



Biological and Water Quality Survey of the Conotton Creek Watershed Tuscarawas, Carroll, and Harrison Counties, Ohio



Division of Surface Water
July 19, 2016

Study Plan for the
2016 Biological and Water Quality Survey
of the Conotton Creek Watershed

Tuscarawas, Carroll, and Harrison Counties, Ohio

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Introduction

As part of the TMDL process and in support of the basin approach for NPDES permitting, an intensive ambient assessment will be conducted during the 2016 field sampling season within the Conotton Creek watershed. The study area is composed of twelve HUC 12 watershed assessment units (Table 1 and Figure 1). A total of 65 sampling stations are allocated to this effort and will provide for the assessment of 27 named streams (Table 2). Ambient biology, macrohabitat quality, water column chemistry, and bacteriological data will be collected from most of these sites. Diel water quality (DO, pH, conductivity, and temperature), sediment chemistry (metals, organics, and particle size), nutrients, benthic and sestonic chlorophyll, continuous temperature, and fish tissue will be evaluated at selected sampling locations.

Sampling Objectives

- 1) Systematically sample and assess the principal drainage network of the Conotton 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 and unverified beneficial use designations,
- 4) Establish and evaluate baseline ambient biological conditions at selected reference stations to evaluate the effectiveness of past, on-going and future pollution abatement efforts,
- 5) Document any changes in the biological, chemical, and physical conditions of the study areas where historical information exists, thus expanding the Ohio EPA data base for statewide trends analysis (e.g., 305[b]), and
- 6) Collect fish samples for the Ohio Sport Fish Consumption Advisory Program (used to assess chemical contaminant levels in fish) from two locations on Conotton Creek at river miles (RMs) 0.2 and 6.7.

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, nonpoint source 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, 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

Aquatic life use (ALU) designations have been verified or otherwise affirmed for three of the 27 named streams in this study area. The remaining 24 waterbodies are classified as either unverified (identified in the WQS, but have not been subjected to a use attainability analysis) or not listed (absent from the WQS). 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.

NPDES Permits

Major and minor NPDES permitted facilities will be evaluated as part of this study. These include both publically owned treatment works and private entities.

Nutrients

A SNAP (Stream Nutrient Assessment Procedure) analysis will be completed for 20-24 sites. At these sites, the reasonable potential that a site is either impaired or threatened by nutrient enrichment will be determined. See Table 2 for a listing of Nutrient Sites (denoted by N). While not in rule, SNAP analysis is required for each survey during the assessment phase.

Sampling Effort

Geo-Referenced Site Labels

The sites listed in the study plan table are coded with EA3 Station IDs that link data across several tables. They must be included on all field, lab and sample sheets and reported with all data results. If for some reason a location other than the one listed in the study plan is sampled, and that location is a trivial distance away from the one listed in the table and is fully representative of the EA3 Station, use the river mile listed in the study plan, and simply record the location information separately. An exact river mile can be assigned later to an Absolute Location Point (ALP) if warranted. If the location is not representative of the site listed on the study plan due to distance or a confounding factor, it should probably not be sampled, but if it is, it should be separated as a new station. It is also imperative that, if a new station is sampled, the study plan coordinator be notified so that this information can be distributed to all the study team.

Field and Laboratory Load

Summarized field and laboratory load (stations, number of samples, and parameters for analysis, etc.) can be found in Table 4 and Table 5. All scheduled locations and necessary stipulations are provided in Table 2.

Water Quality

Water column chemistry samples will be collected from 48 ambient stations within the study area. Water column grab samples and standard field parameters will be collected/measured six times from all locations. The collection of water samples for bacteriological analysis is scheduled for 24 stations at least five times during the recreational season (Table 2).

Datasonde[®] deployment is requested for 24 locations, which includes five sentinel site locations. The deployment of continuous monitors should coincide with typical low summer/fall flows (i.e., approaching $Q_{7, 10}$). The Modeling, Assessment and TMDL Section will be responsible for deployment of the Datasondes[®].

Sampling will be conducted over two field seasons at the sampling locations on Leesville and Atwood Lakes listed in Table 2.

Nutrients

Benthic algae and subsequent chlorophyll-*a* analysis will be sampled at 22 of 24 Datasonde[®] locations. From these paired (DO and chlorophyll-*a*) assessments (22 locations), the reasonable potential for nutrient enrichment as either a cause of aquatic life use impairment or threat to attainment can be determined. The Modeling, Assessment and TMDL (MAT) Section will be responsible for benthic algae sampling and processing, and subsequent SNAP evaluation.

Sediment Sampling

One set of sediment samples will be collected at sites indicated in the table of sampling locations (Table 2) using procedures outlined in Ohio EPA (2015a Appendix III). Fine grained multi-incremental sediment samples will be collected in the upper four inches of bottom material using either clean stainless steel scoops or dredges. Samples will be homogenized and split into 500 ml amber glass jars with Teflon lined lids for organic compound testing and 250 ml HPDE containers for metals testing. They will then be secured inside coolers with wet ice and delivered to the Ohio EPA Division of Environmental Services for analysis. Pollutants to be tested and their analytical methods are listed in the table of chemical/physical parameters (Table 5).

