

**Biological and Water Quality Survey
of the
Tiffin River
and
Selected Tributaries**

Defiance, Fulton, Henry and Williams 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 2013 field sampling season within the Tiffin River basin. The study area is composed **20** HUC 12 watershed assessment units (Table 1). A total of **50** sampling stations are allocated to this effort and will provide for the assessment of **22** named stream (Table 4). 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 Tiffin River in support of both the TMDL process and NPDES permits,
- 2) Gather ambient environmental information (biological, chemical, and physical) from undesignated water bodies, so as to recommend an appropriate suite of Beneficial Uses (e.g., aquatic life, recreational, water supply),
- 3) Verify the appropriateness of 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, and
- 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 five of the 22 streams to be sampled in this study area were made prior to standardized approaches to the collection of in-stream biological data or numerical biological criteria.

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. A list of permitted facilities is presented in Table 2.

Nutrients

In support of the ongoing process of nutrient criteria development and to provide more objective and robust characterization of the sources and effects of nutrient loads in the Tiffin River basin and within the Maumee basin, select stations will be sampled.

Sampling Effort

Field and Laboratory Load

Summarized field and laboratory load (stations, number of samples, and parameters for analysis, etc.) can be found in Tables 3 and 5. All scheduled locations and necessary stipulations are provided in Table 4.

Water Quality

Water column chemistry samples will be collected from **50** 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 **33** stations at least five times during the recreational season (Table 4).

Datasonde® deployment is requested for **20** locations, **eight** sentinel and 12 nutrient monitoring sites. The deployment of continuous monitors should coincide with typical low summer/fall flows (i.e., approaching $Q_{7,10}$). The Modeling section will be responsible for deployment of the data center units.

Nutrients

The DSW modeling staff will collect chlorophyll-a samples from benthic substrate scrapings and sestonic water samples (concurrently with the Datasondes®) at 20 locations in the Tiffin River study area (Table 4). At the same time water column samples in support of nutrient monitoring and assessment efforts will be collected from these locations and will be analyzed for the modeler's suite of parameters (including BOD₅).

Sediment Sampling

One set of sediment samples will be collected at sites indicated in the table of sampling locations (Table 4) using procedures outlined in the *Ohio EPA Sediment Sampling Guide and Methodologies*, 3rd edition (Ohio EPA, 2012). Fine grained multi-incremental sediment samples will be collected in the upper four inches of bottom material using either clean stainless steel scoops or dredges. Samples will be homogenized and split into 500 ml amber glass jars with Teflon lined lids for organic compound testing and 250 ml HPDE containers for metals testing. They will then be secured inside coolers with wet ice and delivered to the Ohio EPA Division of Environmental Services for analysis. Pollutants to be tested and their analytical methods are listed in the table of chemical/physical parameters (Table 5).

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

Lake Sampling

Archbold Reservoir #2 is located in the Village of Archbold in Fulton County, Ohio. It's a manmade upground reservoir that was constructed in 1960 to help the village meet increasing demand for water. This type of lake is typically built on flat ground using earthen levees with roughly 2:1 inside slopes that are covered with limestone riprap to protect them from wind and wave erosion. The lake covers a surface area of about 44 acres and has a maximum depth of 14 ft. with a storage capacity of about 204 million gallons. Source water is obtained from the Tiffin River via an automated pump station located at river mile 47.54. The lake is open to public fishing and there is a concrete boat ramp. Only electric motors are permitted and swimming is not allowed. Fish management activities include routine stocking, population monitoring and angler harvest studies.

Sampling will be done over two field seasons at lakes listed in the table of sampling locations (Table 4). A total of five sampling events will be done per season at a frequency of roughly once per month May – September. At a minimum, grab samples for chemical analysis will be collected at 0.5m below the surface and 0.5m above the bottom from the deepest portion of the lake. Additional sites will be added if the lake is >20 km long, clearly divided into sub-basins, has major inflows or has a beach. Field readings (temperature, dissolved oxygen, pH and conductivity) will be done in the water column at roughly 1m increments between the chemistry samples and secchi depth will also be measured. Lakes used to store public drinking water will have samples analyzed for atrazine. Lakes that develop a visual harmful algae bloom or those with phytoplankton communities dominated by *Cyanobacteria* will have samples analyzed for *Microcystins*. A list of pollutants to be tested with their analytical methods and reporting limits (RL) are summarized below. Other pollutants will be added if they are known or suspected to be a problem. A sediment sample will be collected if none has been done within the last 10 years and analyzed for the parameters listed in Table 5. Fish tissue specimens will be collected in lakes selected by a multi-agency committee with a priority given to those commonly used for sport fishing.

