

## **A.6 FINDINGS: DISCUSSION BY SUBWATERSHED**

There is a growing appreciation that the quality of our water resources are integrally linked with what takes place on the adjacent landscape. And since many problems are cumulative in nature, protection of water quality requires that the analysis of problems take place at least at the subwatershed scale. To that end, the results of the 2001/2002 study are discussed here in terms of the four watershed assessment units (WAUs, interchangeable with the 11-digit USGS Hydrologic Unit Code) of the Big Darby Creek watershed.

The watershed assessment units are described in Table A.19 and depicted in Figure A.11. To assist in the development of subwatershed action plans, summaries of the study results for each of the four subwatersheds and the aquatic life use performance are provided in individual tables (Tables A.21 through A.28). Principal causes and sources of impact on aquatic life are summarized in the tables, as well as recreation uses and significant contaminants in sediment and fish tissue.

Finally, the summary tables include some information that is pertinent to Ohio's Clean Water Act Section 303(d) reporting. Each subwatershed is placed in one of five categories that are defined in federal guidance and described in the 2002 and 2004 Integrated Water Quality Monitoring and Assessment Reports (Ohio EPA, 2004a) (see Table A.20). All four subwatersheds of Big Darby Creek watershed are identified as impaired and requiring that TMDLs be developed. This TMDL work is underway and expected to be completed in 2004.

The assessment unit score is an average grade of aquatic life use status based on recommended uses. The method of calculation is presented in the 2004 Integrated Water Quality Monitoring and Assessment Reports (Ohio EPA, 2004a). An assessment unit score of 80 is used as the benchmark above which a watershed is considered to be in good condition relative to aquatic life uses. A maximum assessment unit score of 100 is possible if all monitored sites meet designated aquatic life uses.

Table A.19. Watershed assessment unit subdivisions of the Big Darby Creek watershed

Watershed Assessment Unit			Summary Tables
Number	Name	Containing Streams <sup>a</sup>	
<b>05060001 190</b>	Big Darby Creek (headwaters to downstream Sugar Run)	Big Darby Creek mainstem (RM 83.2 to RM 50.92) Flat Branch unnamed tributary to Flat Branch Little Darby Creek (Logan Co.) Spain Creek Pleasant Run Buck Run Robinson Run Sweeny Run Sugar Run unnamed tributary to Sugar Run	A.21, A.22
<b>05060001 200</b>	Big Darby Creek (downstream Sugar Run to upstream Little Darby Creek)	Big Darby Creek mainstem (RM 50.92 to RM 34.2) Worthington Ditch Ballenger-Jones Ditch Powell Ditch Yutzy Ditch Fitzgerald Ditch	A.23, A.24
<b>05060001 210</b>	Little Darby Creek	Little Darby Creek Clover Run Lake Run Jumping Run Treacle Creek Howard Run Proctor Run Barron Creek Wamp Ditch Spring Fork Bale Ditch	A.25, A.26
<b>05060001 220</b>	Big Darby Creek (downstream Little Darby Creek to mouth)	Big Darby Creek mainstem (RM 34.2 to RM 0.0) Smith Ditch unnamed tributary to Smith Ditch Gay Run Hellbranch Run Hamilton Ditch Clover Groff Ditch unnamed tributary to BDC (RM 23.77) unnamed tributary to BDC (RM 20.2) unnamed tributary to BDC (RM 18.41) Greenbrier Creek Georges Run Lizard Run	A.27, A.28

<sup>a</sup> Streams that are indented are tributary to the stream listed just above them in the column.

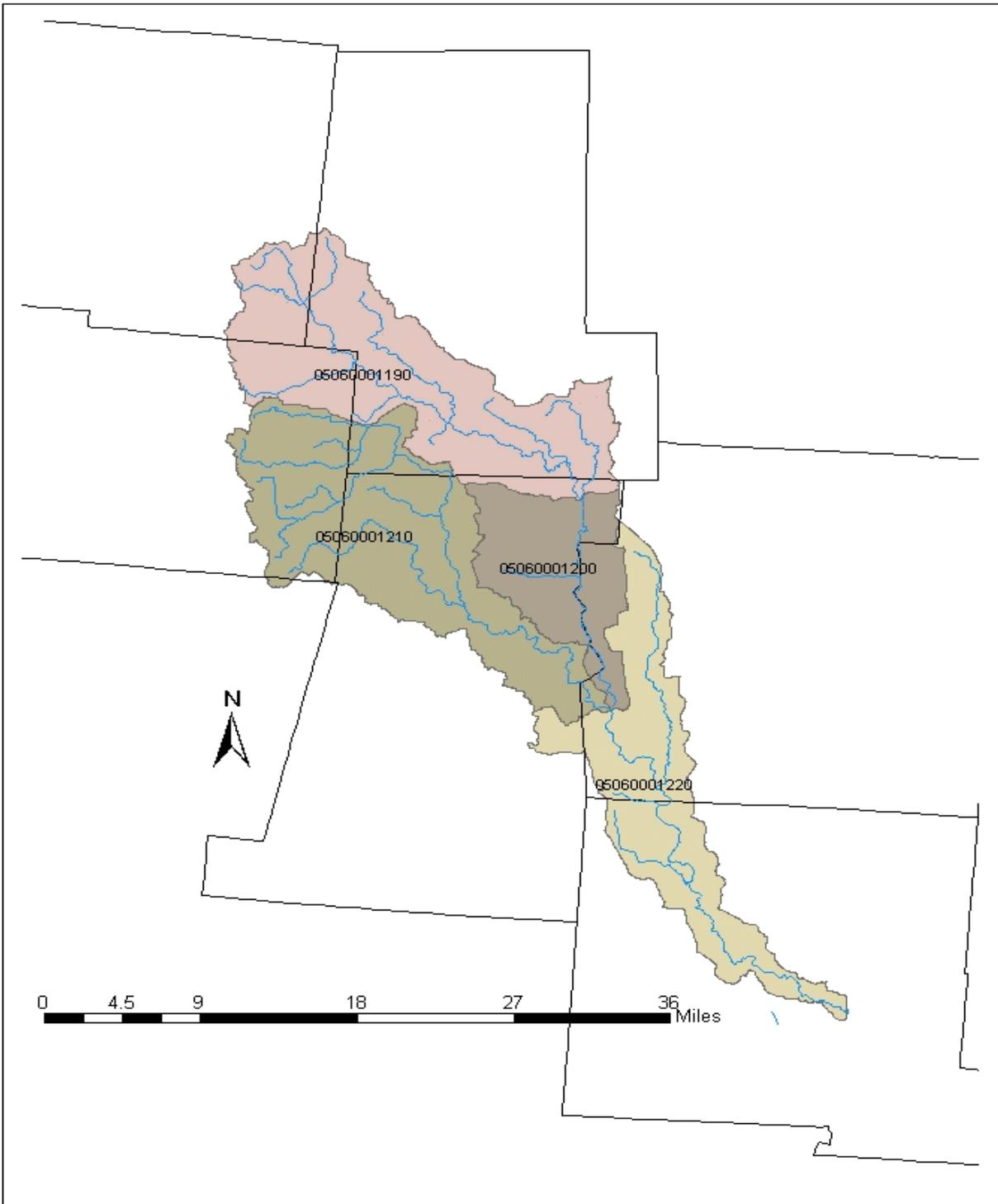


Figure A.11. The four watershed assessment units of the Big Darby Creek watershed.

Table A.20. Section 303(d) reporting categories

Category	Results of Data Assessment and Determination of WQS Use Attainment
1	All designated uses are met, and no use is threatened
2	Some of the designated uses are met but there is insufficient data to determine if all designated uses are met
3	Insufficient data to determine whether <u>any</u> designated uses are met
4	Water is impaired or threatened but a TMDL is not needed
4A	TMDL has been completed
4B	Other required control measures will result in attainment of WQS
4C	Impairment or threat not caused by a pollutant
5	Water is impaired or threatened and a TMDL is needed

Table A.21. Summary of findings for 05060001 190: Big Darby Creek (headwaters to downstream Sugar Run), based on sampling conducted in 2001 and 2002

Watershed Name: Scioto  
 93 Basin Name: Big Darby Creek  
 Assessment Unit Number: 05060001 190  
 Assessment Unit Name: Big Darby Creek (Headwaters to downstream of Sugar Run)

Stream Name(s): Big Darby Creek (headwaters to Sugar Run), Flat Branch, U.T. to Flat Branch, L. Darby Creek (Logan Co.), U.T. to BDC - RM 74.91, Spain Creek, Pleasant Run, U.T. to BDC - RM 69.4, Hay Run, Prairie Run, Buck Run, Robinson Run, Sweeney Run, Sugar Run and U.T. to Sugar Run.

Year(s) of data collection: 2001 and 2002

303(d) category: 5

**Attainment status based on percentage of sampled sites < 50 mi<sup>2</sup>**

Stratification	Number of sites	Number of sites in FULL attainment	Percentage of sites in FULL attainment	Number of sites in Partial attainment	Percentage of sites in Partial attainment	Number of sites in NON attainment	Percentage of sites in NON attainment
< 5 mi <sup>2</sup>	16	13/16	81.3%	1/16	6.3%	2/16	12.5%
5 to 20 mi <sup>2</sup>	16	10/16	62.5%	4/16	25.0%	2 /16	12.5%
(if including < 5 mi <sup>2</sup> then) average			71.9%		15.7%		12.5%
>20 to 50 mi <sup>2</sup>	2	½	50.0%	½	50.0%	0/2	0.0%
average			61.0%		32.9%		6.3%

50 mi <sup>2</sup> to 500 mi <sup>2</sup> RM 71.5 to RM 50.92 Number of miles in segment(s) excluding "unassessed" miles	<b>Attainment status based on mileage in sampled segments &gt; 50 mi<sup>2</sup></b>						
	Number of miles in FULL attainment	Percentage of miles in FULL attainment	Number of miles in Partial attainment	Percentage of miles in Partial attainment	Number of miles in NON attainment	Percentage of miles in NON attainment	WAU scores
20.58 miles	9.35/20.58	45.4%	11.23/20.58	54.5%	0/20.58	0.0%	
		53.2		42.5		3.2	

Site size vs. type	All	WWH	EWH	MWH	LRW	CWHSSH	Mixing Zone(s) (exclude from assessment status)
Number of sites < 50 mi <sup>2</sup>	34	13	14	6	1	9	0
Number of sites > 50 mi <sup>2</sup>	10	0	10	0	0	0	0
Total number of sites	44	13	24	6	1	9	0
Size of smallest sampled drainage area in WAU	1.3 mi <sup>2</sup>		Size of largest sampled drainage area in WAU				150 mi <sup>2</sup>

Table A.21. Continued.

