

**Biological and Water Quality Survey  
of the  
Ohio Brush Creek Basin**

Adams, Brown, Highland, and Pike Counties, Ohio

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## Introduction

As part of the five-year basin approach for NPDES permitting and the TMDL process, an intensive ambient assessment will be conducted during the 2007 field sampling season within the Ohio Brush Creek basin. The study area includes the entire length of Ohio Brush Creek, and all tributaries possessing a drainage area greater than 5.0 miles<sup>2</sup>. A total of 69 sampling stations are dispersed throughout the basin. 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) will be evaluated at selected sampling locations.

A geometric site selection methodology (systematic census) was employed to derive the initial station list. This method has proved rapid and efficient in generating an objective and comprehensive collection of potential sampling sites where an assessment of an entire catchment is desired. However, a negative and unavoidable consequence of this methodology includes substantial data gaps in lower or larger stream segments. It was therefore necessary to directly target these higher order segments (or tributaries) to ensure an even distribution of sampling effort. Also, where the discrete evaluation of a permitted entity or activity is needed, targeted sampling is directed to various and sundry environmental issues or permits within the study area. Lastly, waterbodies that have been previously sampled and evaluated by the Ohio EPA will be selectively revisited for the purposes of trends assessment.

### Sampling Objectives

- 1) Systematically sample and assess the principal drainage network of Ohio Brush Creek 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,
- 4) Establish baseline ambient biological conditions at selected reference stations to evaluate the effectiveness of 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]).
- 6) In support of Ohio EPA's reconstituted lakes monitoring program, limited WQ sampling is allocated to the only significant public reservoir within the Ohio Brush Creek study area, Adams Lake.

## 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**

Many of the streams (named and unnamed) contained within the study area are unassessed. Previous Aquatic Life Use Designations for these waters 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. Furthermore, many water bodies within the study area are entirely unclassified (no existing Beneficial Use Designations). 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**

All NPDES permitted entities within the study area are classified as minor facilities (conduit flow <1 MGD). Considering plant performance, compliance history, and other factors, selected permittees will receive additional scrutiny as part of this survey, above that provided for in the base station list derived from systematic census technique.

### Hillcrest WWTP (private minor, Peebles Quad.)

Located in the Village of Lawshe, the Hillcrest Nursing Home operates a small plant, treating wastewater derived on-site. The 001 outfall discharges to a small unnamed tributary to Ohio Brush that joins the mainstem at RM 28.0.

Remarkably, the treatment system was designed, installed and commenced operation without a PTI. According to the SEDO, the Hillcrest Nursing Home WWTP was poorly designed and is carelessly operated. These structural and operational problems are compounded by the characteristics of the waste stream unique to this facility. Namely, biological treatment is regularly disrupted, inhibited, or rendered ineffective due to the mix of cleaners, disinfectants, and pharmaceuticals that regularly pass through the system. As expected the full suite of characteristics (poor design, indifferent operation, and complex waste stream), has resulted in extended periods of non-compliance. Hillcrest has been referred to AG's office for enforcement, but no action on this matter has occurred to date.

Per discussions with the Standards Section, it was recommended that we bracket the Hillcrest WWTP 001 with chemical monitoring stations as well as adding chemical monitoring stations immediately up and downstream from the receiving stream, on Ohio Brush Creek. Furthermore, additional laboratory analysis for phenol and chlorine are recommended for all sites associated with the evaluation of Hillcrest. Analysis for phenol and chlorine should serve as a signature of wastewater from this facility, as both are common constituents of pharmaceutical preparations and disinfectants, respectively. Lastly, it was also recommended that a toxicity screening (chronic and acute) be performed on both the receiving stream and Ohio Brush Creek itself. The decision to initiate this type of monitoring will be left to the discretion of SEDO WQ staff, as they are best able to appraise the appropriateness and feasibility of this approach.

Peebles WWTP (minor POTW, Peebles Quad.)

A new plant and well-run, but I&I problems still persist in the collection system. The resulting inflow has contributed to treatment irregularities. The Peebles WWTP 001 discharges to Simmer Run at RM 2.2 (old 001 at RM 2.18). Base chemical monitoring will be augmented to evaluate this facility directly. Additional stations will be placed upstream and downstream from the plant and, resources permitting, possibly another site downstream, but closer to the 001.