Benthic Macroinvertebrate Assessment

The condition of the macrobenthos will be evaluated at 49 locations within the Conotton Creek basin. Artificial substrate samples (quantitative) will be collected at 12 stations within the study area. Qualitative benthic macroinvertebrate samples (natural substrates) will be collected at 37 locations. Locations of benthic macroinvertebrate sampling stations are listed in Table 2.

Fish Community Assessment

The condition of the fish assemblages within the study area will be evaluated at 49 locations in the Conotton Creek basin. Multiple pass fish community samples will be collected at 12 sites. Single pass fish community samples will be collected at 37 stations. Single pass evaluations are limited to headwaters, barring reference sites or significant permit issues. The locations of all fish sampling stations are listed in Table 2.

Sentinel Sites

To aid in the development of a TMDL models(s) or otherwise simplified chemical loading analyses, sentinel sites have been established at five designated locations. At each sentinel site, samples are collected monthly beginning prior to the typical field season that begins on June 15th to test for routine water chemistry parameters, pesticides (methods 525.2, 531.1, and 547). Concurrently, stream stage is measured to the nearest 100th of a foot, as the water line against a designated bridge piling or abutment. Further, two of the five sentinel sites have continuous level logger monitors so that a stage-discharge relationship can be better determined. It is imperative that sampling events at sentinel sites should cover the range of stream flow from the 10th to 90th percentiles; hence, precipitation events and continuous discharge gages should be watched to help guide deployment of sentinel site surveys. If conditions warrant, bacteriological sampling at all sentinel sites may be expanded beyond five runs. The locations of sentinel sites are indicated in Table 2.

QUALITY ASSURANCE

Ohio EPA Manuals

All biological, chemical, data processing, and data analysis methods and procedures adhere to those specified in the Surface Water Field Sampling Manual for water column chemistry, bacteria and flows (Ohio EPA 2015a, Biological Criteria for the Protection of Aquatic Life, Volumes II - III (Ohio EPA 1987, 1989a, 2015b, 2015c), The Qualitative Habitat Evaluation Index (QHEI); Rationale, Methods, and Application (Ohio EPA 1989b, 2006) for habitat assessment, and Ohio EPA Fish Tissue Collection Guidance Manual (Ohio EPA 2012).

Use Attainment

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

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

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

Stream Habitat Evaluation

Physical habitat is evaluated using the Qualitative Habitat Evaluation Index (QHEI) developed by the Ohio EPA for streams and rivers in Ohio (Ohio EPA 1989b). Various attributes of the available habitat are scored based on their overall importance to the establishment of viable, diverse aquatic faunas. Evaluations of type and quality of substrate, amount of in-stream cover, channel morphology, extent of riparian canopy,

pool and riffle development and quality, and stream gradient are among the metrics used to evaluate the characteristics of a stream segment, not just the characteristics of a single sampling site. As such, individual sites may have much poorer physical habitat due to a localized disturbance yet still support aquatic communities closely resembling those sampled at adjacent sites with better habitat, provided water quality conditions are similar. QHEI scores from hundreds of segments around the state have indicated that values higher than 60 were generally conducive to the establishment of warmwater faunas while those which scored in excess of 75-80 often typify habitat conditions which have the ability to support exceptional faunas.

Biological Community Assessment

Macroinvertebrates will be collected from artificial substrates and from the natural habitats. Quantitative sampling will be conducted at reference sites and at sites with drainage areas in excess of 20 mi². Qualitative sampling will be conducted in headwater sites with drainages smaller than 20 mi². The artificial substrate collection provides quantitative data and consists of a composite sample of five modified Hester-Dendy (HD) multiple-plate samplers colonized for six weeks. At the time of the artificial substrate collection, a qualitative multihabitat 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 mi² 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 (Ohio EPA 2015c).

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 Ohio EPA (2015 Appendix III).

Lake Sampling

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 Ohio EPA (2015a) and the *Inland Lakes Sampling Procedure Manual* (Ohio EPA 2016). 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 unstratified.

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 Ohio EPA (2015a) 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 diel measurements of dissolved oxygen, pH, temperature, and specific conductance.

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

Five percent of the water samples will be submitted to the lab 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 Ohio EPA (2015a). Matrix spike duplicates will be collected for organic water samples at a minimum of 5 percent.

CONTACTS**Study Team:**

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County Sheriff Offices

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Table 1. Waterbodies and allocated biological sampling effort for each assessment unit (HUC 12)

HUC 12	Sites	Waterbodies
050400010701	1	Jefferson Creek
050400010702	3	Irish Creek, Lick Fork
050400010703	4	Dining Fork, Kirby Run
050400010704	2	Conotton Creek
050400010705	4	North Fork McGuire Creek, Bear Hole Run
050400010706	4	McGuire Creek, Long Run
050400010707	6	Conotton Creek, Trib to Conotton Creek (28.20), Scott Run
050400010801	8	Indian Fork, Honey Run, Pleasant Valley Run, Cold Spring Creek, Gantz Creek, Friday Creek
050400010802	4	Indian Fork, Trib to Indian Fork (3.30), Elliot Run, Willow Run
050400010803	4	Conotton Creek, Trib to Conotton Crk (17.22), Thompson Run
050400010804	3	Huff Run
050400010805	6	Conotton Creek, Trib to Conotton Creek (11.37), Trib to Conotton Creek (7.67), Begger Run