Causes	Sources
Direct habitat alteration	Channelization, riparian removal
Siltation	Road construction
Changes in hydrology	Channelization, hardening of watershed
Nutrients	Domestic sewage, agriculture, spills, livestock breeding facility, land application of manure
Metals	Municipal point source, industrial point source
Low Dissolved Oxygen, Organic enrichment/D.O.	Municipal point source, industrial point source Spills -sewage and agricultural products

**Recreation Use Assessment**

Subcategory of Use: Primary Contact

Impairment: Yes

**Fish Consumption Advisory (FCA) Assessment**

Waters in the WAU Sampled and Assessed: Yes

FCA Issued: Yes

(See the 2004 Ohio FCA for more detailed information at “[www.epa.state.oh.us/dsw/fishadvisory/index.html](http://www.epa.state.oh.us/dsw/fishadvisory/index.html)”)

Impairment Due to FCA: Mercury and PCBs - U.S. Route 42(RM 54.1) to Alkire Road (RM 34.1)

Comments:

Big Darby Creek (020-200)

In the very headwaters of Big Darby Creek siltation and hydromodification associated with road construction has adversely affected aquatic community performance.

The lowest fish community index scores on the mainstem of Big Darby Creek were found within this WAU immediately downstream from the confluence with Flat Branch. This impact which extended a few miles downstream was judged to be due to complex mix of causes and sources of

Table A.21. Continued.

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pollution. They included elevated nutrients from both the Flat Branch WWTP and Flat Branch itself which resulted in a dissolved oxygen sag in Big Darby Creek. Elevated metals from both Flat Branch and Big Darby Creek upstream from the confluence with Flat Branch were also stressors. Hydromodification and turbidity emanating from Flat Branch exacerbated the impact.

Upstream from Milford Center and downstream from Collins Road the fish community was impacted by an unknown source of stress. A quarry on the east side of Big Darby Creek may be a possible source of this stress.

Downstream from Milford Center as far downstream as the confluence with Buck Run biological communities have yet to fully recover from a spill that took place in July of 2000. Spills of agricultural products and domestic waste, dissolved oxygen depletion and organic enrichment were the causes of impairment in this reach of the mainstem. Additional spills have been recorded in this reach and may be suppressing these communities rate of recovery.

Sedimentation, elevated nutrients (e.g., sediment total - phosphorus > LEL) as well as spills from the Fairbanks HS WWTP and from a tank storage area at an adjacent agricultural business yielded partial attainment downstream from the confluence with Buck Run.

Upstream from Ranco Inc. and US Rt. 42 although marginally meeting criteria was being adversely affected by sediments and elevated nutrients which led to a dissolved oxygen sag.

At the downstream limit of the mainstem within this WAU elevated TSS, depressed dissolved oxygen values, high nutrients (i.e., NH<sub>3</sub>, TKN nitrates, nitrites, and T-P >95 ECBP background concentration), high bacterial counts and biosolids were found downstream from the Plain City WWTP contributing to the partial attainment of the EWH criteria downstream from the WWTP. Additionally, numerous spills have been documented within the Village limits of Plain City which would have subsequently drained to Sweeney Run and contributed to the impact. The site downstream from the Plain City WWTP was the only location with Dieldrin > TEC within the watershed and the presence of this banned insecticide may have also contributed to the lowered ICI scores.

#### Flat Branch (02-223) (RM 78.48)

Although fully meeting the biocriteria benchmarks for its designated MWH aquatic life use Flat Branch is contributing to the impacts documented in Big Darby Creek downstream from the confluence with low dissolved oxygen and high TSS values persistent downstream.

#### Little Darby Creek (Logan Co.) (02-251) (RM 78.34)

Although this stream is fully meeting biocriteria at the sites sampled ongoing habitat alteration has led to declines and if continued should result in future non-attainment.

Table A.21. Continued.

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Buck Run (02-209) (RM 63.47)

Partial and non-attainment in the upstream reaches of Buck Run resulted from a combination of nutrient enrichment, sedimentation and livestock impacts. Mid reaches were stressed by high nitrogen and phosphorus, low dissolved oxygen (i.e., violations of the WWH minimum criteria) and TSS concentrations amongst the highest in the watershed. These impacts extended into Big Darby Creek and contributed to declines a short distance downstream in that watercourse.

Robinson Run (02-207) (RM 53.69)

The very poor results in the headwaters are due to very high nutrient concentrations which has led to low dissolved oxygen levels and black anoxic streambed sediments. Channelization has also contributed to the problems documented here. The depressed fish community scores seen at the site downstream from U.S. Route 42 are likely due to a combination of sediment contamination and water quality problems arising from Ranco Inc. One of the highest sediment ammonia concentrations (94 mg/kg) was found at this site. Arsenic and cyanide have been parameters of concern at this location. Further investigation needs to be conducted on Robinson Run bracketing Ranco Inc., the landfill and Chemfix piles with an expanded parameter list to pin down the causes and sources of this impairment.

Sweeney Run (02-357) (RM 52.11)

Sweeney Run has been subject to numerous spills over the years including diesel fuel, milk, oil, manure and material from the water treatment plant. It also receives leachate from septic systems which contributes to the high bacterial counts documented there. Additionally during mosquito season Sweeney Run within the village limits routinely receives overspray of insecticide, which may be contributing to the depressed macroinvertebrate communities in its lower reaches.

Sugar Run (02-206) ((RM 50.62)

The upstream reaches of Sugar Run are currently designated as WWH, but are recommended to be re-designated as MWH. Although biological samples met applicable biocriteria values for the recommended aquatic life use even this lower use is threatened. in upper Sugar Run. Very high nutrients, degrading habitat, and spills have led to dissolved oxygen concentrations (i.e, 2.88 mg/l) which exceed the MWH criterion, lowered biological community scores and exported stressors downstream.

The sampling site at the mouth of Sugar Run (RM 0.7) had one of the highest total phosphorus sediment concentrations in the watershed. Other Sugar Run sites had sedimentation, nutrient enrichment and low dissolved oxygen problems which yielded decreased biological community performance.

The most impacted stream locale for sediment contaminants was Sugar Run at RM 7.00. Here, arsenic concentrations were elevated as were chromium and iron. Copper, nickel, and zinc concentrations were slightly elevated (Table B.5.4). This was the only tributary that exhibited

Table A.21. Continued.

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detectable concentrations of chromium and nickel as well as the highest values for copper, iron, and zinc. The Hershberger Landfill is probably source of these metals.

#### Recreation Uses

Recreation uses were in non-attainment of the Primary Contact Recreation maximum criteria for the entire WAU with Little Darby Creek (Logan County) the sole exception. (See Section A.5.2 for a discussion of recreational use attainment).

#### Sediment Quality

All sediment samples had total organic carbon and total phosphorus values that exceeded LEL concentrations. The sampling site at the mouth of Sugar Run (RM 0.7) had one of the highest total phosphorus sediment concentrations in the watershed.

Sugar Run at RM 7.00 had the highest sediment metal concentrations in the watershed. Here, arsenic concentrations were elevated as were chromium and iron. Copper, nickel, and zinc concentrations were slightly elevated (Table B.5.4). This was the only tributary that exhibited detectable concentrations of chromium and nickel as well as the highest values for copper, iron, and zinc. The Hershberger Landfill may be the source of these metals.

#### Fish Tissue Samples

Only one fish tissue sample exceeded the meal per week criterion for PCBs. The only fish tissue sample with DDT residues of a magnitude to exceed the do not eat threshold was found at RM 63.8, upstream from Streng Road. Most fish tissues samples had mercury concentrations that fell in the one meal per week consumption category. The advisory that was issued for portions of the mainstem of Big Darby Creek within this WAU resulted from the risk assessment procedure which takes into account fish tissue samples collected from the entire mainstem. There are plans to secure additional carp samples in 2004 to match the size and number collected in lower Big Darby Creek to determine if there is a need to extend the advisory further upstream.

