

# **Biological and Water Quality Survey of the Wills Creek Watershed 2014:**

**Guernsey, Noble, Muskingum,  
Coshocton and Monroe Counties, Ohio**

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**Introduction**

The Wills Creek watershed is located in southeastern Ohio in Guernsey, Noble, Coshocton, Muskingum and Monroe Counties and drains 853 square miles. Wills Creek flows into the Muskingum River south of Conesville. Municipalities in the watershed include Cambridge, Byesville and New Concord. Senecaville Lake, Salt Creek Reservoir and Wills Creek Reservoir are located in the watershed. Potential impacts to the watershed are from mining, agricultural activities, point sources, unsewered communities and oil and gas production which include hydraulic fracturing and pipeline construction. The last comprehensive survey of Wills Creek was conducted in 1994 (Ohio EPA 1995a). The conclusions of the 1994 survey was that most of Wills Creek mainstem was in partial or non-attainment of the warm water habitat (WWH) aquatic life use due to a combination of poor habitat, sedimentation from mining and agricultural activities and channel modifications.

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 2014 field sampling season within the Wills Creek watershed. The study area is composed of all or portions of 33 HUC 12 watershed assessment units. Additionally, 22 tributaries that are designated as unverified Limited Warmwater Habitat (LWH) will be assessed in the watershed as part of a 106 USEPA funded grant. A total of 80 sampling stations are allocated to this effort and will provide for the assessment of 44 named streams (Table 1). 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 Wills Creek basin 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 existing, unverified, Beneficial Use Designations, and recommend appropriate use designation to undesignated waters.
- 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]).

**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 in-stream 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

There are 39 individual NPDES permitted facilities within the Wills Creek watershed. 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 all permitted facilities along with discharge and monitoring locations are presented in Table 2.

#### Mining Impacts

Historic mining impacts are prevalent in several of the Wills Creek basin most notably in the Buffalo Fork subwatershed (Rannels Creek, Collins Fork, Miller Creek, Yoker Creek) near Cumberland, White Eyes Creek near Otsego, Two-mile Creek near Linton Mills and around the Wills Creek reservoir. Extensive monitoring has been conducted in the Rannels Creek and Collins Fork subwatershed by the Office of Surface mining (OSM 2000). As resources permit, we will duplicate chemical sampling locations in Collins Fork and Rannels Creek to look at trends within this subwatershed. Unreclaimed mining areas and ponds that drain from The Wilds (discharge to Yoker Creek) will be evaluated as well. We will partner with ODNR-MRM to identify areas for potential reclamation projects. ODNR-MRM and Ohio University are collecting chemistry and flow data this year from tributaries draining into Wills Creek reservoir as well as White Eyes Creek for possible reclamation projects.

#### Sampling Effort

##### Water Quality

Water column chemistry samples will be collected from 69 ambient stations within the study areas. Water column grab samples and standard field parameters will be collected/measured five times from all locations and more frequently at the sentinel stations and large river stations on Wills Creek. Field parameters will also be collected from 9 additional sites that are being sampled under the supplemental 106 grant. The collection of water samples for bacteriological analysis is scheduled for 53 stations. Sampling frequency station density, flow regime, and other field considerations shall comport with the most recent recreational use rule changes. Additional samples will be collected from areas identified to be contributing mine drainage from The Wilds property and from the Buffalo Fork subwatershed. All chemistry, field parameters and bacteria samples will be collected by SEDO.

Datasonde deployment is requested for 30 locations and will be deployed June 24-26 and August 26-28. The Modeling section is responsible for deployment of the data center units.

##### Nutrients

Water column samples in support of nutrient monitoring and assessment efforts will be collected at 30 locations. DSW Modeling staff is responsible for the collection of benthic chlorophyll-a and SEDO will be sampling sestonic chlorophyll-a, dissolve phosphorus and cBOD20 concurrently with either the Datasonde set or retrieval or the interval between these two activities.

**Sediment Chemistry**

Sediment samples are to be collected from approximately fifteen locations within the study area. Analysis will include a full organic scan (BNAs, PCBs, TOC, and Pesticides), a full metals scan (excluding mercury), and sediment particle size. Vanadium samples will also be collected from Chapman Run to evaluate the historic contamination of the AMG Vanadium facility (formerly Sheildalloy Metallurgical Corp). Sampling was conducted by Ohio EPA on Chapman Run in 1994 on the Sheildalloy property to determine the extent of contamination (Ohio EPA, 1995b). Additional sampling locations may be added to determine trends from the 1995 Chapman Run survey.

**Benthic Macroinvertebrate Assessment**

The condition of the macrobenthos will be evaluated at 81 locations. Artificial substrate samples (quantitative) will be deployed and retrieved by MEG staff at 35 stations that have a drainage area greater than 20mi<sup>2</sup>. Qualitative benthic macroinvertebrate samples (natural substrates) will be collected at 46 stations that have a drainage area less than 20mi<sup>2</sup>.

