Field Parameters Only	1
B	Bacteria	17
D	DataSonde®	14

Table 2. Facilities regulated by general or individual NPDES permit for the Symmes and Indian Guyan Creek watershed assessment unit (05090101).

Facility Name/Type	Ohio EPA Permit Number	Receiving Stream	River Mile	Latitude	Longitude	Design Flow (MGD)
Farmview Estates Subdivision WWTP	OPG00065	Symmes Creek	10.33	38.491227	-82.477615	0.025
Symmes Valley Elementary School No1	OPT00032	Trib. to Symmes Creek (RM23.15)	0.4	38.60674	-82.49232	0.015
Mercerville WWTP	OPA00105	Drake Fork	1.65	38.661114	-82.269974	0.024
Oak Hill WWTP	OPB00055	Huntingcamp Creek	1.7	38.88192	-82.57816	0.3
AP Green Refractories Inc. of Oak Hill	OIN00047	Trib. to Grassy Fork (RM1.1)	0.1	38.92462	-82.53997	0.003
Heartland of Jackson	OPR00103	Trib. to Symmes Creek (RM73.07)	2	38.95715	-82.56101	0.01



Table 3. Entities regulated by general NPDES permits within the Symmes and Indian Guyan Creek watershed assessment unit (05090101). The majority of coal mining operations listed in this table are in the reclamation stages. Numerous household sewage treatment system (HSTS) permits issued throughout the watershed, although not all HSTS are under a HTST NPDES permit.

Permit Type	Facility	Ohio EPA Permit Number	Receiving Waterbody	Expiration Date	County
Hydrostatic Test Water	Columbia Gas Trans., LLC – Line R-701-1	0GH00012*AG	Sharps Creek	10/31/12	Lawrence
Small sanitary	South Gallia high school	0GS00010*BG	Drake Fork	12/31/09	Gallia
Coal Surface Mine	ETTA MAE Inc. – Sherritts Mine	0GM00289*BG	Townsend Hollow and unnamed tributary to Aaron Creek	2/28/14	Lawrence
Coal Surface Mine	Collier – Symmes Coal Mine	0GM00461*BG	Symmes Creek	2/28/14	Gallia
Coal Surface Mine	Waterloo Coal Co. Inc. – Layne Pit	0GM00043*BG	Unnamed tributary to Dicks Creek	2/28/14	Jackson
Coal Surface Mine	Waterloo Coal Co. Inc. – Layne Pit D-0712-2	0GM00481*AG	Symmes Creek	2/28/14	Jackson
Coal Surface Mine	Waterloo Coal Co. Inc. – Dark Hollow Mine 2	0GM00276*BG	Hollow Fork	2/28/14	Jackson
Coal Surface Mine	Waterloo Coal Co. Inc.	0GM00509*AG	Symmes Creek	2/28/14	Jackson
Coal Surface Mine	Waterloo Coal Co. Inc. – Mead Zinn	0GM00333*BG	Unnamed tributary to Kyger Run	2/28/14	Jackson
Coal Surface Mine	Waterloo Coal Co. Inc. - Westlake	0GM00361*BG	Unnamed tributary to Symmes Creek	2/28/14	Jackson