Table A.22. Aquatic life use attainment status for the streams sampled in Big Darby Creek watershed assessment unit **05060001 190** during July - October, 2001

Additional sampling was conducted during July - October, 2002 to fill in gaps and further characterize and evaluate impacted areas (noted in **bold**). The Index of Biotic Integrity (IBI), Modified Index of Well Being (MIwb), and Invertebrate Community Index (ICI) scores are based on the performance of fish (IBI,MIwb) and macroinvertebrate communities (ICI). The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support biological communities. (Last updated 03/04/03)

River Mile	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	Mod. IBI	Mod. Iwb	ICla	QHEIb	Attainment Status <sup>c</sup>	Comments
<b>Big Darby Creek (02-200) (WWH/EWH + CWH Recommended)</b>								
-- /83.2	1.3	71.43	-	-	42 <sup>ns</sup>	-	(Full)	ust. At pvt prop.
82.5/82.5	1.5	43.48	52	NA	46	68.0	Full	CR 152
80.8/ --	4.4	19.61	42*	NA	-	61.0	(Non)	SR 287
79.2/79.3	5.6	12.2	48 <sup>ns</sup>	NA	56	64.5	Full	TR 157
<b>Big Darby Creek (02-200) (EWH)</b>								
78.4/78.5	19.4	12.5	37.3*	NA	52	63.5	Partial	Dst. Flat Branch
76.6/76.5	32	6.94	43*	8.91 <sup>ns</sup>	56	73.5	Partial	N. Lewisburg Rd.
69.5/69.4	69	5.92	52	9.24 <sup>ns</sup>	52	70.5	Full	Ust. Collins Rd.,ust.trib
67.0/67.2	81	4.35	44*	8.34*	<b>E</b>	-	<b>Partial</b>	Ust. Milford Center
<b>66.0/66.0</b>	<b>83</b>	<b>4.35</b>	<b>52</b>	<b>9.2<sup>ns</sup></b>	<b>40*</b>	<b>74.5</b>	<b>Partial</b>	Dst. Milford Center
63.8/64.4	89	8.93	49 <sup>ns</sup>	8.18*	50	80.5	Partial	Ust. Streng Rd.,Buck Run
62.5/62.9	121	3.80	47 <sup>ns</sup>	7.52*	42 <sup>ns</sup>	83.5	Partial	SR 38, Dst. Buck Run
54.2/54.1	136	4.76	53	9.23 <sup>ns</sup>	42 <sup>ns</sup>	83.5	Full	US 42, ust. Ranco Inc
53.9/53.9	136	4.76	52	9.35 <sup>ns</sup>	E	93.0	Full	Dst US 42, dst Ranco Inc
52.5/ --	150	7.04	51	9.08 <sup>ns</sup>	-	-	(Full)	Ust SR 161&Sweeny Run
/52.1	150	5.21	-	-	52	-	(Full)	Ust.. Plain City WWTP
52.0/52.0	150	5.21	43*	8.78*	44 <sup>ns</sup>	81.0	Partial	Dst. Plain City WWTP
<b>Flat Branch (02-223) (RM 78.48) (MWH)</b>								
3.2/3.2	3.3	9.09	<u>26</u>	NA	G	25.5	Full	O'Dell Rd.
/2.2	9.3	6.67	-	-	MG	-	(Full)	Adj. SR 739, dst. Tribs
0.8/1.0	13.9	4.93	28	NA	50	36.5	Full	Near mouth
<b>Unnamed Tributary to Flat Branch (02-365) (RM 1.5) (Undesignated/MWH)</b>								
/0.1	3.5	4.42	-	-	F	36.5	(Full)	North Trib TRC
<b>Little Darby Creek (02-251) (RM 78.34) (Logan Co.) (Undesignated/EWH + CWH Recommended)</b>								
3.5/3.5	2.4	31.25	55	NA	54	71.5	Full	SR 287
0.4/0.4	3.9	26.32	50	NA	50	68.0	Full	CR 153
<b>U.T. to Big Darby Creek (02-361) (RM 74.91) (Undesignated/ EWH Recommended)</b>								
0.2/0.3	3.9	13.51	50	NA	VG <sup>ns</sup>	62.5	Full	CR 153
<b>Spain Creek (02-222) (RM 74.3) (WWH/WWH + CWH Recommended)</b>								
5.7/5.7	3.5	22.22	44	NA	MG <sup>ns</sup>	66.0	Full	Lewisburg Rd.
<b>Spain Creek (02-222) (RM 74.3) (WWH/EWH + CWH Recommended)</b>								
3.7/3.4	6.0	21.74	56	NA	44 <sup>ns</sup>	72.0	Full	Gilbert Rd.
0.1/0.1	9.1	11.36	53	NA	56	76.0	Full	Cratty Rd.
<b>Pleasant Run (02-221) (RM 72.01) (EWH)</b>								
4.6/4.1	4.5	22.22	54	NA	VG <sup>ns</sup>	72.0	Full	Dunn Rd.
0.5/0.5	9.4	14.3	58	NA	56	59.5	Full	M'burg-P'City Rd.
<b>U.T. to Big Darby Creek (02-360) (RM 69.4) (Undesignated/WWH Recommended)</b>								
0.2/0.4	4.6	17.68	50	NA	G	64.5	Full	M'burg-P'City Rd.

Continued.

Table A.22. Continued.

River Mile Fish/Invert.	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	IBI	Mod. Iwb	ICia	QHEIb	Attainment Status <sup>c</sup>	Comments
<b>Hay Run (02-220) (RM 67.6) (WWH/EWH Recommended)</b>								
0.3/0.2	5.8	7.35	54	NA	VG	52.5	Full	M'burg-P'City Rd.
<b>Prairie Run (02-219) (RM 63.84) (Undesignated/LRW Recommended)</b>								
0.3/-	3.0	13.89	28	NA	-	23.0	Full	M'burg-P'City Rd.
<b>Buck Run (02-209) (RM 63.74) (WWH)</b>								
10.4/10.4	5.1	5.99	<u>26*</u>	NA	MG <sup>ns</sup>	40.0	Non	Allen Ctr. -P'burg Rd.
7.8/7.8	9.2	6.58	28*	NA	G	55.5	Partial	SR 245
5.0/5.0	18.1	4.83	-	-	MG <sup>ns</sup>	-	(Full)	Milford-Amrine Rd.
0.1/0.6	29.7	6.71	44	7.14*	MG <sup>ns</sup>	70.5	Full	Orchard Rd.
<b>Robinson Run (02-207) (RM 53.69) (WWH)</b>								
/5.5	4.6	6.71	-	-	<u>VP*</u>	-	Non	Dst. Hawn Rd.
2.1/2.1	8.4	9.35	30*	NA	F*	64.0	Non	SR 736
0.7/0.8	11.5	15.87	30*	NA	MG <sup>ns</sup>	70.0	Partial	US 42
<b>Sweeny Run (02-357) (RM 52.11) (Undesignated/WWH Recommended)</b>								
0.1/0.2	4.0	31.25	46	NA	F*	58.0	Partial	Mouth
<b>Sugar Run (02-206) (RM 50.92) (WWH/MWH Recommended)</b>								
7.5/7.7	4.1	7.52	<u>26</u>	NA	F	31.0	Full	Ind.Pkwy.@farm
<b>Sugar Run (02-206) (RM 50.92) (WWH)</b>								
7.0/6.9	9.5	7.52	<u>26</u>	NA	MG <sup>ns</sup>	29.5	Full	Taylor rd.,Dst.landfill
5.4/5.5	11.0	5.21	34*	NA	G	38.5	Partial	US 42
0.5/0.5	19.4	7.69	40	NA	VG	65.5	Full	Cemetery Pike
<b>U.T. to Sugar Run (02-358) (RM 7.39) (Undesignated/MWH Recommended)</b>								
0.1/0.1	5.0	3.73	30	NA	MG	27.0	Full	Ind.Pkwy.

\* Significant departure from ecoregion biocriteria; poor and very poor results are underlined.

\*\* Attainment status not applied to mixing zones.

ns Nonsignificant departure from ecoregion biocriteria (4 IBI or ICI units; 0.5 Iwb units).

a Narrative evaluation is used in lieu of ICI for qualitative samples (E=Excellent, VG=Very Good, G=Good, MG=Marginally good, F=Fair, P=Poor, VP=Very Poor).

b Qualitative Habitat Evaluation Index (QHEI) values based on the most recent version (Rankin 1989).

c Use attainment status based on one organism group is parenthetically expressed.

### Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)

<u>INDEX - Site Type</u>	<u>WWH</u>	<u>EWH</u>	<u>MWHd</u>
IBI - Headwaters/Wading	40	50	24
Mod. Iwb - Wading	8.3	9.4	5.8
ICI	36	46	22

d - Modified Warmwater Habitat for channel modifications.

Table A.23. Summary of findings for 05060001 200: Big Darby Creek (downstream Sugar Run to upstream Little Darby Creek), based on sampling conducted in 2001 and 2002

Watershed Name: Scioto  
 93 Basin Name: Big Darby Creek  
 Assessment Unit Number: 05060001 200  
 Assessment Unit Name: Big Darby Creek (Downstream Sugar Run to upstream Little Darby Creek)

Stream Name(s): Big Darby Creek mainstem (Downstream Sugar Run to upstream Little Darby Creek), Worthington Ditch, Ballenger-Jones Ditch, Yutzy Ditch, and Fitzgerald Ditch.

Year(s) of data collection: 2001, 2002

303d category: 5

**Attainment status based on percentage of sampled sites < 50 mi<sup>2</sup>**

Stratification	Number of sites	Number of sites in FULL attainment	Percentage of sites in FULL attainment	Number of sites in Partial attainment	Percentage of sites in Partial attainment	Number of sites in NON attainment	Percentage of sites in NON attainment
< 5 mi <sup>2</sup>	2	½	50.0%	0/2	0.0%	½	50.0%
5 to 20 mi <sup>2</sup>	2	½	50.0%	½	50%	0/2	0.0%
(if including < 5 mi <sup>2</sup> then) average			50.0%		25.0%		25.0%
>20 to 50 mi <sup>2</sup>	0	NA	NA	NA	NA	NA	NA
average			50.0 %		25.0%		25.0%

50 mi <sup>2</sup> to 500 mi <sup>2</sup> RM 50.92 to RM 34.1 Number of miles in segment(s) excluding "unassessed" miles	<b>Attainment status based on mileage in sampled segments &gt; 50 mi<sup>2</sup></b>						
	Number of miles in FULL attainment	Percentage of miles in FULL attainment	Number of miles in Partial attainment	Percentage of miles in Partial attainment	Number of miles in NON attainment	Percentage of miles in NON attainment	WAU scores
16.82 miles	11.65/16.82	69.3%	6.42/16.82	30.73%	0/16.82	0.0%	
							59.6
							27.9
							12.5

Site size vs. type	All	WWH	EWH	MWH	LRW	CWHS SH	Mixing Zone(s) (exclude from assessment status)
Number of sites < 50 mi <sup>2</sup>	4	4	0	0	0	0	0
Number of sites > 50 mi <sup>2</sup>	4	0	4	0	0	0	0
Total number of sites	8	4	4	0	0	0	0
Size of smallest sampled drainage area in WAU	4.3 mi <sup>2</sup>			Size of largest sampled drainage area in WAU			253 mi <sup>2</sup>

Table A.23. Continued.