**Fish Community Assessment and Fish Tissue**

The condition of the fish assemblages within the study area will be evaluated at 81 locations. Multiple pass fish community samples will be collected at 35 sites by Ohio EPA FEG staff. Single pass fish community samples will be collected at 46 stations. Single pass evaluations are limited to headwaters (less than 20mi<sup>2</sup>), barring reference sites or significant permit issues. Fish tissue will also be collected by Ohio EPA FEG staff at 12 locations.

**Sentinel Sites**

To aid in the development of a TMDL models(s), sentinel sites have been established at fifteen designated locations. At each sentinel site, samples are collected monthly beginning in March and will continue to be monitored until March 2015. Analysis test for routine water chemistry parameters 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. Bacteriological samples will be collected at a minimum of ten times during the recreation use season. The locations of sentinel sites are indicated in Table 1.

**Quality Assurance****Ohio EPA Manuals**

All biological, chemical, EPA laboratory, data processing, and data analysis methods and procedures adhere to those specified in the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio EPA 2006), Biological Criteria for the Protection of Aquatic Life, Volumes II – III (Ohio Environmental Protection Agency 1987, 1989a, 1989b), The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Rankin 1989) for habitat assessment, Ohio EPA Sediment Sampling Guide and Methodologies (Ohio EPA 2001), and Ohio EPA Fish Collection Guidance Manual (Ohio EPA 2004). All methods are summarized in Table 7.

**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 (Rankin 1989). 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 mi<sup>2</sup>. Qualitative sampling will be conducted in headwater sites with drainages smaller than 20 mi<sup>2</sup>. 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). Fish will be sampled at each sampling location with pulsed DC current. Two passes will be conducted at sites larger than 20 mi<sup>2</sup> and at reference sites. Detailed biological sampling protocols are documented in the Ohio EPA manual Biological Criteria for the Protection of Aquatic Life, Volume III (1989).

#### 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 Ekman dredges. Collected sediment will be placed into appropriate containers, placed on ice (to maintain 4°C) and shipped to the Ohio EPA lab. Sampling and decontamination protocols will follow those listed in the Ohio EPA Sediment Sampling Guide and Methodologies, November, 2001.

#### 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 Parts II and III of the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio EPA 2006) 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 locations to evaluate diurnal 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).

**Field Quality Control Samples**

Ten percent of the sediment, water, and bacteria samples 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 Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio EPA 2006). Matrix spike duplicates will be collected for organic water samples at a minimum of 5 percent.