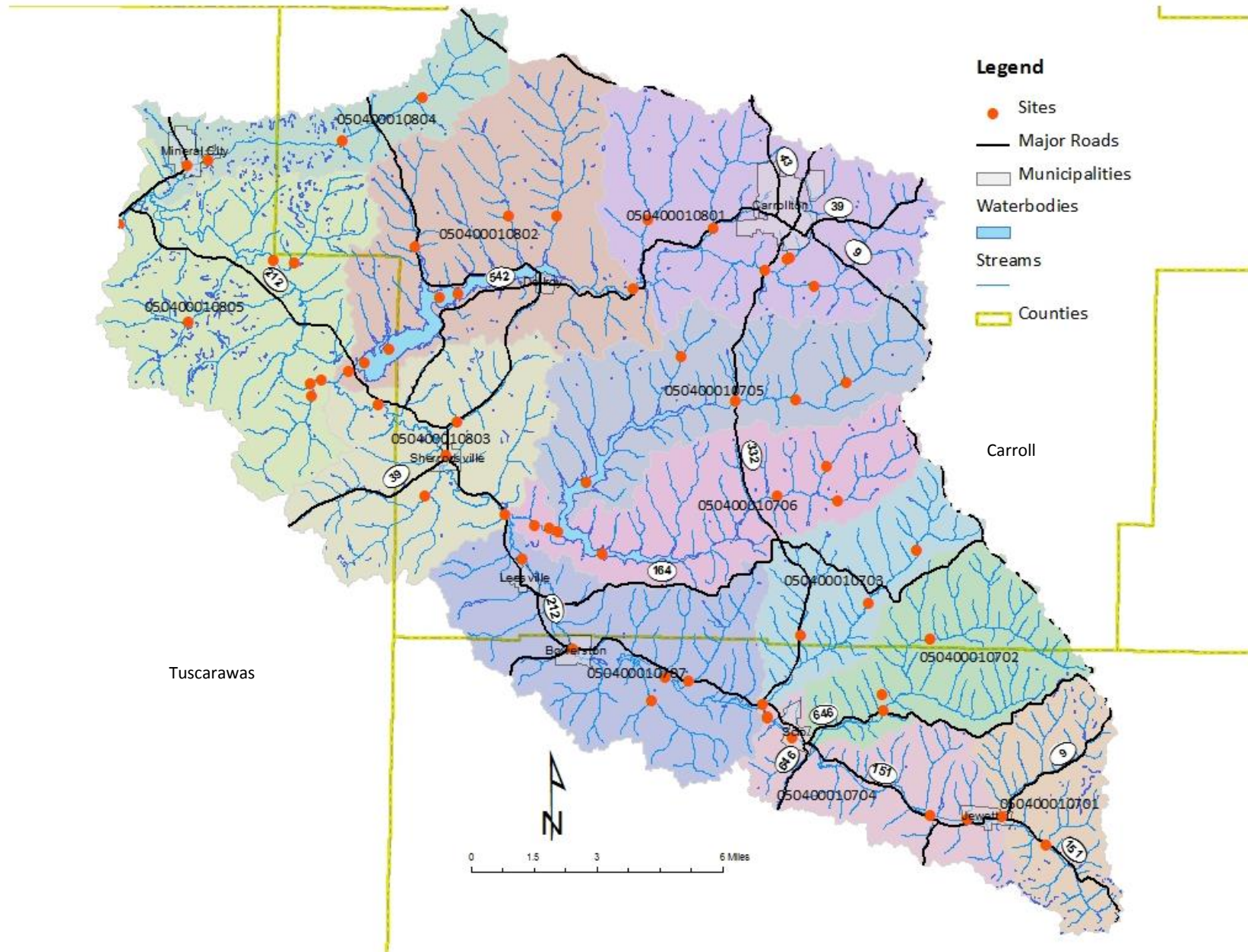


Figure 1. HUC 12 assessment units and sampling locations for the Conotton Creek basin, 2016.

Table 2. Conotton Creek basin survey sampling stations, 2016.