Causes	Sources
Nutrients	Spills, agricultural run-off, domestic sewage
Low dissolved oxygen	Spills, agricultural run-off, domestic sewage
Organic enrichment	Non-irrigated crop production
Habitat alteration	Channelization, riparian removal
Sedimentation	Channelization, riparian removal

**Recreation Use Assessment**

Subcategory of Use: Primary Contact

Impairment: Yes

**Fish Consumption Advisory (FCA) Assessment**

Waters in the WAU Sampled and Assessed: Yes

FCA Issued: No

(See the 2004 Ohio FCA for more detailed information at  
["www.epa.state.oh.us/dsw/fishadvisory/index.html"](http://www.epa.state.oh.us/dsw/fishadvisory/index.html))

Impairment Due to FCA: Yes (Channel Catfish: Mercury, PCBs entire length of Big Darby Creek within WAU)

Comments:

Big Darby Creek (02-200)

The upstream reach of Big Darby Creek within this WAU (i.e., RM 49.5) has carryover impacts from the Plain City WWTP, Sweeney Run and Sugar Run. These include high TSS, biosolids, spills (primarily to Sweeney Run) and low dissolved oxygen. The pooled nature of this segment of the stream has a tendency to exacerbate the problems associated with nutrient enrichment due to extended retention times and lower re-aeration rates. However, this does have the benefit of reducing downstream transport of nutrients.

Full recovery to EWH levels of community performance were evident from Interstate Route 70 (RM 42.1) to the downstream terminus of this WAU. This was due to a combination of factors. Despite the presence of several point sources most were of small volume, many of which discharged primarily to small tributaries. Several of the direct dischargers have been upgraded and documented to be operating within permit limits. One of the largest dischargers, Olen

Table A.23. Continued.

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Corporation ceased operation in 2003. Another major potential source of stress, nonpoint source (NPS) inputs, was ameliorated by the relatively intact wide and wooded riparian buffers present throughout most of this reach. Instream gradient was adequate to flush contributed fines and the intact nature of the stream channel had the net result of a gradual improvement in habitat quality from upstream of exceptional to extraordinary downstream.

Fitzgerald Ditch (02-272) (RM 44.96) - Fitzgerald Ditch is partially meeting the WWH aquatic life use designation in its lower reaches. The reasons for the partial departure from expectations are stream dessication, nutrient enrichment, inadequate dechlorination and modest habitat degradation.

#### Sediment Quality

Very few organic compounds were detected in the sediments sampled in the Big Darby Creek watershed and no organic compounds were detected in samples from this WAU. However sampling sites from the mainstem just upstream this WAU did have detections of acetone and dieldrin. The dieldrin might be of concern since it was found at levels, just downstream from the Plain City WWTP, at a concentration greater than a threshold effect concentration (TEC, MacDonald, 2000). This concentration of dieldrin, an insecticide, may have contributed to the decline in the ICI, total EPT taxa and sensitive macroinvertebrate taxa documented downstream from Sweeney Run and the Plain City WWTP. Since there are significant depositional areas within this WAU immediately downstream it is not unreasonable to suspect that there might be sinks of this compound there.

All sediment samples taken within the WAU revealed total organic carbon concentrations and total phosphorus concentrations exceeding the LEL. The sampling site at the mouth of Sugar Run (RM 0.7), which discharges directly to this WAU, had one of the highest total phosphorus sediment concentrations in the watershed.

#### Fish Tissue Samples

PCB contamination in general was not a significant issue within this WAU based on samples collected. Only one channel catfish collected at RM 49.5, upstream from Amity Pike, had a value that would place it in the one meal per week category. All other samples had values less than the method detection limit. Mercury, a pervasive problem throughout the Midwest, was found in all samples taken within this WAU. More higher mercury tissue values were found in the mainstem of Big Darby Creek within this WAU than anywhere else within the watershed. One third of the samples fell into the one meal per month range for mercury with the site at RM 49.5, upstream from Amity Pike, accounting for four of the samples.

Table A.24. Aquatic life use attainment status for the streams sampled in the Big Darby Creek watershed assessment unit **05060001 200** during July - October, 2001

Additional sampling was conducted during July - October, 2002 to fill in gaps and further characterize and evaluate impacted areas (noted in **bold**). The Index of Biotic Integrity (IBI), Modified Index of Well Being (MIwb), and Invertebrate Community Index (ICI) scores are based on the performance of fish (IBI, MIwb) and macroinvertebrate communities (ICI). The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support biological communities.

River Mile Fish/Invert.	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	IBI	Mod. Iwb	ICI <sup>a</sup>	QHEI <sup>b</sup>	Attainment Status <sup>c</sup>	Comments
<b>Big Darby Creek (02-200) (EWH)</b>								
49.5/49.7	171	4.69	48 <sup>ns</sup>	8.3*	56	76.0	Partial	Ust. Amity Pike
42.0/42.1	240	7.40	55	9.87	50	81.5	Full	Ust. US Rt 70
38.9/ <b>38.9</b>	247	3.97	51	9.01 <sup>ns</sup>	<b>52</b>	82.5	<b>Full</b>	Dst. L.D. Estates WWTP
34.1/34.2	253	4.48	55	10.14	52	93.5	Full	Ust. Little Darby Creek
<b>Worthington Ditch (02-356) (RM 50.62) (Undesignated/WWH Recommended)</b>								
0.2/0.2	4.4	20.83	<u>24</u>	NA	MG <sup>ns</sup>	--	Non	P'city-G'ville Rd.
<b>Ballenger-Jones Ditch (02-355) (RM 49.68) (Undesignated/WWH Recommended)</b>								
0.4/0.2	6.0	15.15	40	NA	E	69.0	Full	P'city-G'ville Rd.
<b>Yutzy Ditch (02-364) (RM 47.1) (Undesignated/WWH Recommended)</b>								
0.4/0.4	4.3	27.03	-	-	MG <sup>ns</sup>	NA	(Full)	P'city-G'ville Rd.
<b>Fitzgerald Ditch (02-272) (RM 44.96) (Undesignated/WWH Recommended)</b>								
0.5/0.5	5.1	33.33	32*	NA	MG <sup>ns</sup>	56.5	Partial	P'city-G'ville Rd.

- \* Significant departure from ecoregion biocriteria; poor and very poor results are underlined.  
 \*\* Attainment status not applied to mixing zones.  
 ns Nonsignificant departure from ecoregion biocriteria (4 IBI or ICI units; 0.5 Iwb units).  
 a Narrative evaluation is used in lieu of ICI for qualitative samples (E=Excellent, VG=Very Good, G=Good, MG=Marginally good, F=Fair, P=Poor, VP=Very Poor).  
 b Qualitative Habitat Evaluation Index (QHEI) values based on the most recent version (Rankin 1989).  
 c Use attainment status based on one organism group is parenthetically expressed.

**Ecoregion Biocriteria:** Eastern Corn Belt Plains (ECBP)

INDEX - Site Type	WWH	EWH	MWHd
IBI - Headwaters/Wading	40	50	24
Mod. Iwb - Wading	8.3	9.4	5.8
ICI	36	46	22

d - Modified Warmwater Habitat for channel modifications.

Table A.25. Summary of findings for 05060001 210: Little Darby Creek, based on sampling conducted in 2001 and 2002 and based on recommended uses

Watershed Name: Scioto  
 93 Basin Name: Big Darby Creek  
 Assessment Unit Number: 05060001 210  
 Assessment Unit Name: Little Darby Creek

Stream Name(s): Little Darby Creek mainstem, Clover Run, Lake Run, Jumping Run, Treacle Creek, Howard Run, Proctor Run, Barron Creek, Wamp Ditch, Spring Fork, Bales Fork.

Year(s) of data collection: 2001, 2002

303d category: 5

**Attainment status based on percentage of sampled sites < 50 mi<sup>2</sup>**

Stratification	Number of sites	Number of sites in FULL attainment	Percentage of sites in FULL attainment	Number of sites in Partial attainment	Percentage of sites in Partial attainment	Number of sites in NON attainment	Percentage of sites in NON attainment
< 5 mi <sup>2</sup>	6	3/6	50.0%	3/6	50.0%	0/6	0.0%
5 to 20 mi <sup>2</sup>	14	8/14	57.1%	6/14	42.9%	0/14	0.0%
(if including < 5 mi <sup>2</sup> then) average			53.6%		46.5 %		0.0%
>20 to 50 mi <sup>2</sup>	5	4/5	80.0%	0/5	0.0 %	1/5	20.0%
average			66.8%		23.3%		10.0%

50 mi <sup>2</sup> to 500 mi <sup>2</sup> RM 31.35 to RM 0.0 Number of miles in segment(s) excluding “un-assessed” miles	<b>Attainment status based on mileage in sampled segments &gt; 50 mi<sup>2</sup></b>					
	Number of miles in FULL attainment	Percentage of miles in FULL attainment	Number of miles in Partial attainment	Percentage of miles in Partial attainment	Number of miles in NON attainment	Percentage of miles in NON attainment
31.35 miles	28.05	89.5%	3.3	10.5%	0	0.0%
<b>WAU scores</b>		<b>78.2</b>		<b>16.9</b>		<b>5.0</b>

Site size vs. type	All	WWH	EWH	MWH	LRW	CWHS SH	Mixing Zone(s) (exclude from assessment status)
Number of sites < 50 mi <sup>2</sup>	26	6	20	0	0	3	0
Number of sites > 50 mi <sup>2</sup>	11	0	11	0	0	0	0
Total number of sites	37	6	31	0	0	3	0
Size of smallest sampled drainage area in WAU	2.6 mi <sup>2</sup>			Size of largest sampled drainage area in WAU			176 mi <sup>2</sup>

Table A.25. Continued.