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

Benthic Macroinvertebrate Assessment

The condition of the macrobenthos will be evaluated at **50** locations. Artificial substrate samples (quantitative) will be collected by MEG staff at **32** stations within the study area. Qualitative benthic macroinvertebrate samples (natural substrates) will be collected at **18** locations. Locations of benthic macroinvertebrate sampling stations are listed in Table 4.

Fish Community Assessment

The condition of the fish assemblages within the study area will be evaluated at **50** locations. Multiple pass fish community samples will be collected at **32** sites by OEPA FEG staff. Single pass fish community samples will be collected at **18** stations. Single pass evaluations are limited to headwaters, baring reference sites or significant permit issues. The locations of all fish sampling stations are listed in Tables 4.

Sentinel Sites

To aid in the development of a TMDL models(s), sentinel sites have been established at **eight** designated locations. At each sentinel site, samples are collected monthly beginning prior to the routine field season that typically begins on June 15th to test for routine water chemistry parameters, pesticides (methods 525.2, 531.1, and 547) and stream stage is measured to the nearest 100th of a foot, as the water line against a designated bridge piling or abutment. Sampling events at sentinel sites should cover the range of stream flow from the 10th to 90th percentiles. If conditions warrant, bacteriological sampling at all sentinel sites may be expanded beyond five runs. The locations of sentinel sites are indicated in Tables 4.

Public Drinking Water Supply

DSW staff should collect at least five herbicide 525.2 and five nitrate/nitrite samples at the public water system intake for Archbold on the Tiffin River at RM 47.5 or a representative nearby sampling location [insufficient data/watch list (nitrates), insufficient data (atrazine)] and from the Archbold Reservoir #2. Samples need to be collected between April and August, with a higher preference for April-June sampling. DDAGW staff will augment DSW sampling in year 2 (2014) with spring storm-event sampling. If spring samples collected by DSW in year one do not show elevated pesticides or nitrates and the water system is not located in a predominantly agricultural watershed, sampling in year two may not be necessary. If samples are not collected in May or early June of year one, earlier sampling in year two will be needed (even if remaining samples do not have elevated nitrates or pesticides).

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 and III (Ohio Environmental Protection Agency 1987, 1989a, 1989b), 2013 Updates to the Biological Criteria for the Protection of Aquatic Life, Volumes II and III (Ohio Environmental Protection Agency 2013a, 2013b), 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).

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 mi². Qualitative sampling will be conducted in headwater sites with drainages smaller than 20 mi². The artificial substrate collection provides quantitative data and consists of a composite sample of 5 modified Hester-Dendy (HD) multiple-plate samplers colonized for six weeks. At the time of the artificial substrate collection, a qualitative 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 (OEPA 1989b) and 2013 Updates to the Ohio EPA manual Biological Criteria for the Protection of Aquatic Life, Volume III (OEPA 2013b).

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

Five percent of the water 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.

Field Staff and Other Contacts

<p>Ohio EPA-Central Office Charles Boucher: (614) 836-8776 Mike Bolton: (614) 836-8781 Laura Hughes: (614) 836-8783 Paul Gledhill: (614) 644-2881 Sarah Becker: (614) 728-2385 Jeff DeShon: (614) 836-8780 Holly Tucker: (614) 836-8777 Beth Risley: (614) 728-2384 Chris Skalski: (614) 644-2144</p>	<p>County Wildlife Officers <u>District 2</u> 952 Lima Avenue Findlay, OH 45840 (419) 424-5000 Williams Co.: Thomas Kochert, (419) 429-8396 Defiance Co.: Matthew Smith, (419) 429-8381</p>
<p>Ohio EPA-NWDO Dan Glomski: (419) 373-3023 Ben Smith: (419) 373-3027 Chris Riddle: (419) 373-3101</p>	<p>County Sheriffs <u>Williams County</u> 218 W Bryan St. Bryan, OH 43506 (419) 636-3151 <u>Defiance County</u> 113 Biede Ave. Defiance, OH 43512 (419) 784-1592 <u>Fulton County Sheriff</u> 129 Court House Plz, Wauseon, OH (419) 335-4010</p>
<p>Hospitals (see attached maps) <u>Montpelier Hospital</u> 909 E Snyder St. Montpelier, OH 43543 (419) 485-3154 <u>Bryan Medical Center</u> 442 W High St, Bryan, OH (419) 633-4029 <u>Community Hospital-Wellness Center- Archibold</u> Archibold, OH (419) 445-4415 <u>Defiance Regional Medical Center</u> 1200 Ralston Ave, Defiance, OH (419) 783-6955</p>	<p>Police Departments <u>Montpelier</u> 221 Empire St. Montpelier, OH 43543 (419) 485-3121 <u>Bryan Police Department</u> 103 N Beech St, Bryan, OH (419) 636-4233 <u>Archbold Police Department</u> 405 E Lutz Rd, Archbold, OH (419) 445-9991 <u>Definace City Police Department</u> 113 Biede Ave, Defiance, OH (419) 784-5050</p>