HUC12	Station	Location	RM	DA (mi ²)	Latitude	Longitude	Sampling Type
<i>Conotton Creek (17-100-000) WWH existing</i>							
50400010707	303623	adj SR 151, Jewett-Hopedale Rd	41.6	3.8	40.3578	-80.9751	F, M, C
50400010704	303721	Adj W. Main St (Jewett)	38.8	16.5	40.3671	-81.01083	D, N
50400010704	R08S04	at CR 50, New Rumley Rd	37.8	17.5	40.3689	-81.0278	F, M, C, O, S, D, B, N
50400010704	303541	at Eastport Rd	33.3	46.8	40.3964	-81.0895	C, D, B, Sn, N
50400010704	R08K05	upst Scio WWTP @ Harrison Hub Rd	32.6	48.0	40.4033	-81.1008	F2, MQ, C, O, S, B, D, N
50400010704	303724	dst Scio WWTP adj CR 80 (Leffler Rd)	32.2	48.7	40.4039	-81.1007	D, N
50400010707	R08S01	at CR 25, Conotton Rd	29.1	70.0	40.4178	-81.1464	F2, MQ, C, B
50400010707	R08S16	at Bowerston @ SR 151	25.3	82.0	40.4283	-81.1881	D, N
50400010707	R08W05	at SR 164, Amsterdam Rd	23.8	87.0	40.4456	-81.1969	F2, MQ, C, D, B, N
50400010707	R08K03	at CR 22, Azalea Rd	22.1	89.0	40.4597	-81.2108	F2, MQ, C, D, B, Sn, N
50400010803	R08S12	NW of Leesville at SR 212	20.5	142.0	40.4750	-81.2183	D
50400010803	303578	at SR 39, Church St, Sherrodsville Park	17.0	156.2	40.4958	-81.2447	F2, MQ, C, B
50400010803	303579	at TR 394, Miller Hill Rd	13.9	165.3	40.5139	-81.2748	F2, MQ, C, D, B, N
50400010805	303715	ust Atwood Regional WWTP	11.65	237.0	40.5226	-81.3007	D, N
50400010805	R08S14	at CR 90, New Cumberland Rd	11.4	241.0	40.5211	-81.3058	F2, MQ, C, O, S, D, B, N
50400010805	303580	from TR 399, Marsh Rd	6.7	261.8	40.5641	-81.3217	F2, T, MQ, C, B
50400010805	303581	at Zoarville Station Bridge TR 390	0.2	286.0	40.5772	-81.3915	F2, T, MQ, C, B
<i>Trib to Conotton Creek (28.20) (17-100-002) Undesignated ALU</i>							
50400010707	303618	at CR 43, Bower Rd	0.6	3.8	40.4099	-81.1529	F, M, C
<i>Trib to Conotton Creek (17.22) (17-100-003) Undesignated ALU</i>							
50400010803	303635	at pipeline	1.0	6.3	40.4819	-81.2542	F, M, C
<i>Trib to Conotton Creek (11.37) (17-100-004) Undesignated ALU</i>							
50400010805	303614	at TR 320, Dawn Rd	0.3	4.6	40.5169	-81.3051	F, M, C
<i>Trib to Conotton Creek (7.67) (17-100-005) Undesignated ALU</i>							
50400010805	303654	at TR 388, Brown Hill Rd	2.9	3.8	40.5434	-81.3608	F, M, C
<i>Huff Run (17-101-000) Unverified WWH</i>							
50400010804	300601	at TR 170, Heritage Rd	7.8	3.7	40.6198	-81.2529	F, M, C
50400010804	300599	at CR 36, Brass Rd	5.5	6.5	40.6051	-81.2899	F, M, C
50400010804	R08P07	E of Mineral City at driveway off CR 110	2.1	10.9	40.5991	-81.3506	D, N
50400010804	300595	at CR 90, New Cumberland Rd USGS gage	1.3	11.8	40.5972	-81.3605	F, M, C, O, S, D, B, Sn, N
<i>Begger Run (17-102-000) Unverified WWH</i>							
50400010805	303653	at CR 90, New Cumberland Rd	0.5	4.0	40.5634	-81.3123	F, M, C, B

HUC12	Station	Location	RM	DA (mi ²)	Latitude	Longitude	Sampling Type
Thompson Run (17-104-000) Unverified WWH							
50400010803	303615	from SR 39, Roswell Rd	0.7	3.7	40.5072	-81.2392	F, M, C
McGuire Creek (17-106-000) Unverified WWH							
50400010706	303616	adj CR 17, Aster Rd	9.9	2.7	40.4783	-81.0670	F, M, C
50400010706	303617	at TR 374, Plymouth Rd	8.3	7.1	40.4803	-81.0947	F, M, C
50400010706	303706	opposite Dyewood Rd	7.55	10.3	40.4774	-81.1073	D, N
50400010706	R08W04	dst Leesville Lake dam @ USGS gage	1.3	49.6	40.4703	-81.1981	F2, MQ, C, B
50400010706	R08S17	at CR 22, Azalea Rd	0.8	49.6	40.4713	-81.2047	D
50400010706	201923	Leesville Lake, L-1	0.0	48.0	40.4689	-81.1944	C
50400010706	303525	Leesville Lake, L-2	0.0	0.0	40.4612	-81.1740	C
50400010705	303526	Leesville Lake, L-3	0.0	0.0	40.4858	-81.1811	C
Long Run (17-106-001) Undesignated ALU							
50400010706	303631	at Alamo Rd	0.7	1.7	40.4901	-81.0717	F, M, C
North Fork McGuire Creek (17-107-000) Unverified WWH							
50400010705	303632	at TR 354, Pebble Rd	9.4	4.1	40.5192	-81.0622	F, M, C
50400010705	303633	at CR 19, Autumn Rd	7.7	6.9	40.5134	-81.0855	F, M, C
50400010705	303542	at SR 322, Scio Rd USGS gage	6.0	11.3	40.5133	-81.1129	F, M, C, O, S, D, B, Sn, N
Bear Hole Run (17-108-000) Unverified WWH							
50400010705	303634	at CR 54, Canyon Rd USGS gage	1.7	1.4	40.5290	-81.1370	F, M
Scott Run (17-109-000) Unverified WWH							
50400010707	303630	at SR 151, Scio-Bowerston Rd	0.7	3.1	40.4164	-81.1362	F, M, C
Indian Fork (17-110-000) Unverified WWH							
50400010801	R08W03	at SR 332, Scio Rd	13.9	12.3	40.5583	-81.0986	F, M, C, O, S, B
50400010801	303543	adj SR 39 (private lane)	9.0	33.5	40.5525	-81.1585	F2, MQ, C, O, D, B, Sn, N
50400010802	R08S15	dst. Atwood Lake dam @ SR 212 USGS gage	0.5	70.0	40.5256	-81.2883	F2, MQ, C, D, B
50400010802	201925	Atwood Lake 1	0.0	0.0	40.5519	-81.2377	C
50400010802	201926	Atwood Lake 2	0.0	0.0	40.5504	-81.2464	C
50400010802	303523	Atwood Lake 3	0.0	0.0	40.5329	-81.2694	C
50400010802	303524	Atwood Lake 4	0.0	0.0	40.5281	-81.2811	C
Honey Run (17-110-001) Undesignated ALU							
50400010801	R08P01	ust Carrollton WWTP and tributary	0.6	3.4	40.5625	-81.0872	F, M, C, B, D, N
50400010801	303642	dst Carrollton WWTP trib	0.5	3.8	40.562035	-81.088367	F, M, C, B, D, N
Trib to Indian Fork (3.30) (17-110-004) Undesignated ALU							
50400010802	303651	at SR 542, USGS gage	1.4	3.4	40.5680	-81.2572	F, M