Seaman WWTP (minor POTW, Seaman Quad.)

The Seaman WWTP 001 outfall discharges to an unnamed West Fork Ohio Brush Creek tributary that joins the West Fork mainstem at RM 7.38. A history of I&I problems, has resulted in treatment irregularities. According to SEDO, I&I problems still persist, but conditions are improving. Base chemical monitoring will be augmented to evaluate this facility. Station are to be deployed to the receiving stream (West Fork Trib.), and so arranged as to bracket Seaman's 001, access and resources permitting.

West Union WWTP (minor POTW, West Union Quad.)

The West Union WWTP 001 outfall discharges directly to Beasley Fork at RM 6.2. Additional monitoring stations are recommended to be placed, downstream from the West Union WWTP at RMs 5.8 and 4.7. The evaluation of potential far-field effects from the facility must consider the possible influence of an unnamed tributary draining Adams County landfill that joins Beasley Fork downstream from the WWTP at RM 4.9. To control for this potential influence, chemical monitoring is recommended for RM 5.8, upstream from the landfill tributary. Monitoring efforts at RM 4.9, downstream from both the WWTP and Adams County Landfill, shall include the full suite of indicators, including ambient biology, macrohabitat and well as water column chemistry.

Murphin Ridge Inn WWTP (private minor, Peebles Quad.)

The Murphin Ridge Inn WWTP 001 outfall discharges to Polk Hollow, a direct Ohio Brush Creek tributary. According to SEDO, the Murphin Ridge WWTP is a small and well-run plant, and as such additional sampling resources will not be allocated to evaluate this facility.

Locust Grove MHP (private minor, Peebles Quad.)

The Locust Grove MHP WWTP 001 discharges to an unnamed tributary to Crooked Creek at RM 2.43. According to SEDO, the Locust Grove WWTP is a small and well-run plant, and as such additional sampling resources will not be allocated to evaluate this facility.

### Winchester WWTP (minor POTW, Winchester Quad.)

The Winchester WWTP 001 discharges to Elk Fork at RM 2.8. According to SEDO, the Winchester WWTP is a small and well-run plant, and as such additional sampling resources will not be allocated to evaluate this facility.

### **401/404 Activities**

#### Ohio Brush Creek

South of Peebles, downstream of SR 32, Ohio Brush Creek was illegally relocated for the development of an off-road race track, about 10 years ago. The modified area extends from approximately RM 25.9 to RM 25.5. If resources permit, single pass fish sampling and the associated habitat evaluation will be directed to this location.

#### Gravel Mining

The 401 Unit indicates that in-stream gravel mining is a pervasive problem in the watershed. However, the lack of glaciation and the dominance of limestone bedrock substrates, argues that gravel mining would likely be a highly localized activity, rather than a broad and general practice. Regardless, all field investigators are advised to note or otherwise document incidences of in-stream gravel mining observed during the summer sampling season, so we may appraise the extent and magnitude of this activity, and potential associated impacts.

### **The Nature Conservancy**

As part of their Edge of Appalachia Preserve, The Nature Conservancy (TNC) has significant land holdings within the Ohio Brush Creek basin. TNC representatives have provided to Ohio EPA a summary of their concerns, interests, and various issues within the study area. Specifically, TNC would like three small waters not presently scheduled for assessment in 2007 added to the sampling list. All of these small streams presently drain conservation areas held by TNC. These small sub-basins may represent excellent reference conditions, as their respective catchments are largely undeveloped. Therefore, it is recommended that a single pass fish sampling effort be directed to each of the waters listed below.

- Waggoner Run
- Mackenzie Run
- Black Run

This *ad hoc* sampling effort is of course dependant on the availability of resources. If qualified Ohio EPA field staff find themselves ahead of scheduled field work, due to favorable weather or any other advantageous temporal developments, they are advised to attempt to collect one sample from each of these waters, preferably near the mouth. As these areas are owned and managed by TNC, please contact Pete Whan or Rich McCarty of the Conservancy's Edge of Appalachia office at (937) 544-2188 to arrange access.