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

HUC 12	Sites	Comments	Waterbodies
041000060201	0	HUC mostly in Michigan	Bean Creek
041000060202	2		Bean Creek, Deer Creek
041000060203	2		Old Bean Creek
041000060204	4		Mill Creek
041000060205	1	All tribs are small.	Bean Creek
041000060301	2		Tiffin River, Bates Creek
041000060302	1	All tribs are small.	Leatherwood Ditch
041000060303	2		Tiffin River, Flat Run
041000060401	2		Lick Creek, Miller Creek
041000060402	3		Lick Creek, Little Lick Creek
041000060403	2		Prairie Creek
041000060404	2		Lick Creek
041000060501	5		Beaver Creek
041000060502	6		Brush Creek, Owl Creek
041000060503	4		Tiffin River
041000060504	2	HUC includes part of Tiffin R. LRAU	Coon Creek, Doty Run
041000060601	2		Lost Creek
041000060602	3		Mud Creek, Dry Creek
041000060603	2		Webb Run
041000060604	1	HUC includes part of Tiffin R. LRAU	Buckskin Creek

Table 2. Facilities regulated by an Individual NPDES permit in the Tiffin River Watershed Assessment Unit (04100006).

Facility Name	Ohio EPA Permit No.	Receiving Stream	River Mile	Wastewater Type and Treatment System
BP Amoco Oil Corp Bulk Plant Bryan	2IN00177	Storm Sewer to Prairie Creek		Storm Water Sedimentation Basin
Bryan Metal - Global Suspension Systems	2IC00039	Storm Sewer to Ditch 40		Noncontact cooling water
Bryan WTP	2IY00002	Storm Sewer to Prairie Creek	0.9	Filter backwash water
Bryan WWTP	2PD00018	Prairie Creek / Pigeon Run	11.0	3.14 MGD Activated Sludge
Durham Estates WWTP	2PG00085	UT Lick Creek		0.02 MGD Activated Sludge
Hickory Hills Subsewer District	2PG00084	UT Owl Creek		5500 GPD Activated Sludge
Hillside Nursing Home	2PG00086	Beaver Creek	15.4	0.042 MGD Sand Filter
Kunkle Schoolhouse	2PR00129	UT West Fork Mill Creek		7100 GPD Package Plant
Lakeland Woods	2PG00087	Beaver Creek	4.65	0.03 MGD Activated Sludge, sand filter
Manufactured Housing Enterprises	2PR00141	Little Lick Creek		6000 GPD Lagoon System
Norlick Place	2PG00067	Lick Creek	21.76	0.048 MGD Activated Sludge
Ohio Turnpike Commission Kunkle Maintenance	2PP00047	UT Beaver Creek		1500 GPD Package Plant
Spangler Candy Company	2IH00107	Storm Sewer to Ditch 40		Noncontact cooling water
Springfield Dairy LLC	2IK00041	UT Prairie Creek		Storm Water, manure discharge to fields
Stryker WWTP	2PB00009	UT Tiffin River	0.28, 32.65	0.350 MGD Aerated Lagoon System
Altenloh Brinck Co., AKA Tru Fast LLC	2PR00105	UT Little Lick Creek	2.2	8000 GPD Package Plant

Facility Name	Ohio EPA Permit No.	Receiving Stream	River Mile	Wastewater Type and Treatment System
West Unity STP	2PB00021	Walnut Run	3.75	0.325 MGD Activated Sludge
Williams Co S. Central Sewer District	2PH00018	Miller Creek	1.8	0.127 MGD Stabilization Pond
Williams County Landfill	2IN00124	Lick Creek		4 Storm Water outfalls from sedimentation ponds
Evansport WWTP	2PG00055	Tiffin River	20.04	0.050 MGD Activated Sludge
Evergreen Lane Office Complex	2PG00052	Tiffin River	7.3	0.015 MGD Activated Sludge
Garden Ridge Nursery	2IN00204	Behrens Ditch		Sand and Trickling Filter treated water
Ney WTP	2IV00112	Little Lick Creek	2.99	5000 GPD sand filtration backwash water
Ney WWTP Lagoon	2PA00095	Lick Creek	10.5	0.041 MGD Stabilization Pond
Northeastern Local Schools - Tinora	2PT00018	UT Mattock Ditch		0.022 MGD Extended Aeration with sand filters
Park Place MHP	2PY00065	UT Tiffin River	1.03	0.0125 MGD Sand Filtration
Vander Made Dairy LLC	2IK00021	UT Dry Creek	4.66	Storm Water, manure discharge to fields
Archbold WWTP	2PB00017	Brush Creek	13.95	2.5 MGD Contact Stabilization
Fayette WWTP	2PB00045	UT Deer Creek	0.25	0.26 MGD Lagoon System – controlled discharge
Harrison Lake State Park	2PP00001	Mill Creek	4.92	0.040 MGD Package Plant – sand filtration
Pettisville WWTP	2PG00014	UT Brush Creek	2.0	0.116 MGD Lagoon System – controlled discharge