Causes	Sources
Unknown toxicity	Spills
Sedimentation	Pasture land, habitat disruption, channelization
Nutrients	Pasture land, agricultural run off
Low dissolved oxygen	Domestic sewage, pasture land, agricultural run off

**Recreation Use Assessment**

Subcategory of Use: Primary Contact

Impairment: Yes (maximum criteria)

**Fish Consumption Advisory (FCA) Assessment**

Waters in the WAU Sampled and Assessed: Yes

FCA Issued: No

(See the 2004 Ohio FCA for more detailed information at

“[www.epa.state.oh.us/dsw/fishadvisory/index.html](http://www.epa.state.oh.us/dsw/fishadvisory/index.html)”)

Impairment Due to FCA: Yes (PCBs - Little Darby Creek threatened See Ohio 2004

Integrated Water Quality Monitoring and Assessment Report Section 7.2 and Table 7-1)

Comments:

Little Darby Creek (02-210) (RM 34.1)

The very headwaters of Little Darby Creek also appears to be suitable for co-designating as CWH. Several lines of evidence point to that conclusion including measured low mean water temperatures, the presence of the requisite number of coldwater macroinvertebrate taxa and the obligate coldwater mottled sculpin. The recommendation is being made to designate Little Darby Creek from its headwaters to RM 37.0 just upstream from the confluence with Lake Run. Although all macroinvertebrate sites on the Little Darby Creek mainstem met either the recommended or current EWH ICI biocriterion there were indications of challenges to this continued level of performance. Impairments to the fish communities were the main reason for partial attainment of the EWH use which was limited to the upper third of the mainstem.

Little Darby Creek upstream from Mechanicsburg as mentioned above is strongly influenced by cool ground water. It is also strongly influenced by the upstream land use which is pasturage. This has led to false bank formation and the transport of silt and fines downstream smothering

Table A.25. Continued.

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substrates and increasing embeddedness. This has led to variable sampling results over time and in the most recent a fish community that did not meet the EWH criteria. The high gradient and strong influx of clean, cool ground water though provide the potential for swift recovery.

The next sampling site was downstream of State Route 29, RM 39.6, where Little Darby Creek winds southeast and east just south of most of Mechanicsburg. This site was also downstream from the confluence with Clover Run and just downstream from a fertilizer / feed distributor storage facility and an open pasture with unrestricted access of livestock to the stream. Fish community scores here appeared to be impaired as a result of historic spills, nutrient enrichment and some sedimentation associated with pasturage.

Downstream from the Wing Road bridge, RM 38.8, untreated sewage discharged from an unpermitted bypass pipe was responsible for the impact to the fish community. The macroinvertebrates sampled just upstream from the pipe were not impacted clearly documenting the culpability of this discharge to the impact. Little Darby Creek should be re-evaluated after the bypass pipe has been sealed and the Mechanicsburg WWTP upgraded.

The next stream segment suffering declines was immediately downstream from the confluence with Treacle Creek and upstream from Axe Handle Road. This segment had previously supported EWH communities and habitat quality had not significantly declined. In 2001 this site dropped below the EWH range. The loss of intolerant species and the fairly low number on non-tolerant individuals were the metrics showing the greatest deviation from expectations. Problems associated with nutrient enrichment and its consequent effects on dissolved oxygen appear to be strong candidates for the depressed fish community results. Continuous dissolved oxygen monitoring has revealed dissolved oxygen dropping below EWH minimums upstream from the bridge and in the downstream reaches of Treacle Creek, whose confluence is immediately upstream.

Fish community scores in general gradually increased with increasing downstream distance towards the mouth. The major exception to this pattern was the site just upstream from the confluence with Big Darby Creek which is marginally meeting EWH criteria. This site is located in an area that prior to the mid 1990s was impounded by a dam across the mouth of Little Darby Creek. As sediments are flushed and more natural features develop this portion of Little Darby Creek is expected to perform at levels comparable to those found just upstream.

#### Clover Run (02-218) (RM 39.8)

Clover Run is fully meeting the recommended WWH aquatic life use designation biocriteria for both fish and benthic macroinvertebrates. The significant presence of the obligate coldwater mottled sculpin and the facultative cool water blacknose dace as well as a handful of cold water macroinvertebrate taxa suggest that Clover Run might have been suitable for the Coldwater Habitat ALU in the past. However the removal or thinning of the riparian buffer and

Table A.25. Continued.

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sedimentation had lowered biological performance to the point that use designation is not currently being proposed.

Lake Run (02-216) (RM 36.9)

Lake Run was designated in the 1978 WQS as EWH based on best professional judgement. Current sampling has revealed biological communities that are only partially meeting the current EWH biocriteria as a consequence of a recent and temporal impact (i.e., inadequate implementation of erosion and storm water BMPs that have delivered excess sediment to the stream channel). It is felt that given time for the disturbed land to stabilize with vegetation and the contributed sediment to be flushed downstream this high gradient stream should easily be able to fully meet the EWH criteria. The current EWH designation has therefore been recommended to be retained. The asterisk denoting that the designation needs to be verified by survey will also be retained in the WQS table to permit resampling in a few years after the stream has been allowed time to recover and determine the true quality and the appropriate aquatic life use designation.

Jumping Run (02-217) ((RM 3.9)

Siltation and episodic nutrient enrichment were judged to be the causes for the partial attainment of the recommended WWH biocriteria in Jumping Run.

Treacle Creek (02-213) (RM 31.3)

Treacle Creek, currently designated EWH its entire length, partially met criteria in its headwaters and is in non-attainment towards its mouth. Habitat although solidly in the very good range is less than generally expected to yield EWH communities. This is a common trait in many of the streams that drain the Cable moraine, particularly those streams draining the boulder belt. One attribute that repeatedly appears is the cooler water temperatures found in these streams, including Treacle Creek. Siltation and elevated nutrients were thought to be the cause of the slightly lowered values in the headwaters. A wide variety of stressors were adversely affecting biological communities towards the mouth of Treacle Creek. Poor habitat resulting from channelization and free access livestock pasturage has resulted in all native substrates being covered in a thick layer of soft, unconsolidated clays and silts. High fecal coliform bacteria and elevated nutrients also contributed to the decline which extended its reach into Little Darby Creek.

Howard Run (02-215) (RM 5.4)

A small tributary to Treacle Creek is fully meeting EWH biocriteria. Cooler water and a largely closed canopy helped to lessen the impacts from NPS inputs. Reducing siltation, widening the woody riparian corridor and permitting natural recovery from past channelization would improve the quality of Howard Run. These actions would also reduce sedimentation and nutrient inputs to Treacle Creek and in turn improve that receiving stream.

Table A.25. Continued.

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and sandy substrates with an increased sediment bedload. There were also indications of modest nutrient enrichment and very high fecal coliform bacteria counts (i.e., >40,000/100 ml.) measured here could have been agricultural runoff and/or from failing septic systems.

Barron Creek (02-212) (RM 24.4)

Barron Creek performed much better than would be predicted based on a cursory evaluation of channel morphology and instream habitat quality. Barron Creek is currently under ongoing maintenance by the Madison County Engineer's Office. A large percent of the watercourse has been channelized yielding an open canopy and groomed grass buffer strips. Excess nutrient inputs caused enrichment with gross algal production and large stands of emergent aquatic macrophytes. Substrates in the bottom of shallow pools were black and anoxic from the accumulated decaying detritus. Cool ground water inputs appear to have ameliorated the impacts that would normally be associated with the elevated levels of nutrients documented in Barron Creek. Establishing a wooded riparian buffer Barron Creek would benefit the aquatic communities locally and Little Darby Creek downstream from the confluence.

Wamp Ditch (02-363) ((RM 23.0)

Wamp Ditch, a small direct tributary to Little Darby Creek, is one of the few that drain into Little Darby Creek from the east. A significant portion of Wamp Ditch is under maintenance by the Madison County Engineer's Office. However, in this case the ameliorating effects of ground water augmentation did not appear to be as effective in reducing the impacts associated with the adjacent land use, instream habitat degradation and nutrient enrichment as it had been in Barron Creek. Wamp Creek possessed similar habitat, and also had significant ground water contribution leading to the conclusion that the water chemistry was probably more severely impacted. Unfortunately no water chemistry samples were taken. In view of the partially meeting of the WWH criteria the stream is being recommended to be designated as WWH. Future monitoring should include water chemistry sampling in addition to the biological and habitat quality monitoring. Restoration of a woody riparian buffer would also benefit Wamp Ditch and the sensitive portion of Little Darby Creek which receives Wamp Ditch water.

Spring Fork (02-211) (RM 17.46)

Spring Fork had a mix of full and partial attainment of the EWH use along its length. As was the case in many of the Little Darby Creek tributaries nutrient enrichment was a significant contributor to the lessened performance and partial attainment seen. Although habitat quality was in the good range throughout most of the reach siltation and sedimentation were felt to have reduced overall performance. Lack of access downstream from the Green Meadows Mobile Home Park WWTP limited the ability to accurately assess the full impact of that point source. However, it was possible to determine that the WWTP was responsible for some of the highest nutrient concentrations in the subwatershed (including ammonia) and that there was a dissolved oxygen sag downstream from the WWTP which approached or exceeded the EWH minimums. Efforts to improve the quality of effluent leaving this WWTP will benefit the

Table A.25. Continued.

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downstream reaches of Spring Fork and the sensitive reach of Little Darby Creek that receives water from Spring Fork.