**Table 1. Sampling locations of the Wills Creek watershed for the 2014 Ohio EPA survey**

Station	River Code	Name	Sample Type	RM	HUC 12	Latitude	Longitude	DA	County
R17S06	17-800-000	WILLS CREEK @ Seneca Lane UST Byesville WWTP	F,M,C <sup>L</sup> ,B,N,D,FT	75.90	50400050207	39.9403	-81.5486	280.0	Guernsey
R17P04	17-800-000	WILLS CREEK @ TWP. RD. 347 DST Byesville WWTP	F,M,C <sup>L</sup> ,B,N,D,FT	68.13	50400050207	39.9917	-81.5581	293.0	Guernsey
R17W13	17-800-000	WILLS CREEK @ CAMPBELL AVE. GAGE UST Cambridge WWTP	F,M,CL,B,N,D,FT,S	64.10	50400050504	40.0145	-81.5871	406.0	Guernsey
611760	17-800-000	WILLS CREEK DST. CAMBRIDGE @ TWP. RD. 452 Dst Cambridge WWTP	F,M,C <sup>L</sup> ,B,N,D	57.36	50400050504	40.0453	-81.5758	472.0	Guernsey
R18S01	17-800-000	WILLS CREEK DST. SALT FORK @ TWP. RD. 365	F,M,CL,B,N,D,FT	46.57	50400050508	40.1217	-81.5928	659.0	Guernsey
R18S22	17-800-000	WILLS CREEK SE OF BIRDS RUN @ ST. RT. 541	F,M,C <sup>L</sup> ,B,N,D	37.74	50400050508	40.1614	-81.6256	672.0	Guernsey
302467	17-800-000	WILLS CREEK UPST. BIRDS RUN @ ST. RT. 658 (HOPEWELL RD.)	F,M,C <sup>L</sup> ,B,N,D,FT,S	31.59	50400050508	40.168242	-81.648628	699.0	Guernsey
R18S21	17-800-000	WILLS CREEK NEAR LINTON MILLS @ ST. RT. 541 (Chem at TR 108)	F,M,C <sup>L</sup> ,B,N,D	27.04	50400050602	40.1797	-81.6906	738.0	Coshocton
302623	17-800-000	Wills Creek At CR 106	F,M,CL,B,N,D,FT	23.16	50400050602	40.211063	-81.672831	749.0	Coshocton
302624	17-800-000	Wills Creek at SR 93 South of Plainsfield	F,M,C <sup>L</sup> ,B,N,D	18.54	50400050604	40.204599	-81.714224	770.5	Coshocton
611770	17-800-000	WILLS CREEK DST. WILLS CREEK DAM @ TWP. RD. 274 (USGS GAGE)	F,M,CL,B,N,D,FT,S	7.04	50400050605	40.1594	-81.8475	842.0	Coshocton
R18S20	17-800-000	WILLS CREEK AT TOWN OF WILLS CREEK @ TWP. RD. 263	F,M,C <sup>L</sup> ,B,N,D	5.25	50400050605	40.1775	-81.8508	849.0	Coshocton
302625	17-800-000	WILLS CR DST COAL PREP PLANT ADJ TR 263 SW town of Wills Creek	F,M,C <sup>L</sup> ,B,N,D	3.05	50400050605	40.160874	-81.870536	851.0	Coshocton
302536	17-800-008	Marlatt Run (Trib to Wills Creek at RM 24.9) at Marlatt Run Road	F,M,C,B	0.40	50400050602	40.21051	-81.664224	7.1	Guernsey
302777	17-800-009	Trib to Wills Creek at RM 34.43 NW of Cambridge	F,M	0.50	50400050508	40.146029	-81.662429	3.4	Guernsey
R18P07	17-803-000	White Eyes Creek @ Highland-Grange Rd	F,M,C <sup>F</sup>	11.90	50400050603	40.073053	81.773964	4.2	Muskingum
301752	17-803-000	WHITE EYES CREEK S OF OTSEGO @ DENT RD.	F,M,C	10.14	50400050603	40.09402	-81.77145	16.2	Muskingum
302572	17-803-000	White Eyes Creek @ Hout Rd	F,M,C,B,N,D,S	4.75	50400050603	40.13467	-81.73612	35.4	Muskingum
R18P06	17-803-000	WHITE EYES CREEK at TR 145	F,M,C	0.67	50400050603	40.169505	-81.739779	43.8	Coshocton
302633	17-803-017	Trib to White Eyes Creek at Houts Road (Possum Hollow)	F,M,C	0.35	50400050603	40.13451	-81.73152	2.7	Muskingum
302602	17-804-000	Brush Run (trib to White Eyes) @ Dent Rd	F,M,C	0.40	50400050603	40.09735	-81.77818	7.3	Muskingum
302634	17-805-000	BACON RUN at mouth TR 410	F,M,C,B	0.01	50400050601	40.21038	-81.71448	14.9	Coshocton
302635	17-806-000	Bone Run at TR-456 (north of Plainfield)	F,M,C	0.01	50400050601	40.21775	-81.72602	6.8	Coshocton
302660	17-808-000	Twomile Run at TR 108	F,M,C	0.50	50400050602	40.16988	-81.67817	2.6	Coshocton
302654	17-809-000	BIRDS RUN GUERNSEY VALLEY ROAD N OF KIMBOLTON	F,M,C,B	4.30	50400050506	40.182278	-81.594663	14.3	Guernsey
R18K03	17-809-000	BIRDS RUN AT TOWN OF BIRDS RUN @ ST. RT. 541	F,M,C,B,N,D,S	0.17	50400050507	40.1692	-81.6481	31.1	Guernsey
203773	17-810-000	JOHNSON FORK E OF GUERNSEY @ PLUM RD.	F,M,C	1.20	50400050507	40.1775	-81.5764	8.6	Guernsey
302769	17-810-001	TRIB TO JOHNSON FORK (RM 1.04) @ PLUM RD	F,M,C	0.20	50400050507	40.180212	-81.576086	0.7	Guernsey
203774	17-812-000	INDIAN CAMP RUN NW OF TOWN OF INDIAN CAMP @ ST. RT. 658	F,M,C,B,N,D	3.90	50400050505	40.105	-81.6547	11.2	Guernsey
302636	17-816-000	Sarchett Run @ Rabbit Rd	F,M,C	1.60	50400050504	40.061649	-81.610708	7.1	Guernsey
R17S36	17-817-000	CHAPMAN RUN AT BUCKEYEVILLE @ TWP. RD. 33	F,M,C	5.73	50400050206	39.9494	-81.6125	6.3	Guernsey