HUC12	Station	Location	RM	DA (mi ²)	Latitude	Longitude	Sampling Type
<i>Elliot Run (17-111-000) Unverified WWH</i>							
50400010802	303702	at CR 69, Clay Rd	1.4	3.5	40.5782	-81.2148	F, M, C
<i>Willow Run (17-113-000) Undesignated ALU</i>							
50400010802	303649	at CR 29, Bedrock Rd USGS gage	1.5	7.7	40.5782	-81.1928	F, M
<i>Pleasant Valley Run (17-114-000) Unverified WWH</i>							
50400010801	303646	at TR 147, Folsam Rd	1.5	6.5	40.5764	-81.1512	F, M, C
<i>Cold Spring Run (17-115-000) Unverified WWH</i>							
50400010801	303644	from SR 39, Roswell Rd	0.6	5.9	40.5730	-81.1219	F, M, C
<i>Gantz Creek (17-117-000) Unverified WWH</i>							
50400010801	303639	at TR 354, Pebble Rd	1.2	7.3	40.5526	-81.0763	F, M, C
<i>Friday Creek (17-117-001) Undesignated ALU</i>							
50400010801	303640	at Chase Road	1.2	3.5	40.5636	-81.0549	F, M, C
<i>Dining Fork (17-118-000) Unverified WWH</i>							
50400010703	303626	from TR 382, Pontiff Rd	6.3	3.1	40.4608	-81.0316	F, M, C
50400010703	303627	at TR 645, Tartan Rd	4.3	6.3	40.4427	-81.0541	F, M, C
50400010703	303628	at SR 151, Scio-Bowerston Rd	0.2	14.7	40.4080	-81.1027	F, M, C, O, S, D, B, N
<i>Kirby Run (17-119-000) Unverified WWH</i>							
50400010703	303629	adj. SR 332, Scio Rd	0.7	3.4	40.4317	-81.0850	F, M, C, B
<i>Irish Creek (17-120-000) WWH verified</i>							
50400010702	303624	from CR 35, Branch Rd	5.0	6.7	40.4296	-81.0262	F, M, C
50400010702	R08S13	at SR 646, Scio New Rumley Rd	2.1	16.1	40.4053	-81.0478	F, M, C, O, S, D, B, N
<i>Lick Fork (17-121-000) Undesignated ALU</i>							
50400010702	303625	at TR 135, Burrier Rd	0.2	5.0	40.4108	-81.0486	F, M, C
<i>Jefferson Creek (17-123-000) WWH verified</i>							
50400010701	R08S07	at High St, Jewett Park	0.2	6.5	40.3681	-80.9950	F, M, C, D, N

B- bacteria sampling	S- sediment sample	MQ- macroinvertebrate quantitative sampling
D- DataSonde® continuous monitors	Sn- sentinel site	M- macroinvertebrate qualitative sampling only
C- water chemistry sampling	FT- fish tissue sampling	F2- two pass fish sampling
	F- single pass fish sampling	N- nutrient site (benthic chlorophyll-a and diel DO)

Table 3. Facilities regulated by an Individual NPDES permit in the Conotton Creek study area.