Table 3. Ohio EPA laboratory and field sampling load for the 2013 Tiffin River survey. Total number of water column analytes does not include field parameters.

Sample Type	No. of Lab Parameters	No. Sites	Passes	Total Samples/Parameters
Conventional Water Quality (total)	31	50	6	300/9300
Pathogen (<i>E. coli</i>)	-	33	5	165
Chlorophyll-a (benthic and sestonic)	1	20	1	20/40
Water Column Organics				
BNA	-	2	1	2/-
Herbicides (including Atrazine)	-	1	5	5/-
Datasonde®	-	20	1	20/-
Sediment	-	7	1	-/-
Sediment Metals	7	7	1	7/49
Sediment Organics (BNA)	-	7	1	7/-
% solids, T-org. C, T-P	3	7	1	7/21
Fish Tissue				
Metals, including Hg	5	6	1	6/30
PCPs, pesticides, % lipids	-	6	1	6/-
Lake		1		
Conventional Water Quality	33	1	5	10/330
Pathogen (<i>E. coli</i>)	1	1	5	5/5
Herbicides (including Atrazine)	-	1	5	5/-
Microcystins	1	1	0-5	0-5/0-5
Chlorophyll-a	1	1	5	5/5
Fish Stations (total)	-	50	1-2	82/-
2x	-	32	2	64/-
1x	-	18	1	18/-
Macrobenthos (total)	-	50	-	-
Quantitative (Hester Dendy)	-	32	-	-
Qualitative (Natural Substrates)	-	18	-	-

Table 4. Tiffin River basin sampling stations, 2013. Sampling types: F=fish collection (X1 if drainage area < 20 mi² and 2X if over), M=macroinvertebrate collection (qualitative sample only if drainage area < 20 mi² and quantitative sample if over), C=water chemistry sample, ^{SS}=sentinel site, O=water column organics, B=bacteria sampling, S=sediment sample, D=DataSonde® continuous monitors, N=algae sample to calculate the Trophic Index Criterion, T=fish tissue sampling, W=public water supply intake sampling.

Stream Location	Station Code	Stream code	River Mile	Drain Area (mi ²)	Sampling Type	HUC 12	Lat. Long.	USGS 7.5'Quad.
Tiffin River at TR G	P07K06	04-600-000	47.54	337	F,M,C ^{SS} ,B,S,D,N,T,W	0301	41.572800 -84.337200	Archbold
Tiffin River at CR I-25	302205	04-600-000	41.14	374	F,M,C,B,D,N	0303	41.546853 -84.391036	West Unity
Tiffin River ust. Stryker at SR 191	P07K03	04-600-000	35.28	407	F,M,C,B,S,T	0503	41.509878 -84.428745	West Unity
Tiffin River W. of STRYKER at CR F (Curtis St.)	300020	04-600-000	33.95	412	F,M,C ^{SS} ,D,N	0503	41.500000 -84.430100	Evensport
Tiffin River SW. OF STRYKER at SR 34/2	P07S08	04-600-000	30.97	418	B	0503	41.478600 -84.441100	Evansport
Tiffin River dst. Stryker at CR C	P07S07	04-600-000	26.17	421	F,M,C,O,B,S,D,N,T	0503	41.456400 -84.420800	Evansport
Tiffin River at CR 22A, dst. Evansport WWTP, ust Brush Cr.	302206	04-600-000	19.72	476	F,M,C,B,D,N	0503	41.431436 -84.401222	Evansport
Tiffin River S. of Evansport at STEVER RD.	P07K01	04-600-000	14.00	562	F,M,C	0504	41.388100 -84.396100	Evansport
Tiffin River at Evansport Rd. (lower crossing)	P07S05	04-600-000	7.09	736	F,M,C,S	0604	41.346400 -84.418900	Defiance West
Webb Run Dst. Garden Ridge Nursery at Flory Rd.	302204	04-602-000	2.98	9.3	F,M,C,B	0603	41.340589 -84.394536	Defiance West
Webb Run NEAR MOUTH, needs access	P07K09	04-602-000	0.40	20.0	F,M,C	0603	41.317800 -84.390800	Defiance West
BUCKSKIN CREEK at SR 15	P07K11	04-604-000	1.20	6.1	F,M,C,B	0604	41.324610 -84.418459	Defiance West
MUD CREEK at COY RD.	P07W17	04-605-000	10.10	47.3	F,M,C	0602	41.334200 -84.544400	Sherwood
MUD CREEK at TRINITY RD.	P07S04	04-605-000	1.50	58.0	F,M,C ^{SS} ,B,D,N,T	0602	41.350300 -84.438100	Defiance West
Dry Creek dst. Farmer and dairy, at (CR 124)	302202	04-608-000	3.75	11	F,M,C,B	0602	41.355075 -84.592292	Sherwood