**Table 1. Sampling locations of the Wills Creek watershed for the 2014 Ohio EPA survey**

Station	River Code	Name	Sample Type	RM	HUC 12	Latitude	Longitude	DA	County
R17K08	17-817-000	CHAPMAN RUN DST. WEST SLAG DITCH (901 Monitoring Station)	F,M,C,B,N,D,S	0.95	50400050206	39.9918	-81.5682	16.7	Guernsey
302637	17-820-000	Salt Fork at SR 513	F,M,C	32.30	50400050402	40.023316	-81.307886	17.8	Guernsey
203793	17-820-000	SALT FORK NE OF OLD WASHINGTON @ FAIRGROUND RD.	F,M,C,B,N,D,S	20.80	50400050402	40.0578	-81.4147	45.0	Guernsey
302466	17-820-000	SALT FORK N OF CAMBRIDGE, DST RESERVOIR @ LEEPER RD/SALT RD	F,M,C,B,N,D,FT,S	0.32	50400050406	40.100471	-81.562704	158.3	Guernsey
R18S13	17-821-000	SUGARTREE FORK S OF BIRMINGHAM @ GUNN RD.	F,M,C,B	11.05	50400050405	40.1344	-81.4353	15.4	Guernsey
R18S28	17-822-000	ROCKY FORK W OF BIRMINGHAM @ ROCKY FORK RD.	F,M,C,B	5.56	50400050404	40.1747	-81.4947	12.2	Guernsey
R18S30	17-824-000	CLEAR FORK @ RYE LANE TR 5880 NE OF BIRMINGHAM	F,M,C,B	3.00	50400050403	40.156853	-81.448745	11.6	Guernsey
R18S19	17-825-000	TURKEY RUN SE OF BIRMINGHAM @ JEFFERS LANE	F,M	1.19	50400050405	40.1644	-81.4106	2.2	Guernsey
R18S26	17-827-000	BRUSHY FORK AT WINTERSET @ ST. RT. 285	F,M,C,B	3.35	50400050401	40.1008	-81.4175	13.6	Guernsey
R18K08	17-830-000	CROOKED CREEK SE OF NEW CONCORD @ PATCH RD.	F,M,C,B	13.25	50400050502	39.967769	-81.700333	11.7	Guernsey
R18S08	17-830-000	CROOKED CREEK E OF NEW CONCORD @ CO. RD. 143	F,M,C	11.15	50400050503	39.990314	-81.677208	33.9	Guernsey
R18K06	17-830-000	CROOKED CREEK AT PHILLIPS RD @ CO. RD. 340 AT FAIRDALE	F,M,C,B,N,D,FT,S	6.28	50400050503	40.0108	-81.6122	55.0	Guernsey
302603	17-831-000	Jackson Run at Jackson Run Rd	F,M,C <sup>F</sup>	0.60	50400050503	40.016372	-81.646724	1.6	Guernsey
302604	17-832-000	PETERS CREEK NE OF NEW CONCORD @ PETERS CREEK RD.	F,M,C <sup>F</sup>	2.96	50400050503	40.026004	-81.69821	3.4	Guernsey
R18P04	17-832-000	PETERS CREEK E OF NEW CONCORD @ U.S. RT. 40	F,M,C	0.28	50400050503	40.0103	-81.6575	10.4	Guernsey
302605	17-833-000	Bobs Run at Peter's Creek Rd	F,M,C <sup>F</sup>	0.15	50400050503	40.01867	-81.66994	2.6	Guernsey
302606	17-834-000	North Crooked Creek at Morgan Rd (dwst WWTP)	F,M,C,B,N,D	1.40	50400050501	39.98794	-81.70107	16.3	Guernsey
302607	17-835-000	FOX CREEK AT NEW CONCORD @ S. BRIDGE II PARKING AREA	F,M,C <sup>F</sup>	0.96	50400050501	39.993066	-81.746375	3.8	Muskingum
302571	17-835-000	Fox Creek at New Concord WTP and SR83	F,M,C,N,D	0.70	50400050501	39.992016	-81.743147	7.8	Muskingum
302608	17-836-000	Dare Run at Holmes Rd	F,M,C <sup>F</sup>	0.70	50400050502	39.9777	-81.68412	1.6	Guernsey
R17L11	17-840-000	LEATHERWOOD CREEK AT SPENCER STATION @ ELDON RD.	F,M,C,B	23.75	50400050301	39.9636	-81.2719	17.8	Guernsey
R17K14	17-840-000	LEATHERWOOD CREEK E OF SALESVILLE, at SR 761	F,M,C	20.70	50400050301	39.9708	-81.3408	29.5	Guernsey
302465	17-840-000	LEATHERWOOD CREEK W OF KINGS MINE @ DEERFIELD RD.	F,M,C,B,N,D,FT,S	9.80	50400050302	39.989703	-81.495852	68.5	Guernsey
R17K11	17-840-000	LEATHERWOOD CREEK SE OF CAMBRIDGE @ SIGMON RD.	F,M,C	6.29	50400050302	40.0111	-81.5308	82.6	Guernsey
302537	17-840-000	LEATHERWOOD CREEK @ T-35 BYESVILLE RD	F,M,C,N,D,FT	3.40	50400050302	40.021231	-81.565729	90.6	Guernsey
R17K15	17-843-000	INFIRMARY RUN AT LORE CITY @ ST. RT. 265	F,M,C	0.42	50400050302	39.9889	-81.4578	7.2	Guernsey
R17P01	17-844-000	SHANNON RUN AT SPENCER STATION @ ST. RT. 265	F,M,C <sup>F</sup>	0.05	50400050301	39.9636	-81.2672	4.4	Guernsey
302653	17-850-000	Seneca Fork at SR 379	F,M,C,B	24.80	50400050101	39.854195	-81.277208	17.7	Monroe