Two other waters of interest to TNC include, Cedar Run and Strait Creek. Presently, these streams will be subjected to the full suite of monitoring by Ohio EPA. TNC reported that there is some limited development pressure within the upper Cedar Run basin.

### **Lake Monitoring**

Adams Lake is a publicly owned 47 acre reservoir, located north of West Union, in Tiffin Township. The lake is fed by five unnamed tributaries within the Lick Fork sub-basin and its

outlet forms the Lick Fork proper. One lake station will be sampled three times over the course of the summer field season. Each sampling event will include a collection from the epilimnion and hypolimnion. Water column analysis for these samples will include, ammonia-N, specific conductance, ICP 1 metals, ICPMS 1 metals, nitrate-N, nitrite-N, pH, total volatile solids, total dissolved solids, total suspended solids, total solids, sulfate, TKN, TOC, total phosphorus, and dissolved oxygen. In addition to chemical analysis, samples for bacteriological monitoring shall be commensurate with the three chemical sampling runs. This waterbody was last sampled by the Ohio EPA in 1996.

## **Sampling Effort**

### **Field and Laboratory Load**

Summarized field and laboratory load (stations, number of samples, and parameters for analysis etc.) can be found in Table 1. All scheduled locations and necessary stipulations are provided in Table 2.

### **Water Chemistry**

Water column chemistry and bacteria samples will be collected from 67 stations within the study areas. Water column grab samples and standard field parameters will be collected/measured five times from all locations. At these sites, the collection of water samples for bacteriological analysis shall be commensurate with the 5 chemical sampling runs.

Presently, STORET station identification numbers are available for only a fraction of the proposed sampling sites for the Ohio Brush Creek survey. Over the past two-three survey cycles, STORET numbers have been assigned on an as needed during the study planning process. However, we are deviating from that practice for the 2007 study areas. By agreement of all affected parties, it was determined that SEDO surface water staff will assume the responsibility of developing STORET numbers where needed, for Ohio Brush Creek before the on-set of the field season proper. Specifically, these necessary station identifiers need to be provided to the study plan coordinator (Charles Boucher) on or preferably before the first of June.

In addition to the conventional grab samples, there are three sites from which district staff are requested to provide two filtered water column samples for chlorophyll analysis, collected between late July and mid-September, each following at least two weeks of stable, low flows. Locations of nutrient sampling stations are identified in Table 2.

Water column organic samples will be collected twice from 15 locations, five sentinel sites and ten ecoregional reference sites. Analysis will include the standard organic scans (VOCs, BNAs, PCBs, TOC, and chlorinated pesticides), for both runs.

Similarly, Datasonde deployment is limited to eight locations, five sentinel sites and three nutrient monitoring (chlorophyll) sites. If possible, the deployment of continuous monitors should coincide with typical low summer/fall flows (i.e., approaching Q<sub>7</sub>10). The OEPA DSW modeling section will be responsible for deployment of the datascanner units.

The decision to remove selected parameters from the standard survey template has yet to be reached. Of the parameters in questions, measures of biochemical oxygen demand are of most concern for Ohio Brush Creek study. Ideally, the various measures of demand should be determined from all samples collected throughout the Ohio Brush Creek study area. However, if

these analytes are dropped from the standard list, cBOD<sub>5</sub> and BOD<sub>5</sub> analysis are, at a minimum, requested for the following streams, stream segments or specific sampling stations:

- Ohio Brush Creek mainstem, from RM 52.49 to RM 0.5
- West Fork Ohio Brush Creek, from RM15.19 to RM 0.37
- Baker Fork, RM 1.5
- Beasly Fork, RM 0.75
- Lick Fork, RM 1.03
- All Ecoregional Reference Sites not contained within the segments identified above.

Final modifications to the standard chemical template include a request for phenol and chlorine analysis at five sites. These extra parameters are needed to better characterize the influence of the Hillcrest Nursing Home WWTP on both the receiving stream (a small tributary), and Ohio Brush Creek itself. Phenol and chlorine monitoring sites are specifically identified in Table 2.