Stream Location	Station Code	Stream code	River Mile	Drain Area (mi ²)	Sampling Type	HUC 12	Lat. Long.	USGS 7.5'Quad.
Openlander Rd.								
LOST CREEK at SEEVERS RD.	P07W19	04-606-000	8.97	14.4	F,M,C	0601	41.368600 -84.684200	Mark Center
LOST CREEK at BEHNFELDT RD.	P07W18	04-606-000	1.41	25.6	F,M,C,B,D,N	0601	41.334200 -84.575800	Sherwood
LICK CREEK at CR 13	P07W20	04-609-000	21.77	6.2	F,M,C	0401	41.486534 -84.573998	Bryan
LICK CREEK ust. Ney, at CR 13	P07K13	04-609-000	17.66	30.0	F,M,C,D,N	0402	41.445300 -84.572800	Bryan
LICK CREEK dst. Ney WWTP at THE BEND RD.	P07S36	04-609-000	10.05	58.5	F,M,C,B,D,N	0404	41.380800 -84.516400	Bryan
LICK CREEK at TRINITY RD.	500310	04-609-000	1.23	105	F,M,C ^{SS} ,B,D,N,T	0404	41.368900 -84.438300	Defiance West
MILLER CREEK Dst. WWTP adj. CR 309	P07K17	04-612-000	0.50	20.9	F,M,C,B,D,N	0401	41.471400 -84.586400	Bryan
L. LICK CREEK at BEHNFELDT RD.	P07W22	04-611-000	4.97	7.5	F,M,C	0402	41.408300 -84.573600	Bryan
L. LICK CREEK ust. Ney, ust. RR	P07S41	04-611-000	0.80	23.3	F,M,C,B,D,N	0402	41.378300 -84.526700	Bryan
PRAIRIE CREEK dst. Bryan WWTP, adj. TR 183	P07S13	04-609-001	9.80	9.8	F,M,C,O,B,S,D,N	0403	41.456100 -84.508600	Bryan
PRAIRIE CREEK at Flickinger Rd. (lower crossing)	P07W12	04-609-001	3.40	26.0	F,M,C,B	0403	41.398800 -84.478300	Evansport
BRUSH CREEK ust. Archbold, at Archbold Lutz Rd. (CR D)	P07S22	04-614-000	19.06	19.7	F,M,C,B,D,N	0502	41.543300 -84.264400	Archbold
BRUSH CREEK dst. Archbold WWTP, at TR 24	P07S20	04-614-000	13.28	34.6	F,M,C,B,S,D,N	0502	41.498300 -84.325600	Ridgeville Corners
BRUSH CREEK at CR 24.25	P07W29	04-614-000	9.11	54.0	F,M,C	0502	41.467200 -84.356700	Ridgeville Corners
BRUSH CREEK at CR C	P07K19	04-614-000	5.76	62.0	F,M,C	0502	41.456400 -84.374700	Ridgeville Corners / Evansport
BRUSH CREEK at CR 22-60	P07W15	04-614-000	1.05	65.0	F,M,C ^{SS} ,B,D,N,T	0502	41.433300 -84.390000	Evansport
OWL CREEK at CR 25	P07S03	04-615-000	0.07	10.3	F,M,C	0502	41.466400 -84.342200	Ridgeville Corners
COON CREEK @ CO. RD. 23	P07K24	04-616-000	0.62	9.3	F,M,C,B	0504	41.429200 -84.379200	Evansport
Doty Run at Evansport Rd.	302201	04-613-000	0.63	5.3	F,M,C	0504	41.381325 -84.417186	Evansport
BEAVER CREEK @ CO. RD. K	P07P17	04-617-000	17.12	14.9	F,M,C	0501	41.572200 -84.497500	West Unity
BEAVER CREEK	P07K25	04-617-	12.66	29.5	F,M,C,B	0501	41.537800	Montpelier