**Table 1. Sampling locations of the Wills Creek watershed for the 2014 Ohio EPA survey**

Station	River Code	Name	Sample Type	RM	HUC 12	Latitude	Longitude	DA	County
R17K16	17-850-000	SENECA FORK NEAR SENECAVILLE @ ST. RT. 285	F,M,C	6.50	50400050105	39.92546	-81.462413	127.0	Guernsey
R17P03	17-850-000	SENECA FORK AT BUFFALO @ CO. RD. 25	F,M,C,B,N,D,S	2.07	50400050105	39.9125	-81.5172	150.0	Guernsey
302661	17-852-000	Opossum Run at Walhinding Rd	F,M,C	0.55	50400050105	39.91381	-81.47688	12.4	Guernsey
203815	17-856-000	BEAVER CREEK SW OF BATESVILLE @ TWP. RD. 189	F,M,C,B,N,D	2.40	50400050102	39.9011	-81.3197	17.0	Noble
302662	17-858-000	Glady Run at McVicker RD TR 62	F,M,C	0.89	50400050103	39.86397	-81.34431	8.3	Noble
203816	17-859-000	S. FK. SENECA FORK NE OF SUMMERFIELD @ TWP. RD. 199	F,M,C,B	3.30	50400050103	39.8433	-81.3175	27.6	Noble
302663	17-860-001	North Fork Seneca Creek (Skin Creek) TR 636	F,M,C	1.66	50400050103	39.82979	-81.27935	4.9	Monroe
R17S24	17-870-000	BUFFALO FORK DST. CUMBERLAND @ N. IOWA RD.	F,M,C,B,N,D,S	6.12	50400050202	39.8708	-81.6242	33.6	Guernsey
203820	17-870-000	BUFFALO FORK JUST E OF BLUEBELL, DST TRIB, ADJ ST .RT. 146	F,M,C	2.20	50400050205	39.9011	-81.5867	67.0	Guernsey
R17S21	17-870-000	BUFFALO FORK W OF FAIRVIEW at SR 821	F,M,C,B,N,D,S	0.10	50400050205	39.9044	-81.5661	68.8	Guernsey
R17S16	17-872-000	YOKER CREEK NE OF CUMBERLAND @ N. IOWA RD. (Trib to Buffalo Fk)	F,M,C,B,N,D,S	0.34	50400050201	39.8714	-81.6258	23.1	Guernsey
R17S18	17-878-000	COLLINS FORK AT CUMBERLAND @ ST. RT. 83	F,M,C	0.18	50400050202	39.8475	-81.6614	22.6	Guernsey
R17S31	17-879-000	MILLER CREEK W OF CUMBERLAND @ ST. RT. 340	F,M,C	0.15	50400050202	39.8478	-81.6714	11.9	Guernsey
R17S33	17-881-000	Rannells Creek at rd of SR 87	F,M,C	1.06	50400050202	39.83303	-81.663641	5.5	Noble
302611	17-890-000	BUFFALO CREEK AT SARAHSVILLE @ MILL RD.	F,M,C <sup>F</sup>	11.00	50400050203	39.805011	-81.471615	5.7	Noble
302610	17-890-000	BUFFALO CREEK at Pleasant Hill Rd. (Twp. Rd. 134)	F,M,C	9.20	50400050204	39.823781	-81.487171	21.2	Noble
302609	17-890-000	Buffalo Creek Chareleston Rd. (Twp. Rd. 109)	F,M,C	5.40	50400050204	39.858815	-81.522950	35.9	Guernsey
R17S11	17-890-000	BUFFALO CREEK AT FAIRVIEW @ ST. RT. 146	F,M,C,B,N,D,FT,S	0.08	50400050204	39.9028	-81.5506	49.9	Guernsey
302612	17-891-000	N. Fk. Buffalo Cr. Halley Ridge Rd. (Co. Rd. 37)	F,M,C	0.73	50400050204	39.841262	-81.504906	6.7	Noble
302615	17-892-000	South Fork Buffalo Creek Fredericksdale Rd. CR 211	F,M,C	2.85	50400050203	39.803370	-81.426570	5.0	Noble
302614	17-892-000	South Fork Buffalo Creek at SR 285	F,M,C,B	0.45	50400050203	39.81234	-81.46904	12.4	Noble
302616	17-893-000	Little Buffalo Creek along SR-146 at Shenandoah School parking lot	F,M,C <sup>F</sup>	3.84	50400050203	39.80718	-81.44703	0.1	Noble

Supplemental 106 grant  
 Sentinel Sites to be monitored monthly from March 2014-March 2015

F - Fish 35x2 passes=70 + 46-1 pass (116 total passes)  
 M-Macroinvertebrate 35 quantitative (HDs) and 46 qual samples  
 C - Chemistry and Field parameters (AMD template)-56 (Will be sampled 5 times during the field season) Vanadium will be added to both Chapman Run sites  
 C<sup>F</sup> -Field parameters only for 106 grant - 9 (will be sampled 3 times during the field season)  
 C<sup>L</sup> - Chemistry Large River Template, Acidity and Field Parameters - 13 (will be sampled 5-10 times)  
 N-Nutrients (Chlorophyll A, Ortho-P)-43  
 D - Datasonde - 30 (2 deploymnts scheduled for June 24-26 and July 29-31)  
 B-Bacteria - 53 (Will be sampled 5-10 times from May to October)  
 FT - Fish Tissue = 12  
 S-Sediment - 15 (plus vanadium at lower Chapman Run site)