OEPA Permit Number	Facility Name	Design Discharge (MGD) ²	Wastewater Type, Treatment System, Cont. or Batch Discharge	Stream & RM at Discharge	County
050400010801 – Cold Spring Run					
3IN00295	Agland Co-op Inc	Monitor	Batch discharger	Town Creek (RM 1.1)	Carroll
3PC00027	Carrollton WWTP	0.75	Tertiary treatment, UV disinfection	Honey Run (RM 0.5)	Carroll
050400010804 – Huff Run					
3IN00382	Rosebud Mining Co Deep Mine	0.00175	Batch discharger – coal water treatment ponds, sedimentation ponds	Huff Run (RM7.7)	Carroll
0PB00052	Mineral City WWTP	0.15	UV disinfection	Huff Run(RM1.7)	Tuscarawas
3IP00189	Rosebud, Hope Rd Surface Mine	Monitor	Batch discharger, acid mine drainage treatment ponds	Huff Run (RM 3.8, 4.0, 4.1)	Tuscarawas
050400010805 – Dog Run					
3PQ00100	Atwood Regional WSD	0.65	WWTP	Conotton Cr (RM11.37)	Tuscarawas
050400010705 – North Fork McGuire Creek					
3PR00223	NEOSA Salvation Army Camp	0.025	WWTP	Leesville Lake (near confluence with McGuire Creek)	Carroll
3PR00342	Ohio FFA Camp Muskingum	0.0225	WWTP-discharging to spray irrigation	Farm field	Carroll
3PR00362	Camp Aldersgate Church	0.0075	WWTP	Leesville Lake (near confluence with McGuire Creek)	Carroll
3PR00461	Camp Firebird LLC	0.006	Evapotranspiration Lagoon	n/a	Carroll
050400010707 – Headwaters Lower Conotton					
3PA00039	Leesville WWTP	0.025	WWTP with SSOs	Conotton Cr (RMQ3)	Carroll
0PA00083	Bowerston WWTP	0.051	WWTP with SSOs	Conotton Cr (RMQ5.2)	Harrison
050400010704 – Headwaters Middle Conotton					
0PB00058	Scio WWTP	0.2	WWTP with SSOs	Conotton Cr (RM33)	Harrison
0PA00084	Jewett WWTP	90 gpd for every 1 cfs stream flow	WWTP with SSOs, batch discharger	UT Conotton (29.7)	Harrison
050400010701 – Headwaters Upper Conotton					
0IZ00022	Harrison Co WSD-Germano	0.0018	WWTP	Jefferson Cr (RM4.0)	Harrison

Table 4. Ohio EPA laboratory and field sampling load for the 2016 Conotton Creek survey. Total number of water column analytes does not include field parameters.

Sample Type	No. of Lab Parameters	No. Sites	Passes	Total Samples/Parameters
Conventional Water Quality (total)	32	48	3-5	240/7680
Pathogen (<i>E. coli</i>)	–	23	5+	115+
Chlorophyll-<i>a</i> (benthic and sestonic)	2	23	1	23/46
Water Column Organics				
BNA	Full Scan ¹	9	1	9/Full scan
Pesticides	Full Scan ²	9	1	9/Full scan
PCBs	Full Scan ³	9	1	9/Full scan
Glyphosate ^A	1	9	1	9/-
Datasonde[®]	–	24	2	24/4
Sediment	–	8	1	-/-
Sediment Inorganics*	Full Scan	8	1	8/Full scan
Sediment Organics**	Full Scan	8	1	8/Full scan
Sediment Particle Size	-	8	1	8/Full scan
Fish Tissue				
Metals, including Hg	5	2	1	2/10
PCPs, pesticides, % lipids	–	2	1	2/-
Fish Stations (total)	–	49	1-2	–
2x	–	12	2	–
1x	–	37	1	–
Macrobenthos (total)	–	49	–	–
Quantitative (Hester Dendy)	–	12	–	–
Qualitative (Natural Substrates)	–	37	–	–

1- BNA Method 625, Wastewater Analysis

2- Pesticide Method 608, Wastewater Analysis and Atrazine ELISA Method

3- PCBs Method 608, Wastewater Analysis

A - Glyphosate Method 547, Drinking Water Analysis

*Particle Size, % Solids, TOC, Ammonia, Total P, ICP3, ICPMS2

**BNA 8270. Pesticides 8081, PCBs 8082 – SW846 Analysis

Table 5. List of chemical/physical water quality parameters to be analyzed/ measured in surface water, sediment, lake, and fish tissue from the Conotton Creek study area, 2016. Water samples will be collected from streams 6 times (organics once), sediment once, and fish tissue once. Bacteria samples will be collected 5 times during the recreational use period.