Stream Location	Station Code	Stream code	River Mile	Drain Area (mi ²)	Sampling Type	HUC 12	Lat. Long.	USGS 7.5'Quad.
Ust Pulaski @ CO. RD. 16		000					-84.515300	
BEAVER CREEK dst. Pulaski @ U.S. RT. 127	P07P14	04-617-000	7.52	36.0	F,M,C,B	0501	41.491100 -84.514700	Bryan
BEAVER CREEK @ CO. RD. D	P07S01	04-617-000	2.90	41.0	F,M,C	0501	41.469700 -84.463600	Evansport
BEAVER CREEK @ CO. RD. 20	P07P11	04-617-000	0.61	44.8	F,M,C ^{SS} ,D,N	0501	41.458900 -84.438300	Evansport
Leatherwood Cr. @ CO. RD. H	P07K27	04-619-000	1.15	9.8	F,M,C,B	0302	41.528100 -84.421400	West Unity
FLAT RUN @ CO. RD. 22-75	P07K28	04-620-000	0.40	10.2	F,M,C,B	0303	41.538600 -84.382800	West Unity
BATES CREEK @ CO. RD. 25-2	P07K30	04-622-000	1.65	11.8	F,M,C,B	0301	41.583900 -84.351400	Archbold
MILL CREEK ust. Alvordton trib @ CO. RD. S	P07W25	04-624-000	14.49	12.9	F,M,C	0204	41.680600 -84.395600	Alvordton
MILL CREEK dst. Alvordton trib @ CO. RD. P	P07W26	04-624-000	11.90	23.4	F,M,C,B	0204	41.651400 -84.411900	Alvordton
MILL CREEK Dst. dairy @ CO. RD. 22	P07S32	04-624-000	7.92	32.8	F,M,C,B	0204	41.641700 -84.399200	Alvordton
MILL CREEK @ Old Angola Rd.	P07S31	04-624-000	1.85	39.0	F,M,C ^{SS} ,B,D,N	0204	41.622800 -84.323600	Archbold
BEAN CREEK @ U.S. RT. 20	500330	04-626-000	7.55	206	F,M,C ^{SS} ,B,D,N	0202	41.677867 -84.231875	Morenci
BEAN CREEK @ Old Angola Rd.	P07S33	04-626-000	2.20	246	F,M,C,B	0205	41.623100 -84.296100	Archbold
DEER CREEK dst. Fayette WWTP, at CR 23	P07W24	04-628-000	4.56	9.9	F,M,C,S,B	0202	41.670000 -84.307500	Fayette
Old Bean Creek at CR 19	302203	04-628-000	6.22	14.0	F,M,C	0203	41.635864 -84.229314	Morenci
OLD BEAN CREEK @ Old Angola Rd.	P07S34	04-632-000	1.85	25.0	F,M,C,B,D,N	0203	41.623300 -84.290300	Archbold
Archbold Reservoir #2	204363				C,B,W	0502		Archbold

Table 5. List of chemical/physical water quality parameters to be analyzed/ measured in surface water, sediment, Lake and fish tissue from the Tiffin River study area, 2012. Water samples will be collected from streams 6 times (organics once), sediment once, lakes 5 times, and fish tissue once. Bacteria samples will be collected 5 times during the recreational use period.