**Table 2. NPDES Permitted Facilities in the Wills Creek watershed**

OEPA #	USEPA #	FACILITY	STATION	Type	Latitude	Longitude
0IH00025	OH0076732	Island Aseptics LLC	001	Final Outfall	39.9815	-81.54891
0II00018	OH0114847	Metallurg Vanadium Corp	001	Final Outfall	39.99083	-81.56611
0II00018	OH0114847	Metallurg Vanadium Corp	002	Final Outfall	39.98583	-81.56278
0II00018	OH0114847	Metallurg Vanadium Corp	003	Final Outfall	39.98472	-81.55278
0II00018	OH0114847	Metallurg Vanadium Corp	801	Upstream Monitoring	39.98241	-81.56361
0II00018	OH0114847	Metallurg Vanadium Corp	901	Downstream-Farfield Monitoring	39.99175	-81.568
0IL00073	OH0076368	Columbus & Southern Ohio El Conesville Prep	001	Final Outfall	40.16129	-81.86985
0IL00073	OH0076368	Columbus & Southern Ohio El Conesville Prep	002	Final Outfall	40.1622	-81.8669
0IL00122	OH0099392	ODNR Simco Wildlife Area	001	Final Outfall	40.1962	-81.81498
0IN00101	OH0076627	Conesville FGD Waste Disposal Facility	001	Final Outfall	40.19543	-81.83
0IN00101	OH0076627	Conesville FGD Waste Disposal Facility	002	Final Outfall	40.19396	-81.84182
0IN00101	OH0076627	Conesville FGD Waste Disposal Facility	003	Final Outfall	40.19368	-81.83069
0IN00101	OH0076627	Conesville FGD Waste Disposal Facility	004	Final Outfall	40.1963	-81.8302
0IN00101	OH0076627	Conesville FGD Waste Disposal Facility	005	Final Outfall	40.19475	-81.84201
0IN00101	OH0076627	Conesville FGD Waste Disposal Facility	006	Final Outfall	40.19478	-81.84257
0IN00219	OH0120847	BP Amoco Oil Corp Bulk Plant Cambridge	001	Final Outfall	40.02899	-81.60004
0IQ00008	OH0005754	Plastic Compounders Inc	001	Final Outfall	40.03302	-81.59738
0IY00061	OH0124915	Pleasant City WTP	001	Final Outfall	39.9045	-81.54581
0IY00100	OH0128112	Byesville Wetzler Haynes Water Filtration Plant	001	Final Outfall	39.96666	-81.52087
0PA00003	OH0021351	Quaker City WWTP	001	Final Outfall	39.96884	-81.30454
0PB00004	OH0024287	Byesville STP	001	Final Outfall	39.98402	-81.54536
0PB00004	OH0024287	Byesville STP	801	Upstream Monitoring	39.97733	-81.54301
0PB00004	OH0024287	Byesville STP	901	Downstream-Nearfield Monitoring	39.99166	-81.55796
0PB00028	OH0021024	New Concord WWTP	001	Final Outfall	39.99396	-81.72174
0PB00028	OH0021024	New Concord WWTP	801	Upstream Monitoring	39.99449	-81.72294
0PB00028	OH0021024	New Concord WWTP	901	Downstream-Farfield Monitoring	39.98795	-81.7011
0PB00088	OH0128023	Pleasant City WWTP	001	Final Outfall	39.91231	-81.5384
0PB00088	OH0128023	Pleasant City WWTP	801	Upstream Monitoring	39.91047	-81.53554
0PB00088	OH0128023	Pleasant City WWTP	901	Downstream-Farfield Monitoring	39.91047	-81.53554
0PD00020	OH0024309	Cambridge WPCC	001	Final Outfall	40.0378	-81.6026
0PD00020	OH0024309	Cambridge WPCC	801	Upstream Monitoring	40.02629	-81.60394
0PD00020	OH0024309	Cambridge WPCC	901	Downstream-Nearfield Monitoring	40.03647	-81.59816