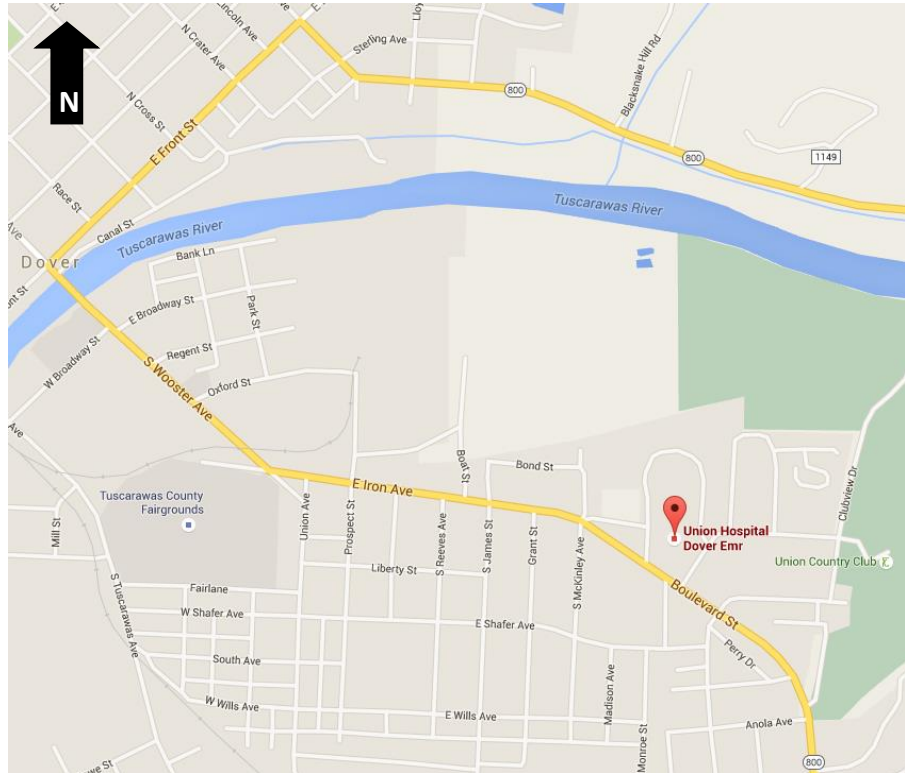
Parameters	Test Method	Water (RL)	Sediment (RL)	Lake	Fish Tissue
Alkalinity	USEPA 310.1	X (5 mg/l)		X	
Acidity	OEPA 210.1	X (5 mg/l)			
Bromide	USEPA 320.1	X (5 mg/l)			
Carbonaceous BOD, 20-day	OEPA 310.2	X (3 mg/l)			
Turbidity	OEPA 180.1			X	
Solids, Dissolved (TDS)	SM 2540C	X (10 mg/l)		X	
Solids, Suspended (TSS)	SM 2540D	X (5 mg/l)		X	
Solids, Volatile Suspended	SM 2540 D/E			X	
Organic Carbon	SM 5310 B			X	
Carbonate/Bicarbonate	SM 2320 B			X	
Ammonia-N	USEPA 350.1	X (0.05 mg/l)		X	
Total Kjeldahl Nitrogen (TKN)	USEPA 351.2	X (0.2 mg/l)		X	
Nitrate-Nitrite	USEPA 350.1	X (0.5 mg/l)		X	
Nitrite	USEPA 353.2	X (0.02 mg/l)		X	
Chloride	USEPA 325.1	X (5 mg/l)		X	
Chemical Oxygen Demand (COD)	USEPA 410.4	X (20 mg/l)			
Sulfate	USEPA 375.2	X (10 mg/l)		X	
Total Phosphorus	USEPA 365.4	X (0.01 mg/l)	X (50 mg/kg)	X	
Orthophosphate (as P)	USEPA 365.1	X (0.01 mg/l)		X	
ICP 1 (Al,Ba,Ca,Fe, Mg, Mn, Na, K, Sr, Zn, Hardness)	USEPA 200.7	X		X	
ICP 3 (Al,Ba,Ca,Fe,Mg,Mn,Na,K,S,Zn)	USEPA 200.7		X		
ICPMS 1 (As,Cd,Cr,Cu, Ni,Pb,Se)	USEPA 200.8	X		X	
ICPMS 5 (As,Be,Cd,Co,Cr,Cu,Ni,Pb,Se)	USEPA 6020A		X		
BNA Organics (SVOCs)	USEPA 625	X	X (USEPA 8270)		
Herbicides (including Atrazine)	USEPA 525.2	X		X	
Microcystins	OEPA 701.0			X	
pH	Field Meter	X		X	
Conductivity	Field Meter	X		X	
Dissolved Oxygen (mg/l and % saturation)	Field Meter	X		X	
Temperature	Field Meter	X		X	
E.coli	USEPA 1603	X		X	
Chlorophyll a	USEPA 445.0	X		X	
Percent Solids	SM 2540G		X		
Total organic carbon	OEPA 335.2		X (0.1%)		
Cadmium, Copper, Lead, Nickel, Silver, Zinc	USEPA 200.8/ USEPA 200.7		X		
ICPMS 6 (As,Cd,Pb,Se)	USEPA 200.8/ SM3113B				X
Mercury	USEPA 245.1		X (USEPA 7471A)		X
PCBs	OEPA 590.1				X
Pesticides	OEPA 590.1				X
Percent Lipids	OEPA 581.5				X