Bales Ditch (02-362) (RM 3.64)

Bales Ditch possessed very good instream habitat (QHEI - 70). Gradient in the moderate - high range indicates the potential energy to recover from habitat disruptions and to transport and expel fine sediments and thus improve. A moderately wide to wide riparian buffer coupled with an undisturbed stream channel, moderately high gradient and glacial till yielded a diverse and moderately stable stream channel. The habitat was judged to be easily capable of supporting a WWH aquatic biological community and yielded an excellent fish community and a good macroinvertebrate community. Again, cool ground water inflow appeared to have ameliorated the effects of elevated nutrient concentrations.

The Little Darby Creek subwatershed has benefitted greatly by the contribution of ground water to a large percentage of its tributaries. Comparable instream habitat and equivalent concentrations of nutrients in this system without the ground water would have led to a much higher percentage of Warmwater Habitat streams with more widespread and more severe impairment. Thus, recovery can be much quicker if protective measures are taken. Additionally, every effort should be made to protect the aquifer that is supplying cool water to this unique oasis of biodiversity.

Sediment Quality

Very few organic compounds were detected in the sediments sampled in the Big Darby Creek watershed and none were found within the Little Darby Creek subwatershed.

Nutrient analysis for sediments included both ammonia, total phosphorus, and total organic carbon. The third highest concentration in the watershed for ammonia was on Little Darby Creek at RM 15.3 (U.S. Route 42) which may be due to NPS runoff (57 mg/kg). There has been a slight decrease in macroinvertebrate community quality here over time. The highest total phosphorus concentration in the entire watershed was also found at RM 15.3 in Little Darby Creek.

Total organic carbon was found in the Little Darby Creek WAU at concentrations above the lowest effect level (LEL, Persaud and Jaagumagi, 1993). Total organic carbon values in Little Darby Creek (2.2 mg/kg - 5.0 mg/kg) were comparable to values documented in other ECBP tributary streams in central Ohio, such as Bokes Creek (2.5 mg/kg -3.5 mg/kg) and Olentangy River tributary streams (1.5 mg/kg - 9.4 mg/kg) (Ohio EPA 2000 and Ohio EPA 2001).

Sediment total phosphorus was evaluated at all but two sites on Little Darby Creek and all exceeded LEL concentrations. The high total phosphorus concentration in sediments in the watershed was found at Little Darby Creek (RM 15.3). Non-point sources of total phosphorus

Table A.25. Continued.

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are likely responsible for the value found at RM 15.30 in Little Darby Creek since there are no point sources nearby. There has been a slight decline in macroinvertebrate community quality over time at this site.

#### Fish Tissue Contamination

A total of 22 samples were collected from this WAU. All samples were taken from the mainstem of Little Darby Creek extending from RM 29.5, Axe Handle Road downstream to the mouth. Only two of the samples had PCB concentrations that were greater than method detection limits. Both of these samples were taken at RM 0.7 and had concentrations that would place them in the high one meal per week range. Mercury values for most sites and samples fell in the one meal per week range with two samples just over into the one meal per month range. Three samples fell into the unlimited consumption concentration range, which is a fairly unusual occurrence for samples from the Midwest. Two of those samples were taken from RM 24.4, Rosedale-Plain City Road.

#### Recreation Use

The entire Little Darby Creek WAU is not meeting the primary contact maximum bacterial standard. While the mainstem of Little Darby Creek was shown to meet the criteria, most of the tributary streams did not, in many cases doubling the water quality criterion of 2,000 fecal coliform bacteria per 100 ml. Howard Run was an exception amongst the tributaries as was the mainstem of Treacle Creek. Both streams met recreational criteria, although when taken in its entirety, the Treacle Creek subwatershed was in non-attainment. Barron Creek was an example of a small stream within this subwatershed that had extremely serious bacterial contamination, likely resulting from unlimited access of livestock to the stream.

Various sources of bacterial pollution exist in this watershed, ranging from poorly operated WWTPs to on-lot sewage treatment systems, livestock feedlots or pastures as well as the reaches with unlimited access of livestock to the stream. Stream reaches that are attaining recreational standards should be closely monitored to ensure continued attainment as the situation seems threatened by the bacterial pollution noted in many of the tributary streams.

Table A.26. Aquatic life use attainment status for the streams sampled in the Big Darby Creek watershed assessment unit **05060001 210** during July - October, 2001 and based on recommended uses

Additional sampling was conducted during July - October, 2002 to fill in gaps and further characterize and evaluate impacted areas (noted in **bold**). The Index of Biotic Integrity (IBI), Modified Index of Well Being (MIwb), and Invertebrate Community Index (ICI) scores are based on the performance of fish (IBI, MIwb) and macroinvertebrate communities (ICI).

River Mile	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	IBI	Mod. Iwb	ICIA	QHEIb	Attainment Status <sup>c</sup>	Comments
<b>Little Darby Creek (02-210) (RM 34.1) (EWH + CWH Recommended)</b>								
41.2/41.2	3.3	43.47	42*/ <b>48</b>	NA	VG <sup>ns</sup>	80.5/ <b>70</b>	Part/ <b>Full</b>	Alison Rd.
39.6/39.3	9.4	13.33	42*	NA	48	69.5	Partial	Ust SR 29dst fert.dist.
38.8/38.8	13.2	12.99	35*	NA	48	82.0	Partial	Wing Rd. Dst M'burg WWTP
<b>Little Darby Creek (02-210) (RM 34.1) (EWH)</b>								
34.7/34.6	25.9	4.72	49 <sup>ns</sup>	NA	56	82.5	Full	Irwin Rd.
- / <b>33.2</b>	28.0	4.50	-	-	<b>54</b>	-	<b>(Full)</b>	Ust. R.dale-Mford Center Rd.
29.5/29.4	70.0	2.67	45*	8.8*	50	66.5	Partial	Axe Handle Rd.
<b>26.6 /26.5</b>	72.0	21.7	<b>54</b>	<b>10.0</b>	<b>52</b>	<b>58.0</b>	<b>Full</b>	Dst. Chuckery
24.5/24.5	83.0	2.02	52	9.3 <sup>ns</sup>	58	62.5	Full	Rosedale-Plain City Rd.
<b>23.1/23.2</b>	89.0	2.02	<b>48<sup>ns</sup></b>	<b>9.5</b>	<b>E</b>	<b>55.5</b>	<b>Full</b>	Dst. Finley -Guy Rd.
<b>20.5/20.5</b>	98.0	3.18	<b>56</b>	<b>9.3<sup>ns</sup></b>	<b>48</b>	<b>64.5</b>	<b>Full</b>	Ust. Arthur Bradley Rd.
/17.0	142	4.42	-	-	48	-	(Full)	Adj. L. Darby Rd.
15.3/15.4	151	2.69	57	9.6	50	95.5	Full	US 42
/15.3	151	2.69	-	-	<b>46</b>	-	<b>(Full)</b>	Dst. US 42
6.5/6.4	163	8.47	58	9.3 <sup>ns</sup>	54	95.5	Full	US 40, Ust W. Jeff WWTP
4.1/3.8	170	5.59	55	9.7	52	99.0	Full	Roberts Rd. Dst WWTP
0.2/0.5	176	9.9	49 <sup>ns</sup>	9.0 <sup>ns</sup>	56	77.5	Full	Mouth @ Metropark
<b>Clover Run (02-218) (RM 39.8) (EWH/WWH Recommended)</b>								
0.6/0.6	2.0	47.62	36 <sup>ns</sup>	NA	VG	60.0	Full	Rd to Maple Grove Cem.
<b>Lake Run (02-216) (RM 36.9) (EWH/EWH Deferred)</b>								
0.9/0.9	6.0	16.39	42*	NA	VG <sup>ns</sup>	71.0	Full	SR 4
<b>Jumping Run (02-217) (RM 3.9) (EWH/WWH Recommended)</b>								
0.3/0.2	2.4	16.67	30*	NA	G	63.0	Partial	SR 559
<b>Treacle Creek (02-213) (RM 31.3) (EWH)</b>								
11.8/11.7	5.7	15.63	40*	NA	VG <sup>ns</sup>	67.5	Partial	M'burg-Belle. Rd.
8.3/8.3	10.3	34.48	52	NA	E	67.5	Full	Eagle Rd.
6.0/6.0	17.0	16.13	48 <sup>ns</sup>	NA	VG <sup>ns</sup>	66.5	Full	SR 161 at Irwin
0.8/0.7	37.3	3.45	-	-	MG*	29.5	(Non)	Covered bridge nr. mouth
<b>Howard Run (02-215) (RM 5.4) (EWH)</b>								
0.5/0.6	2.6	13.27	52	NA	VG <sup>ns</sup>	55.5	Full	McMahill Rd.
<b>Proctor Run (02-214) (RM 3.69) (EWH)</b>								
4.9/4.9	3.9	41.67	42*	NA	VG <sup>ns</sup>	71.5	Partial	Park Rd.
3.1/3.2	9.1	22.22	48 <sup>ns</sup>	NA	VG <sup>ns</sup>	65.0	Full	SR 559
1.6/1.7	10.0	12.35	52	NA	E	73.0	Full	McMahill Rd.

Continued.

Table A.26. Continued.