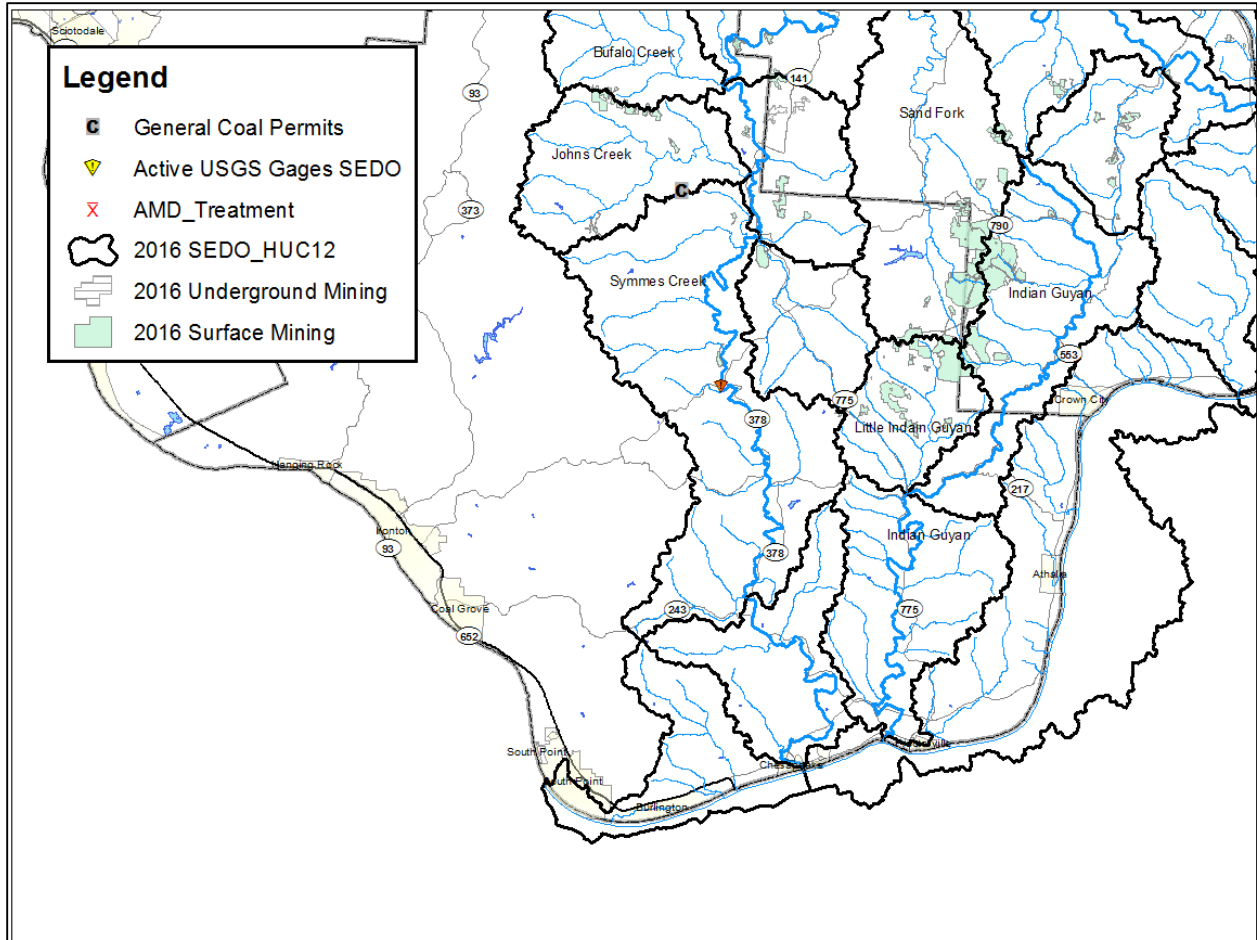


Figure 1. Mining operations within the Symmes Creek and Indian Guyan Creek watersheds.