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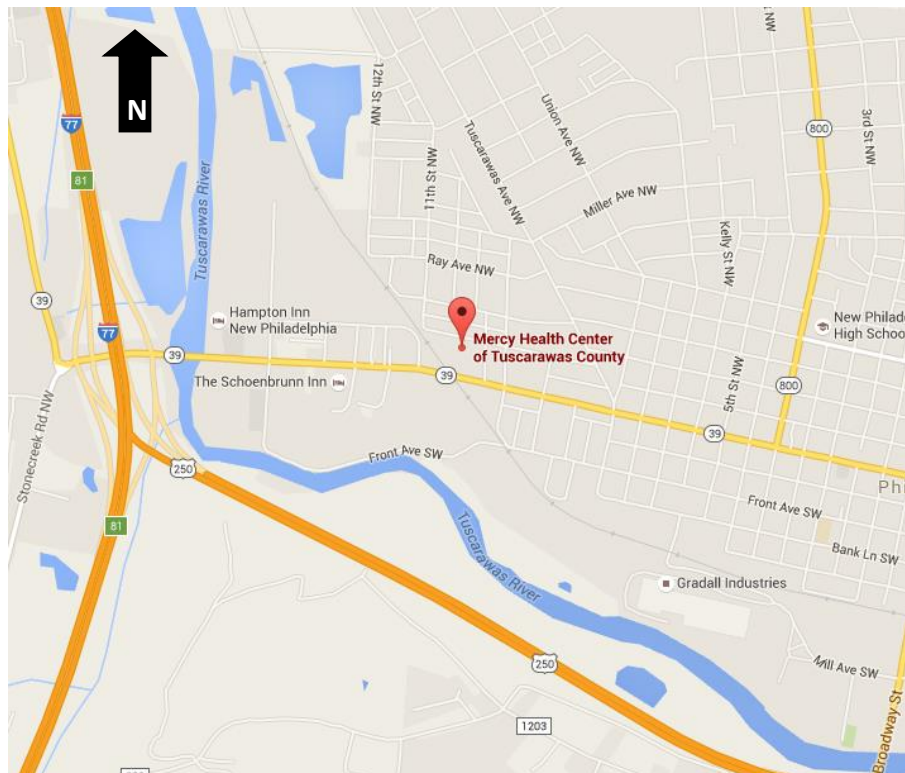
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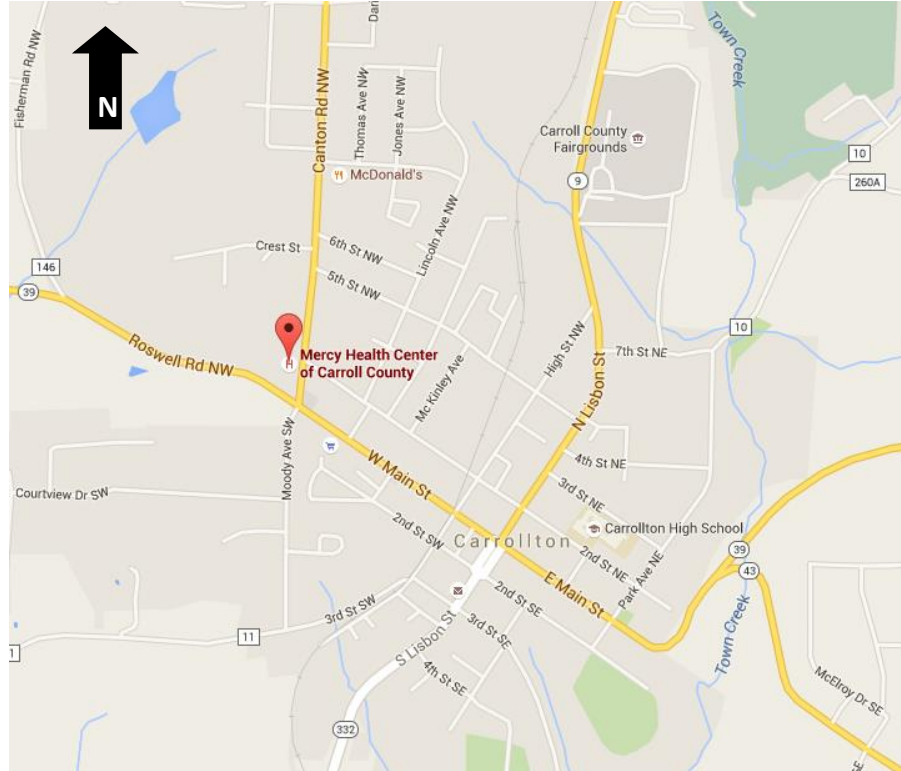
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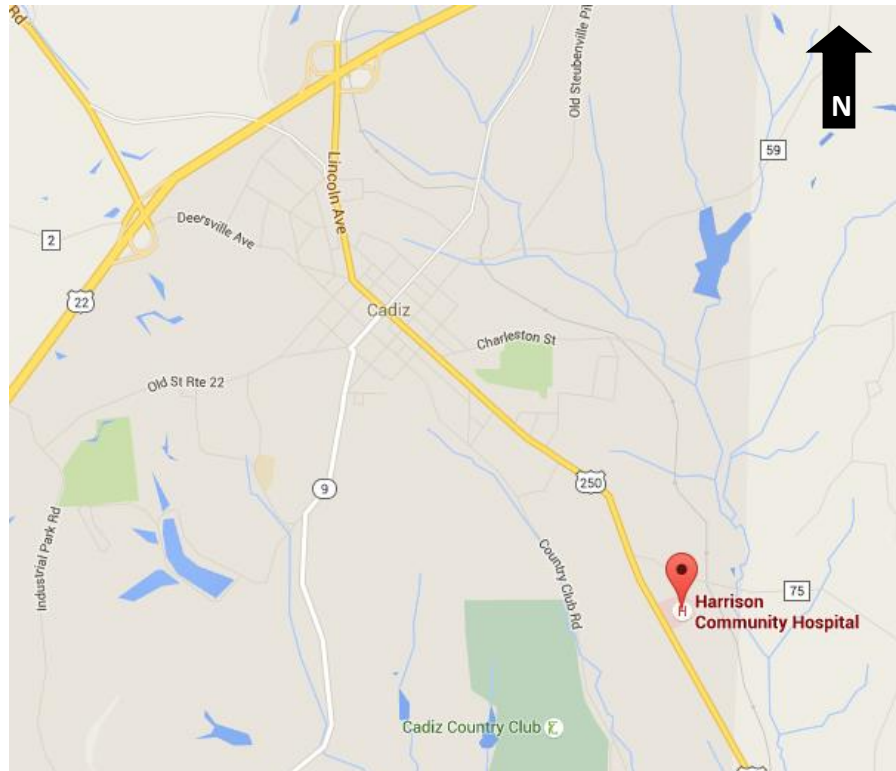
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