### **Sediment Chemistry**

Sediment samples are to be collected at the 15 locations (sentinel and reference stations) 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. Please note, due to very limited practical benefit, demonstrated over many years, analysis for sediment VOCs is not recommended for any Ohio Brush Creek sediment samples. Given the limited laboratory allocation, sediment and metal-organic sampling stations were chosen to evaluate areas likely to demonstrate contamination, aid in elucidating longitudinal trends in sediment contamination relative to a known source(s), characterization of sentinel sites, and characterization ecoregional sediment reference sites. Locations of all sediment sampling stations are listed in Table 2.

### **Benthic Macroinvertebrate Assessment**

The condition of the macrobenthos will be evaluated at 60 locations. Artificial substrate samples (quantitative) will be collected by MEG staff at 21 stations within the study area. Qualitative benthic macroinvertebrate samples (natural substrates) will be collected at 39 locations. Locations of benthic macroinvertebrate sampling stations and type of sample required are listed in Table 2.

For its size and location within the State, Ohio Brush Creek supports a disproportionately diverse mussel fauna, including 30 taxa, five of which are presently state endangered, and many others are considered rare (Waters 1988 and TNC pers. Com. 2007). As noted by Waters (1988) the presence of rare and endanger *Lampsilis teres*, yellow sandshell is of particular significance. Also, as part of the old Teays drainage system is presently contained within the Ohio Brush Creek basin, the presence of hereto unreported relic Teays species within the study area cannot be discounted. Therefore, given both the existing diverse mussel fauna and the possibility for new Teays relics, all field investigators are advised to carefully document the mussel fauna through the collection of weathered or fresh-dead shells. Where species identification is questionable and the specimen(s) is living, investigators are advised to make numerous diagnostic photographs and to make copious written observations on said specimen(s), regarding location, habitat, and diagnostic shell features, etc. A list of mussel taxa recorded for the Ohio Brush Creek basin is presented in Table 3.

### **Fish Community Assessment**

The condition of the fish assemblages within the study area will be evaluated at 60 locations. Multiple pass fish community samples will be collected at 21 sites by OEPA FEG staff. Single pass fish community samples will be collected at 39 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 Table 2.

The Ohio Brush Creek catchment supports a very diverse fish assemblage. A total of 82 species has been recorded from the watershed since 1975. The fish fauna includes many sensitive, declining or otherwise intolerant species. Presently one true Teays relic is documented within the study area, the State threatened species *Clinostomus funduloides*, rosyside dace. However, this does not necessary exclude the possibility of hereto undocumented small populations of other similar taxa, namely, *Notropis boops*, bigeye shiner. Field investigators are advised to be aware of this and other uncommon fish species (*Notropis blennioides*-river shiner, *Notropis buchmanianus*-ghost shiner, *Hybopsis storeriana*-silver chub, *Erimyzon oblongus*-creek chubsucker, *Hiodon tergisus*-mooneye) that may be or are presently found within the Ohio Brush Creek basin.

### **Sentinel Sites**

To aid in the development of a TMDL models(s), sentinel sites have been established at five designated locations. At each sentinel site, samples are collected monthly beginning prior to the routine field season that typically begins on June 15<sup>th</sup> to test for routine water chemistry parameters, pesticides (methods 525.2, 531.1, and 547) and stream stage is measured to the nearest 100<sup>th</sup> 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 10<sup>th</sup> to 90<sup>th</sup> percentiles. The locations of sentinel sites are indicated in Table 2.

### **Field Staff and Other Contacts**

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Table 1. Ohio EPA laboratory and field sampling load for the 2007 Ohio Brush Creek survey. Total number of water column analytes does not include field parameters.

Sample Type	No. Lab Parameters	No. Sites	Passes	Total Samples/Parameters
<b>Conventional Water Quality (total)*</b>	35	67 <sup>LP</sup>	5	350/12,250
<b>Water Column Organics</b>		15	2	30/-
New Age Pesticides	–	15	2	30/-
BNA, Pesticides, PCBs	–	15	2	30/-
<b>Datasonde</b>	–	8	1	NA
<b>Sediment</b>	–	15	1	15/-
Sediment Metals**	10	15	1	15/150
Sediment Organic	(Full Scan)#	15	1	15/Full Scan
Sediment Particle Size		15	1	15/-
<b>Fish Stations (total)</b>	–	60	1-2	81/-
2x	–	21	2	42/-
1x	–	39	1	39/-
<b>Macrobenthos (total)†</b>	–	59	NA	33.9 (HDs and Equivalents)/-
Quantitative (Hester Dendy)	–	21	NA	21/-
Qualitative (Natural Substrates)	–	39	NA	39 (12.9 HD Equivalents)/-