River Mile Fish/Invert.	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	Mod. IBI	Iwb	IC1a	QHEIb	Attainment Status <sup>c</sup>	Comments
<b>Barron Creek (02-212) (RM 24.4) (EWH/WWH Recommended)</b>								
2.1/2.1	4.9	5.26	48 <sup>ns</sup>	NA	MG <sup>ns</sup>	44.5	Full	Rosedale-Plain City Rd.
0.2/0.1	6.3	14.58	-	-	MG <sup>ns</sup>	-	Full	SR 38
<b>Wamp Ditch (02-363) (RM 23.0) (Undesignated/WWH)</b>								
0.1/0.14.8	12.50		30*	NA	MG <sup>ns</sup>	45.5	Partial	Vogelburg Rd.
<b>Spring Fork (02-211) (RM 17.46) (EWH)</b>								
15.8/15.8	4.3	17.24	48 <sup>ns</sup>	NA	G*	60.5	Partial	Wren Rd.
13.7/13.3	8.3	12.99	54	NA	VG <sup>ns</sup>	62.5	Full	Ust. SR 29, ust. Trib.
10.1/10.1	14.6	3.73	40*	NA	56	<b>69.0</b>	<b>Partial</b>	Ust. Cemetary Rd.
7.8/7.7	19.3	3.33	48 <sup>ns</sup>	NA	G*	54.5	Partial	R'dale-M'Ctr. Rd
<u>/3.4</u>	32	8.3	-	-	<b>E</b>	-	<b>(Full)</b>	Dst. SR 38
<u>/3.3</u>	32	8.3	<b>52</b>	<b>9.8</b>	<b>56</b>	<b>67.5</b>	<b>Full</b>	Dst. SR 38
<b>Bales Fork (02-362) (RM 3.64) (Undesignated/WWH Recommended)</b>								
0.4/0.4	5.2	12.86	50	NA	G	70.0	Full	R'dale-M' Ctr. Rd.

- \* Significant departure from ecoregion biocriteria; poor and very poor results are underlined.  
 \*\* Attainment status not applied to mixing zones.  
 ns Nonsignificant departure from ecoregion biocriteria (4 IBI or ICI units; 0.5 Iwb units).  
 a Narrative evaluation is used in lieu of ICI for qualitative samples (E=Excellent, VG=Very Good, G=Good, MG=Marginally good, F=Fair, P=Poor, VP=Very Poor).  
 b Qualitative Habitat Evaluation Index (QHEI) values based on the most recent version (Rankin 1989).  
 c Use attainment status based on one organism group is parenthetically expressed.  
 X15 Less than optimal flow over artificial substrate samplers

**Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)**

INDEX - Site Type	WWH	EWH	MWHd
IBI - Headwaters/Wading	40	50	24
Mod. Iwb - Wading	8.3	9.4	5.8
ICI	36	46	22

d - Modified Warmwater Habitat for channel modifications.

Table A.27. Summary of findings for 05060001 220: Big Darby Creek (downstream Little Darby Creek to mouth), based on sampling conducted in 2001 and 2002

Watershed Name: Scioto  
 93 Basin Name: Big Darby Creek  
 Assessment Unit Number: 05060001 220  
 Assessment Unit Name: Big Darby Creek (Downstream from Little Darby Creek to mouth)

Stream Name(s): Big Darby Creek mainstem (Downstream from Little Darby Creek to mouth), Smith Ditch, Trib to Smith Ditch, Gay Run, Hellbranch Run, Hamilton Ditch, Clover Groff Ditch, Springwater Run, U.T. to Big Darby Creek - RM 23.77, Clark's Lake Outlet, U.T. to Big Darby Creek, Greenbrier Creek, Georges Creek, Lizard Run.

Year(s) of data collection: 2001, 2002

303d category: 5

**Attainment status based on percentage of sampled sites < 50 mi<sup>2</sup>**

Stratification	Number of sites	Number of sites in FULL attainment	Percentage of sites in FULL attainment	Number of sites in Partial attainment	Percentage of sites in Partial attainment	Number of sites in NON attainment	Percentage of sites in NON attainment
< 5 mi <sup>2</sup>	11	5/11	45.4%	2/11	18.2%	4/11	36.4%
5 to 20 mi <sup>2</sup>	5	2/5	40.0%	1/5	20.0%	2/5	40.0%
(if including < 5 mi <sup>2</sup> then) average			42.7 %		19.1%		38.2%
>20 to 50 mi <sup>2</sup>	7	4/7	57.1%	3/7	42.9%	0/7	0.0 %
average			49.9 %		31.0 %		19.1%

50 mi <sup>2</sup> to 500 mi <sup>2</sup> and greater: RM 34.1 to RM 0.0 Number of miles in segment(s) excluding "unassessed" miles	<b>Attainment status based on mileage in sampled segments &gt; 50 mi<sup>2</sup></b>						
	Number of miles in FULL attainment	Percentage of miles in FULL attainment	Number of miles in Partial attainment	Percentage of miles in Partial attainment	Number of miles in NON attainment	Percentage of miles in NON attainment	WAU scores
34.1 miles	34.1/34.1	100.0%	0.0/34.1	0.0%	0.0/34.1	0.0%	10.0
		75.0		15.5			

Site size vs. type	All	WWH	EWB	MWH	LRW	CWHS SH	Mixing Zone(s) (exclude from assessment status)
Number of sites < 50 mi <sup>2</sup>	23	18	2	2	1	0	0
Number of sites > 50 mi <sup>2</sup>	15	0	15	0	0	0	0
Total number of sites	38	18	17	2	1	0	0
Size of smallest sampled drainage area in WAU	0.8 mi <sup>2</sup>		Size of largest sampled drainage area in WAU			555 mi <sup>2</sup>	

Table A.27. Continued.

Causes	Sources
Low dissolved oxygen	Ground water, septic systems, package plants
Nutrients	Septic systems, rowcrop, suburban run-off, package plants
Unionized ammonia	Package plants, septic systems
Siltation	Construction, hydromodification
Sediment metals (nickel, zinc, chromium)	Unknown source

**Recreation Use Assessment**

Subcategory of Use: Primary Contact  
 Impairment: Yes (maximum criteria)

**Fish Consumption Advisory (FCA) Assessment**

Waters in the WAU Sampled and Assessed: Yes  
 FCA Issued: Yes  
 (See the 2004 Ohio FCA for more detailed information at  
 “[www.epa.state.oh.us/dsw/fishadvisory/index.html](http://www.epa.state.oh.us/dsw/fishadvisory/index.html)”)  
 Impairment Due to FCA: Yes (PCBs, mercury - Big Darby Creek from Little Darby  
 Creek to mouth. See Section B.8.3 for details).

Comments:

**Big Darby Creek (02-200)**

All sites sampled on the mainstem of Big Darby Creek fully met all applicable biocriteria within this WAU. There were, however, indications that certain segments are currently under stress and starting to decline.

A short distance downstream from the community of Darbydale nutrient enrichment and low dissolved oxygen have led to several negative macroinvertebrate community attributes including a 300% increase in relative abundance, a 20% drop in sensitive EPT taxa, and the disappearance of viable bivalves. Construction of the planned Darbydale WWTP should eliminate this problem by incorporating all of the existing septic systems and unsewered portions of Darbydale as well as several small package WWTPs. Due to the potential for construction of WWTPs to foster increased development and higher population density the Darbydale WWTP service area has

Table A.27. Continued.

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been delineated to keep these problems in check. Ensuring optimum performance of this WWTP will be important to maintaining the very high quality nature of this portion of Big Darby Creek.

The extremely high quality habitat downstream from the confluence with Hellbranch Run appeared to have ameliorated most of the impacts that would be expected downstream from this tributary. There was a slight decline in the ICI and, while the IBI recorded was 54, there was a noteworthy decline in the number of sucker species and overall numerical abundance. Elimination of the Timberlake WWTP, which is currently the main source of impairment in lower Hellbranch Run, should improve this situation.

Conditions appear to have improved downstream from the PCI WWTP in recent years. However, when last sampled in 1997 fish communities posted significant declines downstream from the PCI WWTP. The WWTP was routinely operating above design flow between 1988 and 1998, which had led to increased pollutant loadings to this segment of Big Darby Creek and the subsequent biological impairment. Recent upgrades and process improvements at the WWTP have led to much improved treatment, lowered loadings and much improved biological performance. With the planned expansion of this facility and the elimination of several package plants and diversion of their sewage to PCI, the loadings from this plant are expected to increase, while the overall loadings to the stream will decrease. Ensuring optimum performance of this WWTP as the expected changes occur will be important to the very high quality of the receiving stream and protection of sensitive and endangered organisms downstream.

Conspicuous algal mats observed in recent years at locations where the stream canopy has permitted sunlight to reach the water's surface suggest that lower Big Darby Creek is being subjected to increasing nutrient loads. Additionally, changes in hydrology have resulted in destabilization of the streambed making it hostile to bivalve molluscs, as documented in 2001/2002. See the macroinvertebrate and fish discussions in Sections B.7 and B.8, respectively, for specific details.

#### Smith Ditch (02-353) (RM 31.69)

Smith Ditch is a high quality direct tributary to Big Darby Creek. Field notes indicate that this site should have been a classic good intermittent stream with very deep pools, strong ground water influence and a wooded riparian corridor. The low number of fish at the downstream site was noteworthy with low D.O. from groundwater a suspected source.

Hamilton Ditch and Clover Groff Ditch are both severely impaired in their headwaters with very slight improvement with downstream distance.

#### Hamilton Ditch (02-259) (RM 11.19)

Hamilton Ditch is the more rural western tributary forming Hellbranch Run. Upstream adverse influences include historical channelization that has resulted in very poor instream habitat. The

Table A.27. Continued.

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straightening of the channel has greatly reduced habitat diversity and entrenchment, particularly harmful because the streambed's low gradient has trapped sediment within the stream channel. Recently, residential construction run-off is delivering silt from sites with inadequate storm water BMPs. Significant suppression of the instream biological community would be expected with the poor habitat but not to the levels evident here. Clearly poor water quality was contributing to the toxic response observed. Hamilton Ditch was documented to be extremely nutrient enriched with ammonia, TKN and total phosphorus in the 90 to 95<sup>th</sup> percentile versus ecoregional (ECBP) background concentrations. This enrichment resulted from a mix of agricultural and residential sources.