**Table 2. NPDES Permitted Facilities in the Wills Creek watershed**

OEPA #	USEPA #	FACILITY	STATION	Type	Latitude	Longitude
OPD00028	OH0139700	Byesville WTP	001	Final Outfall	39.980145	-81.546337
OPD00028	OH0139700	Byesville WTP	801	Upstream Monitoring	39.97733	-81.54301
OPD00028	OH0139700	Byesville WTP	901	Downstream-Nearfield Monitoring	39.99166	-81.55796
OPG00010	OH0050393	Coventry Estates I Subdiv WWTP	001	Final Outfall	40.048332	-81.55918
OPG00018	OH0050709	Beech Meadows Subdiv WWTP	001	Final Outfall	40.005001	-81.691108
OPG00043	OH0075876	Coventry Estates II Subdiv WWTP	001	Final Outfall	40.048957	-81.557365
OPH00013	OH0107727	Mental Health Center WWTP	001	Final Outfall	40.06982	-81.59374
OPH00015	OH0135186	Buffalo Hills Campgd STP	001	Final Outfall	39.88847	-81.43686
OPP00026	OH0037826	Salt Fork SP Marina WWTP	001	Final Outfall	40.07565	-81.48917
OPP00027	OH0037851	Salt Fork SP Lodge & Cabin WWTP	001	Final Outfall	40.10409	-81.52927
OPP00028	OH0037834	Salt Fork SP Campground WWTP	001	Final Outfall	40.07342	-81.4964
OPP00034	OH0037842	Salt Fork SP Beach WWTP	001	Final Outfall	40.09056	-81.49833
OPP00051	OH0076791	ODOT Rest Area 5-27	001	Final Outfall	40.03795	-81.40067
OPP00057	OH0076911	ODOT Rest Area 5-29	001	Final Outfall	39.94179	-81.53463
OPP00058	OH0076929	ODOT Park No 5-30	001	Final Outfall	39.906384	-81.528889
OPP00068	OH0090999	Salt Fork SP Sugartree Marina WWTP	001	Final Outfall	40.10835	-81.53194
OPP00068	OH0090999	Salt Fork SP Sugartree Marina WWTP	002	Final Outfall	40.10835	-81.53194
OPP00085	OH0124770	Eastern Alliance Supervised Living Facility	001	Final Outfall	39.99557	-81.69665
OPR00079	OH0099368	Ports Petroleum Co Inc Gas Mart No 727	001	Final Outfall	40.05361	-81.32667
OPR00089	OH0099759	Go-mart No 57	001	Final Outfall	40.02687	-81.4461
OPR00098	OH0104027	Buffalo Duke Dutchess Store	001	Final Outfall	39.91228	-81.52618
OPR00099	OH0104051	Couto's Pizza & Subs	001	Final Outfall	39.91227	-81.526185
OPR00143	OH0127990	Spring Valley Campground	001	Final Outfall	40.0014	-81.59327
OPS00004	OH0050156	Shenandoah Inn Inc	001	Final Outfall	40.03049	-81.44825
OPT00010	OH0091375	Rolling Hills Secrest Elem Sch	001	Final Outfall	39.94836	-81.45849
OPW00007	OH0075809	Rolling Hills Subdiv WWTP	001	Final Outfall	39.9481	-81.56211
OPW00007	OH0075809	Rolling Hills Subdiv WWTP	801	Upstream Monitoring	39.94712	-81.56477
OPW00007	OH0075809	Rolling Hills Subdiv WWTP	901	Downstream-Nearfield Monitoring	39.9486	-81.56102
OPX00002	OH0059102	Seneca Lake Camp Area	001	Final Outfall	39.92916	-81.42169
OPX00003	OH0076414	Lake Seneca Resorts Assoc	001	Final Outfall	39.95	-81.4097

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Dan Beetem: 740-638-5030 ext 2110

**Safety**

Hospitals	
Guernsey	Muskingum
Southeastern Ohio Regional Medical Ctr 1341 Clark Street Cambridge, OH 43725 (740) 439-8000 (North east side of town) 40.04118 / -81.5779	Primecare Of Southeastern Ohio 1210 Ashland Ave #1 Zanesville, OH 43701 (740) 454-8551 (SR 146 and SR 60) 39.9534 / -82.01155
Guernsey	Belmont
Southeastern Ohio Regional Medical Ctr 10095 Brick Church Rd Cambridge, OH 43725 (just north of Byesville off SR 209) (740)439-8977 39.9818 / -81.5762	Barnesville Hospital Assoc., Inc. 639 West Main Street Barnesville, OH 43713 (740) 425-3941 (1 mile west of SR 800 – road becomes Fairview Rd) 39.9927 / -81.1895

Law Enforcement				
Sheriff				
Muskingum County	Guernsey County	Noble County	Coshocton County	Monroe County
Matthew J. Lutz, 1840 East Pike Zanesville, OH 43701 <b>(740) 452-3637</b>	Michael R. McCauley 601 Southgate Pkwy. Cambridge , OH 43725 <b>(740) 439-4455</b>	Stephen S. Hannum 420 Olive St Caldwell, OH 43724 <b>(740) 732-5631</b>	Timothy Rogers 328 Chestnut St Coshocton, OH 43812 <b>(740) 622-2411</b>	Charles R. Black 108 W Court St Woodsfield, OH 43793 <b>(740)472-1612</b>
Ohio State Highway Patrol				
Zanesville Patrol Post 3760 East Pike Street Zanesville, OH 43701 <b>(740) 453-0541</b>	Cambridge Patrol Post 7051 Glenn Highway Road Cambridge, OH 43725 <b>(740) 439-1388</b>	Cambridge Patrol Post 7051 Glenn Hwy Rd Cambridge, OH 43725 <b>(740) 439-1388</b>	Zanesville Patrol Post 3760 East Pike Street Zanesville, OH 43701 <b>(740) 453-0541</b>	St. Clairsville Patrol Post 51400 National Rd St. Clairsville, OH 43950 <b>(740) 695-0915</b>
ODNR Wildlife Officers				
Jeffery Berry (740) 589-9991	Guernsey Roby Williams (740) 589-9984	Brad St.Clair (740) 589-9992	Jerrold Allison (740) 589-9982	Wes Feldner (740) 589-9989
Muskingum Watershed Conservancy District				
Scott Barnhart Muskingum Watershed Conservancy District Chief of Recreation / Chief Ranger 330-343-6647 ext. 2261				