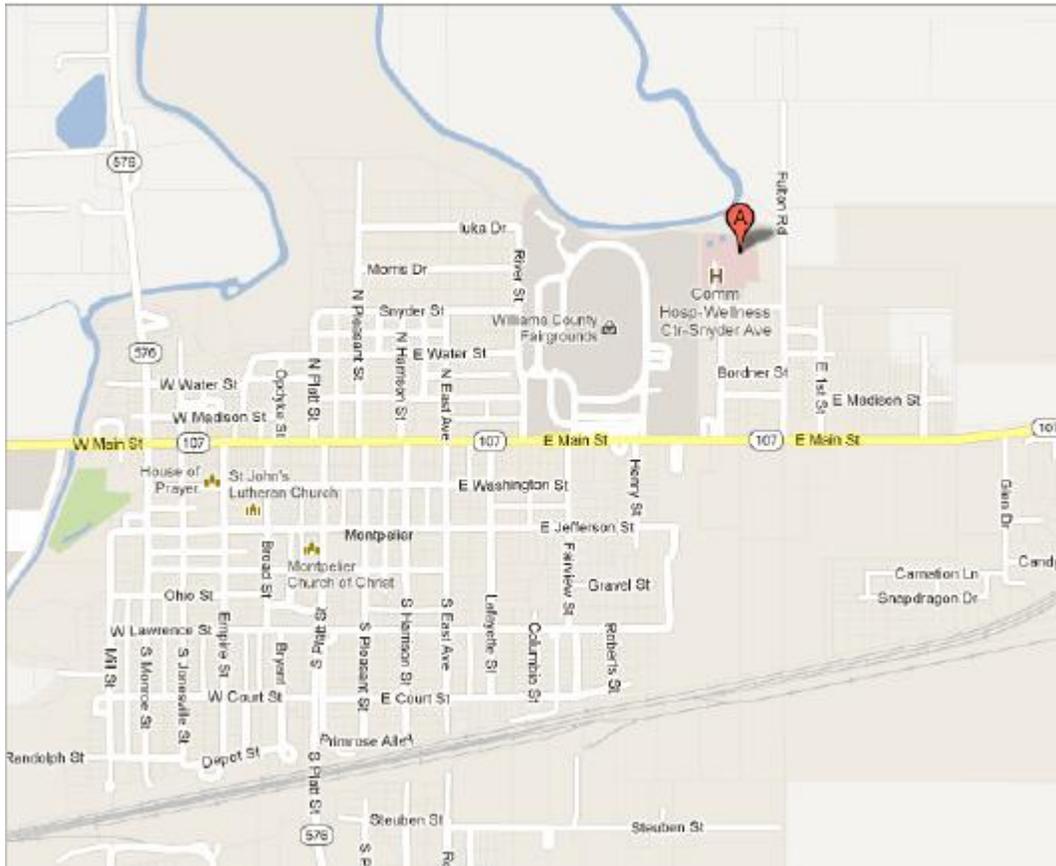
Parameters	Test Method	Water (RL)	Sediment (RL)	Lake	Fish Tissue
Alkalinity	USEPA 310.1	X (5 mg/l)		X	
Carbonaceous BOD, 20-day	OEPA 310.2	X (3 mg/l)			
Turbidity	OEPA 180.1			X	
Solids, Dissolved (TDS)	SM 2540C	X (10 mg/l)		X	
Solids, Suspended (TSS)	SM 2540D	X (5 mg/l)		X	
Solids, Volatile Suspended	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	
ICPMS 1 (As,Cd,Cr,Cu, Ni,Pb,Se)	USEPA 200.8	X		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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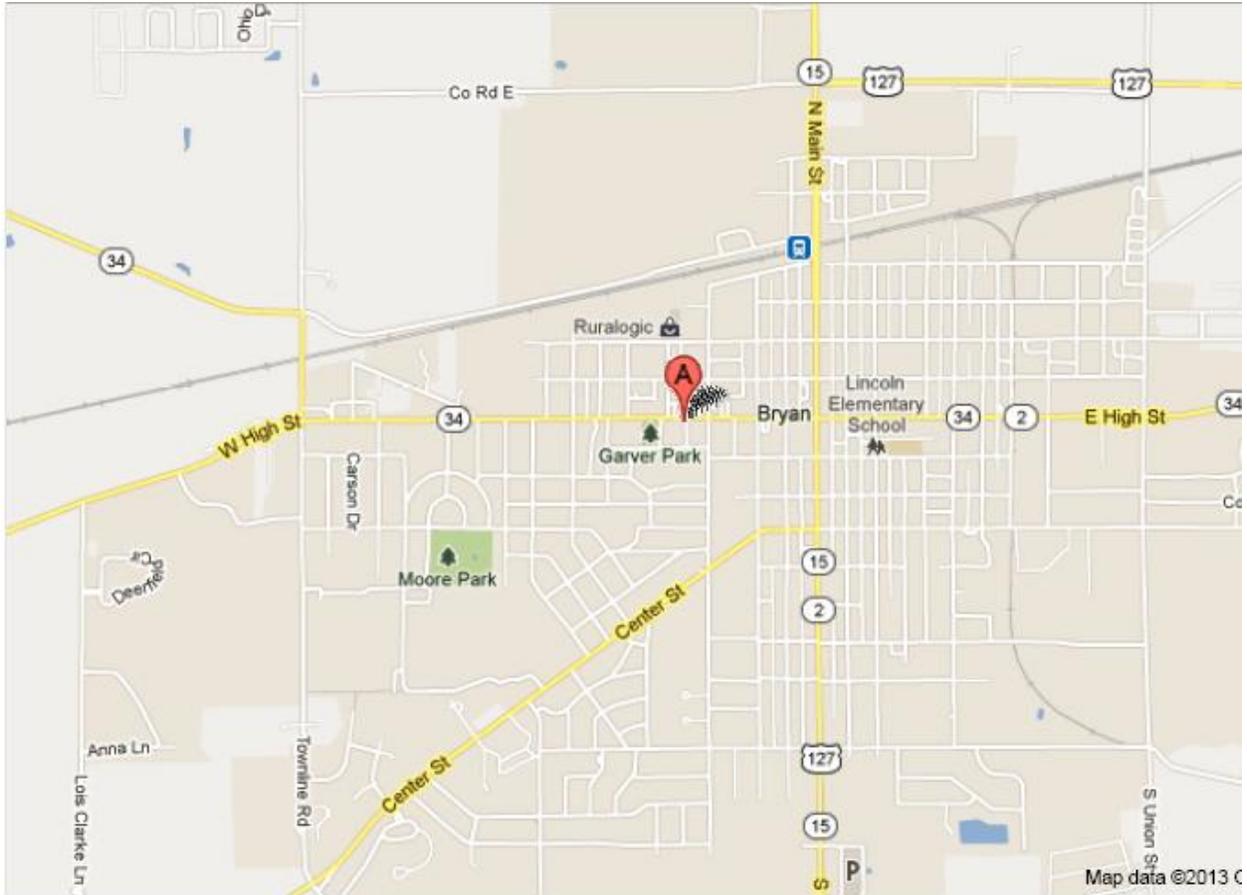
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Bryan Medical Center