\* - Bacteriological measures will include 5 fecal coliform runs for all stations. Standard parameters include BOD, cBOD, and sulfate. However, if these analytes are dropped from survey template, measures of biochemical oxygen demand are recommended for selected streams or stream segments. These waterbodies are identified in the Water Column Chemistry section of this study plan.

\*\* - Ohio EPA sediment samples will be analyzed for the following metals: Al, As, Cd, Cr, Cu, Pb, Fe, Mn, Ni, and Zn.

# - Full Scan includes BNAs, PCBs, Pesticides, and TOC. Please note, due to very limited utility, demonstrated over many years, analysis for sediment VOCs is not recommended for Ohio Brush Creek sediment samples.

† - The ratio of HD Equivalents and HD is 3:1.

LP - Includes limited water column sampling scheduled for Adams Lake in Support of the DSW, Lake Monitoring Program.

Table 2. Ohio Brush Creek sampling stations, 2007. Sample type: F-fish, B-macro-benthos, C-water column chemistry, S-sediment, and E-effluent.

<i>Stream (RivCode)</i>	<b>RM</b>	<b>DA</b>	<b>Sampling</b>	<b>Location</b>	<b>Topo Map</b>
<b>STORET</b>					
<b>Ohio Brush Creek (10-200-00)</b>			<b>EWH Aquatic Life Use - Verified</b>		
200740	54.72	8.7	(F,B,C)	Deadfall Rd	Belfast
300295	52.49	26.0	(F,B,C) <sup>a</sup>	Peach Orchard Rd.	Belfast
3000294	47.16	52.4	(F,B,C) <sup>a</sup>	Dst. Elk Run, at footbridge	Sinking Spring
X04S22	44.90	55.0	(F,B,C,S) <sup>a</sup>	Adj. TR 113, dst. Ford <sup>Ref</sup>	Sinking Spring
X04G01	40.40	130.0	(F,B,C,D,S) <sup>a</sup>	SR 73, at Serpent Mound <sup>SS</sup>	Sinking Spring
X04S20	30.43	174.0	(F,B,C) <sup>a,b</sup>	Dst. Shimer Run @RR crossing	Peebles
300292	28.80	-	(C) <sup>a,b</sup>	Dst. Hillcrest Nurse.Home, via trib.	Peebles
X04S19	24.80	315.0	(F,B,C,S) <sup>a,b</sup>	Adj. Lawshe Rd., ust. SR 41 <sup>Ref</sup>	Peebles
300291	21.35	328.0	(F,B,C) <sup>a,b</sup>	Fawcett Rd.	Lynx
X04S18	15.2	371.0	(F,B,C,S) <sup>a</sup>	End of TR 84 <sup>Ref</sup>	Lynx
600660	13.15	-	(C,D,S) <sup>a</sup>	USGS Gauge <sup>SS</sup>	Lynx
600650	10.4	396.0	(F,B,C) <sup>a</sup>	SR 125	Lynx