## REFERENCES

- Hughes, R. M., D. P. Larsen, and J. M. Omernik. 1986. Regional reference sites: a method for assessing stream pollution. *Env. Mgmt.* 10(5): 629-635.
- Karr, J.R. and D.R. Dudley. 1981. Ecological perspective on water quality goals. *Env. Mgmt.* 5(1): 55-68.
- OSM. 2000. A report on the Cumulative Off-site Impacts from a Large Area Mine in Southeast Ohio. Mining and Reclamation Activities in the Big Muskie Pit Area. Office of Surface Mining, Oversight and inspection, 4480 Refugee Road, Columbus, Ohio.
- Ohio Environmental Protection Agency. 2006. Ohio EPA manual of surveillance methods and quality assurance practices, updated edition. Division of Environmental Services, Columbus, Ohio.  
<http://www.epa.state.oh.us/dsw/documents/Field%20Manual%203-6-06%20revision.pdf>
- Ohio EPA. 2004. State of Ohio Cooperative Fish Tissue Monitoring Program, Fish Collection Guidance Manual  
Final.March 2004  
<http://www.epa.state.oh.us/dsw/fishadvisory/FishCollectionGuidanceManual05.pdf>
- Ohio EPA. 2001. Sediment sampling guide and methodologies, 2<sup>nd</sup> edition. Nov. 2001. Division of Surface Water, Columbus, Ohio.  
<http://www.epa.state.oh.us/dsw/guidance/sedman2001.pdf>
- Ohio EPA. 1995a. Biological and water quality survey of Wills Creek and selected tributaries. Oct. 1995. Division of Surface Water, Columbus, Ohio.  
<http://epa.ohio.gov/portals/35/documents/willscr9.pdf>
- Ohio EPA. 1995a. Biological, sediment and water quality study of Chapman Run and associated wetlands. Aug. 1995. Division of Surface Water, Columbus, Ohio.  
<http://epa.ohio.gov/portals/35/documents/chapmn94.pdf>
- Ohio EPA. 1987a. Biological criteria for the protection of aquatic life: Volume I. The role of biological data in water quality assessment. Division of Water Quality Monitoring and Assessment, Surface Water Section, Columbus, Ohio.  
<http://www.epa.state.oh.us/dsw/bioassess/BioCriteriaProtAqLife.html>
- Ohio EPA. 1987b. Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters. Division of Water Quality Monitoring and Assessment, Surface Water Section, Columbus, Ohio  
<http://www.epa.state.oh.us/dsw/bioassess/BioCriteriaProtAqLife.html>
- Ohio EPA. 1989a. Addendum to biological criteria for the protection of aquatic life: Users manual for biological field assessment of Ohio surface waters. Division of Water Quality Planning and Assessment, Surface Water Section, Columbus, Ohio.  
<http://www.epa.state.oh.us/dsw/bioassess/BioCriteriaProtAqLife.html>
- Ohio EPA. 1989b. Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities. Division of Water Quality Planning and Assessment, Columbus, Ohio.  
<http://www.epa.state.oh.us/dsw/bioassess/BioCriteriaProtAqLife.html>
- Omernik, J.M. 1987. Ecoregions of the conterminous United States. *Ann. Assoc. Amer. Geogr.* 77(1): 118-125.

Rankin, E.T. 1989. The qualitative habitat evaluation index (QHEI): rationale, methods, and application. Division of Water Quality Planning and Assessment, Columbus, Ohio.  
<http://www.epa.state.oh.us/dsw/bioassess/BioCriteriaProtAqLife.html>

**Long Term Monitoring Schedule**

[http://www.epa.ohio.gov/portals/35/tmdl/2012IntReport/MonitSched\\_2012\\_withLRAU.pdf](http://www.epa.ohio.gov/portals/35/tmdl/2012IntReport/MonitSched_2012_withLRAU.pdf)

**Ohio EPA TMDL**

<http://www.epa.ohio.gov/dsw/tmdl/index.aspx>

[http://www.epa.ohio.gov/dsw/document\\_index/305b.aspx](http://www.epa.ohio.gov/dsw/document_index/305b.aspx)