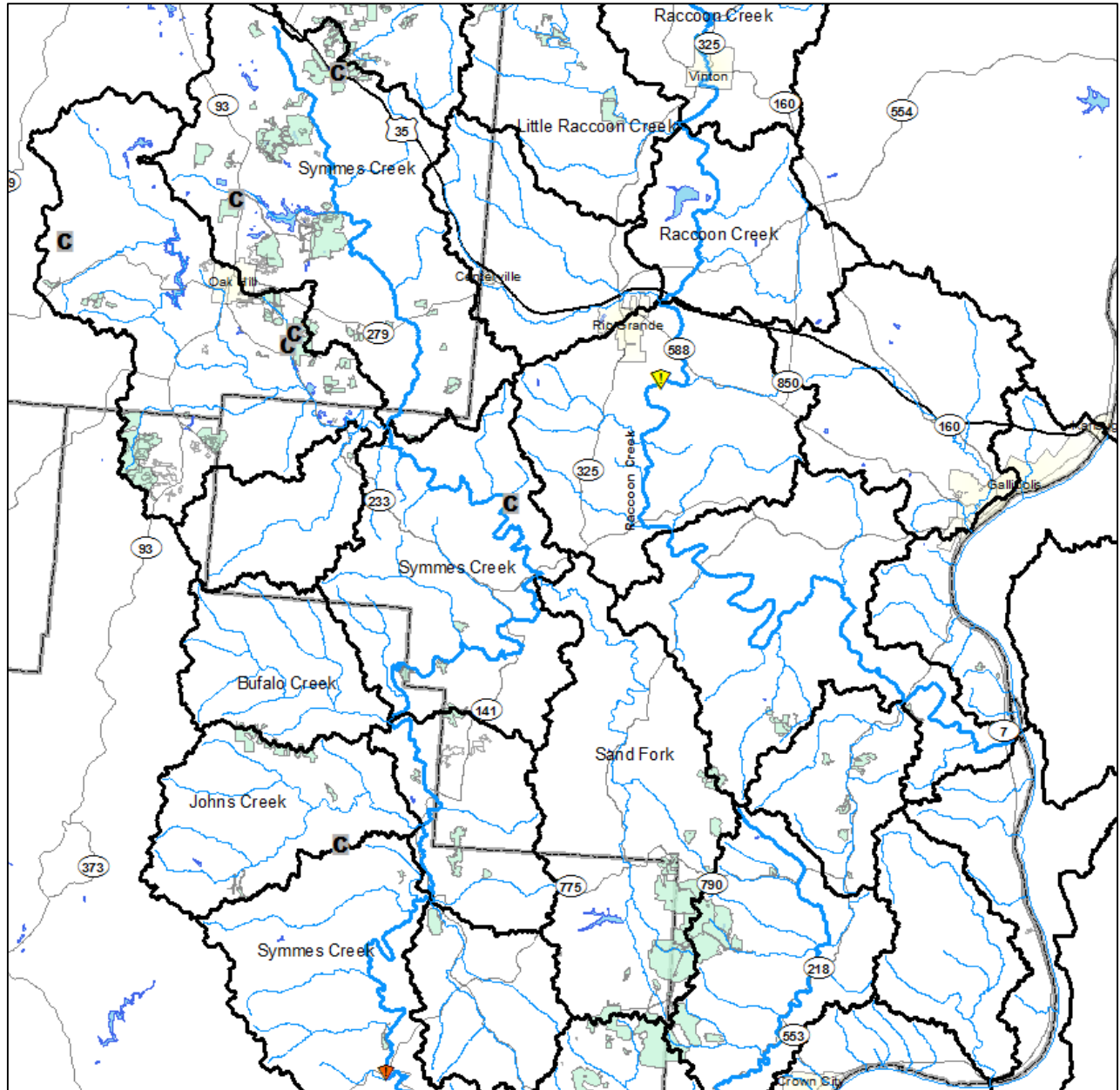
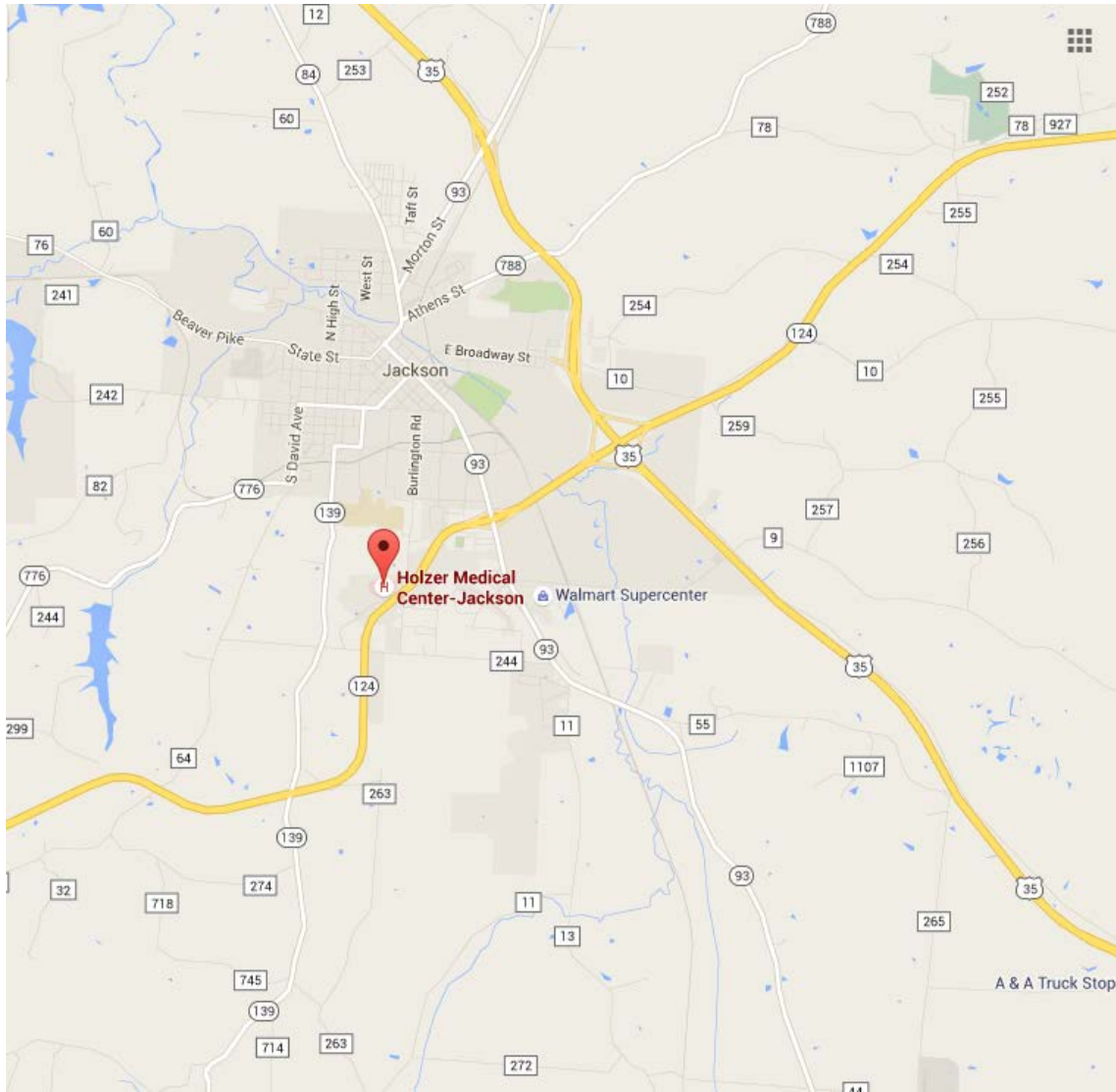
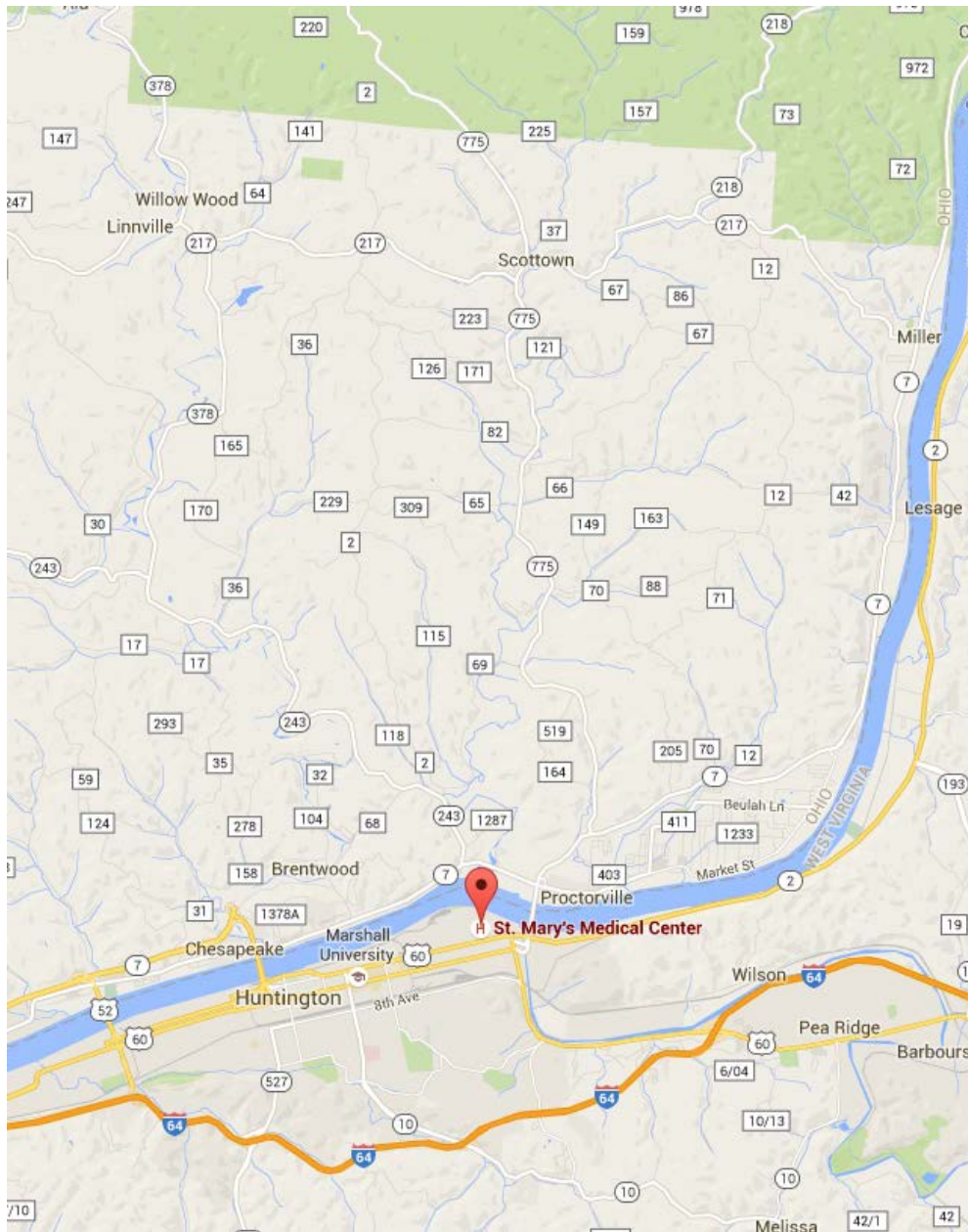


Figure 1 (cont'd). Mining operations within the Symmes Creek and Indian Guyan Creek watersheds.

Table 4. List of chemical/physical water quality parameters to be analyzed/measured in surface water, sediment, and fish tissue samples from the lower Auglaize River tributary 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 mg/L			
cBOD, 20 day	OEPA 310.2	2 mg/L			
BOD, 5 day	SM 5210B	2 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)	SM 5310B / OEPA 335.2	2 mg/L	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	0.8 mg/kg	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		
PCBs / Pesticides / Chlordane	USEPA 8082 / OEPA 590.1			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
Volitile 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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