			<b>WWH Aquatic Life Use - Verified</b>		
X04S17	6.0	423.0	(F,B,C,D) <sup>a,c</sup>	Dst. Beasley Fork	Concord
300290	0.5	435.0	(F,B,C) <sup>a</sup>	US 52 (Ohio River backwater)	Concord
<b>Flat Run (10-232-000)</b>			<b>WWH Aquatic Life Use - Unverified</b>		
200732	1.12	5.5	(F,B,C) <sup>e,c</sup>	SR 770	Sinking Spring
<b>Elm Run (10-233-000)</b>			<b>WWH Aquatic Life Use - Unverified</b>		
300305	1.75	6.1	(F,B,C) <sup>e</sup>	Deadfall Rd.	Belfast
<b>Elk Run (10-234-000)</b>			<b>WWH Aquatic Life Use - Unverified</b>		
300306	1.33	5.2	(F,B,C)	Ust. Elm Run	Belfast
200733	0.84	13.9	(F,B,C)	Coss Rd.	Belfast
<b>Lost Fork (10-237-00)</b>			<b>WWH Aquatic Life Use - Unverified</b>		
200739	2.54	5.9	(F,B,C)	SR 247	Belfast
200738	1.66	12.2	(F,B,C)	Peach Orchard Rd.	Belfast
<b>Baker Fork (10-240-000)</b>			<b>WWH Aquatic Life Use - Unverified</b>		
200730	14.73	13.3	(F,B,C)	Dry Bone Rd.	Bainbridge
200729	10.48	21.0	(F,B,C) <sup>a</sup>	Fort Hill Rd.	Sinking Spring
X04G02	1.5	43.1	(F,B,C,D,S) <sup>a</sup>	Horner Chapel Rd. <sup>SS</sup>	Sinking Spring
<b>Middle Fork Baker Fork (10-241-000)</b>			<b>WWH Aquatic Life Use - Unverified</b>		
200727	5.4	~11.5	(F,B,C)	Sinking Creek Rd.	Sinking Spring
200725	0.25	20.3	(F,B,C) <sup>a</sup>	Strait Creek Rd.	Sinking Spring
<b>Strait Creek (10-245-000)</b>			<b>WWH Aquatic Life Use - Unverified</b>		
X99Q09	0.83	5.9	(F,B,C) <sup>e</sup>	SR 41	Sinking Spring
<b>Muddy Fork (10-246-000)</b>			<b>WWH Aquatic Life Use - Unverified</b>		
300309	0.39	6.1	(F,B,C) <sup>e</sup>	Frost Rd.	Bainbridge
<b>West Fork Ohio Brush Creek (10-220-000)</b>			<b>EWH Aquatic Life Use - Unverified</b>		
300300	20.53	4.8	(F,B,C) <sup>e</sup>	Heaton Rd.	Winchester
300299	17.92	12.0	(F,B,C)	Melblanc Rd.	Winchester
200716	15.19	22.7	(F,B,C,D) <sup>a,c</sup>	SR 136	Winchester
X04S28	12.74	27.3	(F,B,C,S) <sup>a</sup>	CR 37 <sup>Ref</sup>	Seaman
X04S27	10.5	38.9	(F,B,C) <sup>a</sup>	Ust. Little West Fork	Seaman
X04S26	7.5		(C) <sup>a</sup>	Dst. Seaman WWTP, via UN Trib.	Seaman
X04S26	6.08	76.0	(F,B,C) <sup>a</sup>	SR 770	Seaman