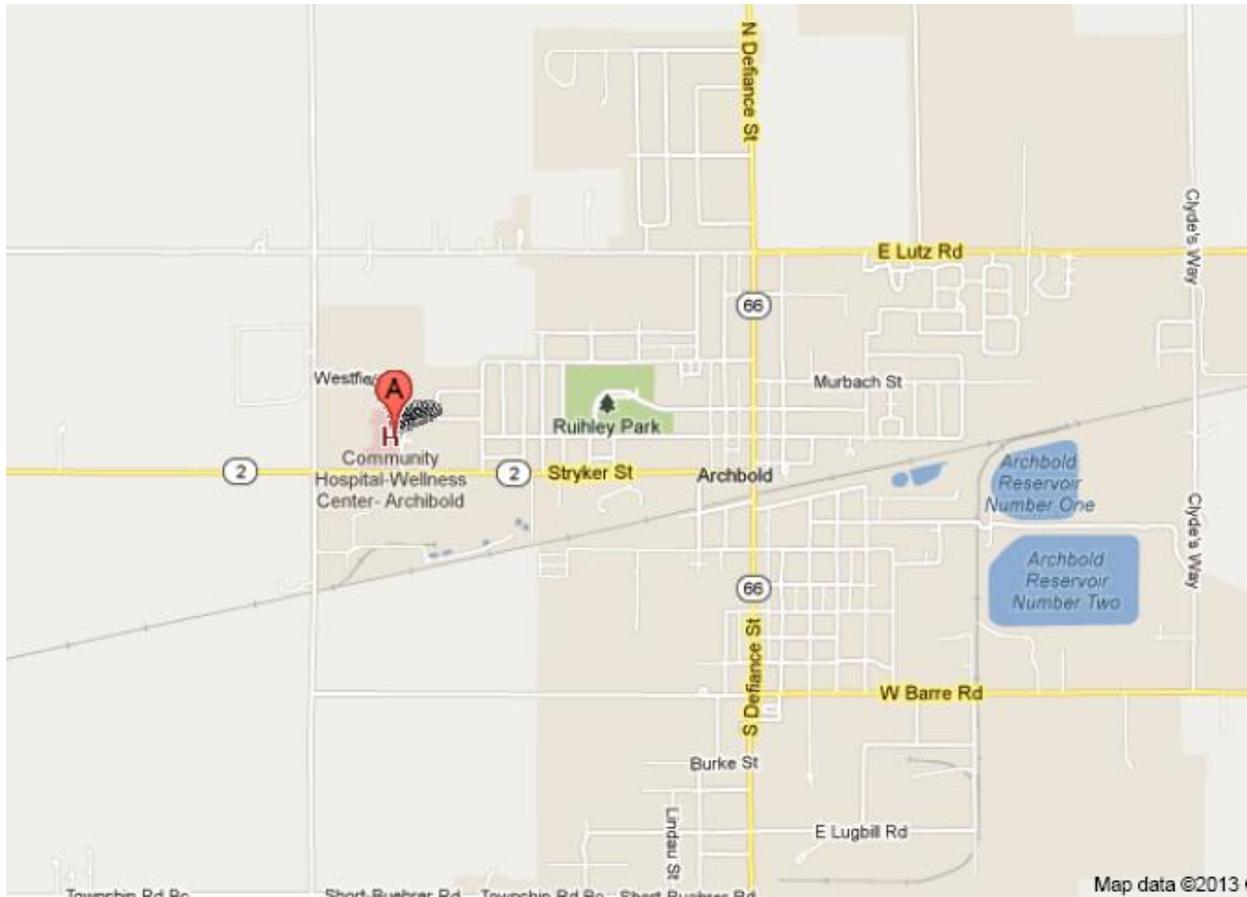
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