Table 2. continued.

<i>Stream (RivCode)</i> <b>STORET</b>	<b>RM</b>	<b>DA</b>	<b>Sampling</b>	<b>Location</b>	<b>Topo Map</b>
<b>West Fork Ohio Brush Creek (10-220-000) EWH Aquatic Life Use - Unverified</b>					
X99Q08	1.1	129.0	(F,B,C,S) <sup>a</sup>	Dst. Georges Creek <sup>Ref</sup>	Peebles
X04S25	0.37	-	(C,D,S) <sup>a</sup>	Peterson Rd. <sup>SS</sup>	Peebles
<b>UN West Fork Trib at RM 7.38 (10-250-000) Unlisted</b>					
-	-	NA	(E)	Seaman WWTP 001-outfall	Seaman
300301	0.5	-	(C)	Dst. Seaman WWTP	Seaman
<b>Georges Creek (10-222-000) EWH Aquatic Life Use - Unverified</b>					
200708	3.2	5.9	(F,B,C)	Lane off SR 770, ust SR 770	Seaman
X04P05	0.06	12.2	(F,B,C)	Nicholes Rd.	Peebles
<b>Cherry Fork (10-224-000) WWH Aquatic Life Use - Unverified</b>					
300302	8.74	5.7	(F,B,C)	SR 136	Seaman
200710	7.50	9.8	(F,B,C)	Paint Rd.	Seaman
X04P07	2.61	20.3	(F,B,C,S) <sup>a</sup>	Graces Run Rd. <sup>Ref</sup>	Seaman
<b>Grace Run (10-225-000) WWH Aquatic Life Use - Unverified</b>					
200709	1.35	6.3	(F,B,C) <sup>c</sup>	SR 247	Seaman
<b>Buck Run (10-225-000) WWH Aquatic Life Use - Unverified</b>					
300303	0.38	10.7	(F,B,C)	Armstrong Rd.	Seaman
<b>Little West Fork (10-229-000) WWH Aquatic Life Use - Unverified</b>					
300304	6.26	5.5	(F,B,C)	Forsythe Rd.	Sugar Tree Ridge
200715	5.69	9.2	(F,B,C)	Shaw-Baker Rd.	Sugar Tree Ridge
200713	0.04	22.5	(F,B,C) <sup>a</sup>	Buck Run Rd.	Seaman
<b>Elk Fork (10-230-000) WWH Aquatic Life Use - Unverified</b>					
X04S02	1.61	6.7	(F,B,C)	Tri-County Rd.	Seaman
<b>UN Ohio Brush Creek Trib. at RM 28.9 [AKA Lawshe Trib.] Unlisted</b>					
300307	0.1	-	(C) <sup>b,d</sup>	Dst. Hillcrest Nursing Home	Peebles
<b>Shimer Run (10-200-000) WWH Aquatic Life Use - Unverified</b>					
-	-	NA	(E)	Peebles WWTP 001-outfall	Peebles
X04S32	2.1	-	(C)	Dst. Peebles WWTP	Peebles
X04S05	0.01	6.7	(F,B,C)	At mouth	Peebles
<b>Beasley Fork (10-205-000) WWH Aquatic Life Use - Unverified</b>					
300296	5.8	-	(C)	Dst. West Union WWTP, ust. Landfill	West Union
-	-	NA	(E)	West Union WWTP 001-outfall	West Union
X04S24	4.7	-	(F,B,C)	Dst. West Union WWTP, dst. Landfill	West Union
X04S10	3.2	10.1	(F,B,C)	SR 247	Manchester Island
X04S23	0.75	18.0	(F,B,C,D) <sup>c</sup>	At ford near the mouth	Concord
<b>UN Beasley Fork Trib. at RM 4.6 (10-205-000) Unlisted</b>					
300297	0.17	4.9	(F,B,C) <sup>c</sup>	At a Lane near the mouth	West Union
<b>Cedar Run (10-209-000) EWH Aquatic Life Use - Unverified</b>					
X04P10	0.38	10.7	(F,B,C)	Gustin Rd.	Lynx
<b>Moore's Run (10-206-000) EWH Aquatic Life Use - Unverified</b>					
300310	0.2	-	(F,B,C) <sup>c</sup>	At SR 247	Manchester Island
<b>Lick Fork (10-211-000) EWH Aquatic Life Use - Unverified</b>					
X99Q05	4.3	7.8	(F,B,C,S)	Ust. Tributary <sup>Ref</sup>	West Union
X04P09	1.03	-	(F,B,C,D,S)	Vaughn Ridge Rd. <sup>SS</sup>	Lynx

Table 2. continued.

Stream (RivCode) STORET	RM	DA	Sampling	Location	Topo Map
<b>UN Lick Fork Trib. at RM 4.02 (10-211-000) [AKA Louiso Tributary] EWH Aquatic Life Use - Unverified</b>					
200704	2.8	2.7	(F,B,C) <sup>e</sup>	At Farm lane or ust. to Unity Rd.	West Union
X99Q06	0.2	8.3	(F,B,C)	At mouth	West Union
<b>Trebor Run (10-212-000) EWH Aquatic Life Use - Unverified</b>					
X4P12	0.1	7.2	(F,B,C,S)	SR 41 <sup>Ref</sup>	Lynx
<b>Cave Run (10-213-000) EWH Aquatic Life Use - Unverified</b>					
X99Q07	0.1	3.8	(F,B,C,S) <sup>e</sup>	Near mouth, adj. lane <sup>Ref</sup>	Lynx
<b>Bundle Run (10-214-000) EWH Aquatic Life Use - Unverified</b>					
300298	0.68	6.0	(F,B,C) <sup>e</sup>	Trail off SR 781	Peebles
<b>Little East Fork (10-216-000) WWH Aquatic Life Use - Unverified</b>					
X04P04	0.90	6.9	(F,B,C,S)	Old SR 32 <sup>Ref</sup>	Peebles
200721	0.4	9.9	(F,B,C)	Near mouth at farm	Peebles
<b>Crooked Creek (10-218-000) WWH Aquatic Life Use - Unverified</b>					
200724	2.15	8.3	(F,B,C)	SR 73	Sinking Spring

**Sampling** - F-fish community, B-benthic macroinvertebrates, C-water column chemistry, D-datasonde, S-sediment.

**DA** - Drainage Area (miles<sup>2</sup>).

**Ref** - Ecoregional reference stations.

**SS** - Modeling sentinel sites.

- a** - Sites draining an area greater than 20 miles<sup>2</sup>. Therefore all sites so identified will receive: 2x fish, quantitative macrobenthos, and 6x water column chemistry. All remaining sites (<20 mlies<sup>2</sup>) will receive 1x fish, qualitative macrobenthos, and 3x water column chemistry.
- b** - Chemical samples must include analysis for phenol and chlorine.
- c** - Nutrient study site: Filtered samples for chlorophyll analysis, datasonde deployment, and cBOD<sub>5</sub> analysis are requested.
- d** - Sites deployed to evaluate the Hillcrest Nursing Home will receive 6x chemical sampling, regardless of drainage area.
- e** - Ten sites that may be dropped entirely from the survey. This will depend on the final decision reached by DSW management regarding the allocation and/or redistribution of limited staff resources for the 2007 field season. As of the final distribution of this study plan (June 20, 2007) a decision regarding this matter has yet to be reached. All field investigators and other affected parties will be notified directly if sites so designated are in fact to be dropped from the Ohio Brush Creek survey. Alternatively, fish monitoring for these site may be performed by SEDO.

Table 3. Mussel taxa reported from the Ohio Brush Creek watershed (Waters 1988 and TNC pers com 2007.). Nomenclature follows Waters (1993) and Cummings and Mayer (1992). Author acknowledges that some of the common and scientific nomenclature provided below may not be current. **E** - endangered in Ohio (Ohio DNR 2007).

<i>Actinonaias ligamentina</i> (Mucket)	<i>Magnonaias nervosa</i> (Washboard) <b>E</b>
<i>Alasmidonta viridis</i> (Slippershell)	<i>Obliquaria reflexa</i> (Three-horned Wartyback)
<i>Amblema plicata plicata</i> (Three-ridge)	<i>Obovatia subrotunda</i> (Round Hickorynut) <b>E</b>
<i>Anodontoides ferussacianus</i> (Cylindrical Papershell)	<i>Pleurobema clava</i> (Clubshell) <b>E</b>
<i>Cyclonaias tuberculata</i> (Purple Wartyback)	<i>Potamilus latus</i> (Pink Heelsplitter)
<i>Pyganodon grandis grandis</i> (Giant Floater)	<i>Potamilus ohioensis</i> (Pink Papershell)
<i>Fusconaia flava</i> (Wahbush Pigtoe)	<i>Ptychobranchus fasciolaris</i> (Kidney Shell)
<i>Lasmigona complanata</i> (White Heelsplitter)	<i>Quadrula cylindrica cylindrica</i> (Rabbitsfoot) <b>E</b>
<i>L. costata</i> (Fluted Shell)	<i>Quadrula quadrula</i> (Mapleleaf)
<i>Legumia recta</i> (Black Sandshell)	<i>Epioblasma triquetra</i> (Snuffbox)
<i>Lampsilis ovata</i> (Ridged Pocketbook) <b>E</b>	<i>Simpsonaias ambigua</i> (Salamander Mussel)
<i>L. radiate luteola</i> (Fatmucket)	<i>Strophitus undulates</i> (Squawfoot Mussel)
<i>L. teres</i> (Yellow Sandshell) <b>E</b>	<i>Truncilla truncata</i> (Deertoe)
<i>L. ventricosa</i> (Plain Pocketbook)	<i>Truncilla donaciformis</i> (Fawnsfoot)
<i>Leptodea fragilis</i> (Fragile Papershell)	<i>Tritogonia verrucosa</i> (Pistolgrip)

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