Clover Groff Ditch (02-245) (RM 11.19)

Clover Groff Ditch is the easternmost tributary that is being encroached upon by Hilliard and metropolitan Columbus. Clover Groff Ditch has also been channelized historically with accumulated sediment trapped in the modified, entrenched channel. These sediment deposits cover the most rocky substrates and neutralized most of the habitat. Sedimentation has become a more pronounced problem in recent years due to inadequate implementation of erosion control BMPs. Gray septic storm water inputs from the adjacent suburban area as well as inadequately treated sewage have collectively caused enriched conditions that were likely periodically toxic. Supporting this conclusion were measured concentrations of ammonia, nitrite and total phosphorus in the 90 to 95<sup>th</sup> percentile range of ecoregional (ECBP) background conditions. Fecal coliform counts were also elevated

Hellbranch Run (02-204) (RM 26.1)

Biological condition at the three upstream sites of Hellbranch Run, although improved from values recorded at the downstream sites in its source tributaries (Hamilton and Clover Groff Ditches), still only marginally and partially met WWH criteria. Habitat quality was obviously a factor in the suppressed performance at the upstream site with a QHEI of only 39.5 recorded there. Habitat quality in general improved with downstream distance and quickly became less of a factor. The improved biological performance did indicate an improved water quality condition and perhaps ground water augmentation given that the biological performance was higher than the evaluated habitat would normally deliver. The presence of mottled sculpins, an obligate coldwater taxa, not only here but in increased numbers at all sites downstream support this observation. However, there were water column indications of modest nutrient enrichment which extend at least downstream to RM 5.8, downstream from the Oakhurst Knolls WWTP.

Habitat quality in the lower five miles of Hellbranch Run exceeds that necessary to support Exceptional Warmwater Habitat biological communities and marginally meets those criteria at RM 3.7 and 1.0. Hellbranch Run partially attains the EWH use at RM 0.5, downstream from the Timberlake WWTP. This WWTP has a history of operational problems and consistently violates permit limits with sludge frequently detected in stream and very high ammonia concentrations and other nutrient parameters in evidence. The influent to this WWTP is being redirected to a

Table A.27. Continued.

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regional WWTP by 2005, which should lead to significant improvement in the lower reach of Hellbranch Run.

Springwater Run (02-203) (RM 24.0)

Springwater Run is the small tributary draining Harrisburg. Downstream from town, channelization and nutrient enrichment have led to low dissolved oxygen levels and algal productivity which is impacting the benthic macroinvertebrates. Harrisburg is currently investigating options for dealing with domestic sewage and should eliminate most of the nutrient inputs to Springwater Run.

Unnamed tributary to Big Darby Creek (02-352) (RM 23.77)

This small creek is believed to be a naturally intermittent stream that dries out after freshets as a result of the underlying alluvial geologic deposits which have resulted in it being a losing stream.

Unnamed tributary to Big Darby Creek (02-270) (RM 20.2)

Although fully meeting its recommended use the elimination of effluent from the Clark's Lake Subdivision, Dot Mar MHP WWTP, and Foxlair Farms WWTP should improve water quality to the point that biological communities would meet the criteria for EWH based on the instream habitat potential.

Unnamed tributary to Big Darby Creek (02-366) (RM 18.41)

Although the habitat was judged suitable for supporting WWH communities, nutrient enrichment and sedimentation were preventing the macroinvertebrate communities from meeting criteria. Agricultural run-off was the source of these stressors.

Greenbrier Creek (02-202) (RM 16.75)

Natural stream dessication associated with the underlying alluvial deposits yielded poor macroinvertebrate results in 2001 at RM 1.1. However, both sites upstream in 2001 and 2002 met biocriteria.

Lizard Run (02-273) (RM 12.93)

This small stream was found dry even after a recent rain and must flow only during significant precipitation events. The underlying alluvial deposits make it a losing stream.

Sediment Quality

Nutrients found in the Big Darby Creek mainstem followed the same pattern as the tributaries in most instances. Ammonia concentrations were not as elevated as some of those found in the tributaries, however the three sites with higher concentrations have shown trends of decreasing quality. The highest concentrations were found at RM 3.10 (83 mg/kg) (Table B.5.3). This area has accumulated sediment from upstream nonpoint source inputs (i.e., agriculture, tributaries and other sources). Sediment ammonia, along with other factors, likely contributed to decreased mussel diversity in this reach (see mussel trends discussion in Section B.7.4).

Table A.27. Continued.

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All sites exhibited total organic carbon concentrations greater than the lowest effect level (LEL, Persaud and Jaagumagi, 1993). Total organic carbon values in the Big Darby Creek mainstem (range 2.8 mg/kg - 7.2 mg/kg) compare favorably with those in other central Ohio waterbodies such as the Olentangy River (2.1 mg/kg - 9.0 mg/kg), Stillwater River (2.1 mg/kg - 9.1 mg/kg), and the middle Scioto River (1.5 mg/kg - 15.0 mg/kg) (Ohio EPA 2000 and Ohio EPA 2001).

All sites analyzed for total phosphorus were also greater than the LEL (Ibid). Results for other ECBP streams show that the lower value of the Big Darby Creek sediment phosphorus concentration range (i.e., 971 mg/kg - 1700 mg/kg) was almost double to more than double the lower values from the Olentangy and Stillwater Rivers, respectively (Olentangy River - 527 mg/kg - 1060 mg/kg, Stillwater River - 480 mg/kg - 1610 mg/kg).

Acetone was the only detectible organic contaminant found in the sediment samples in this WAU and was found on the mainstem of Big Darby Creek at RM 3.10. There were no known sources for this contaminant. The concentration found was not at a level that would pose a threat to aquatic life.

In contrast, metals were found in sediments throughout the Big Darby Creek mainstem. Two locations within this WAU are of particular concern: RM 52.0, downstream of the Plain City WWTP, and RM 3.1 near the mouth.

At RM 3.1 on Big Darby Creek sediment aluminum and barium were elevated in comparison to the Ohio EPA sediment reference values. Nickel was elevated (48 mg/kg) and exceeded the TEC concentration. The zinc sediment concentration at RM 3.1 of 128 mg/kg also exceeded the TEC concentration. The sediment chromium exceeded the LEL (Table B.5.3). The elevated sediment metals and silt bedload with attached phosphorus and ammonia noted earlier likely contributed to decreased mussel diversity in this reach. Further investigation should be conducted to identify this source and an effort made to remediate it.

#### Fish Tissue

A total of 34 fish tissue samples were collected from sites in this WAU accounting for approximately 41% of total samples collected in the watershed. Twenty five samples were collected from the mainstem and nine from Hellbranch Run. PCBs were either below detection limits or very close to the do not eat threshold at the upstream site on the mainstem of Big Darby Creek within this WAU. From RM 13.4, downstream from Darbyville to the mouth the picture was different. Samples within this segment yielded the highest PCB values in the watershed including a very large flathead catfish which had PCB levels high enough to place it in the one meal per two month category. Much of the higher levels can be attributed to the greater size of the fish included in the samples. Almost all of the fish tissue samples on the mainstem had mercury levels that fell into the one meal per week range. The previously mentioned flathead catfish yielded the highest mercury concentration again largely due to its advanced age.

Table A.27. Continued.

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None of the nine fish tissue samples taken in Hellbranch Run yielded concentrations greater than method detection limit for PCBs. Mercury concentrations were also fairly low with all values falling into the meal per week range.

Recreation Use

The lower Big Darby Creek WAU evaluated as a whole showed attainment of the primary contact recreational standard. Individual streams such as Smith Ditch, Georges Run, and Greenbrier Creek also showed attainment. However, the Hellbranch Run subwatershed and Springwater Run were in non-attainment of the maximum primary contact recreational standard with Springwater Run violating both the geometric mean and maximum criteria. Residential development pressures, coupled with the poorly functioning or aging WWTPs and failing on-site sewage disposal systems found in the Hellbranch Run subwatershed, are contributing to non-attainment. The situation in Springwater Run is similar, with many failing on-site sewage disposal systems. Plans for several of the WWTPs in Hellbranch Run should improve conditions downstream from them. The failing septic systems still need to be addressed; bacterial problems will persist until solutions are developed and implemented. Harrisburg is currently investigating options for sewage treatment; bacterial problems will persist until a solution is developed and implemented.

Table A.28. Aquatic life use attainment status for the streams sampled in the Big Darby Creek watershed assessment unit **05060001 220** during July - October, 2001

Additional sampling was conducted during July - October, 2002 to fill in gaps and further characterize and evaluate impacted areas (noted in **bold**). The Index of Biotic Integrity (IBI), Modified Index of Well Being (MIwb), and Invertebrate Community Index (ICI) scores are based on the performance of fish (IBI,MIwb) and macroinvertebrate communities (ICI). The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support biological communities. (Last updated -10/01/03)

River Mile	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	Mod. IBI	Mod. Iwb	ICIa	QHEIb	Attainment Status <sup>c</sup>	Comments
29.1/-	449	4.52	54.7	10.82	-	86.0	(Full)	Ust. Darbydale
<b>/28.6</b>	450	4.52	-	-	<b>E</b>	-	<b>(Full)</b>	Dst. Darbydale
-- /26.9	453	5.85	-	-	54	-	(Full)	Adj Gville-Hburg Rd.
<b>26.1 /26.1</b>	496	7.87	<b>56</b>	<b>9.4</b>	<b>E</b>	<b>94.5</b>	<b>Full</b>	Dst. Hellbranch Run
23.8/23.8	498	6.71	55	10.20	46	87.5	Full	SR762
22.8/22.5	505	4.1	53	11.36	56	84.5	Full	DST. PCI WWTP
18.7/19.1	513	4.74	52	10.53	E <sup>X15</sup>	85.0	Full	Adj Darby Creek Rd.
<b>15.7 /15.8</b>	529	3.94	<b>56</b>	<b>10.5</b>	<b>52</b>	<b>88.5</b>	<b>Full</b>	Adj. Gulick Rd.
<b>/15.1</b>	532	3.94	-	-	<b>54</b>	-	<b>(Full)</b>	Dst. Georges Run
13.4/13.5	534	4.37	52	10.82	56	85.5	Full	SR 316, Darbyville
<b>10.4/11.2</b>	<b>537</b>	<b>4.15</b>	<b>56</b>	<b>9.6</b>	<b>52</b>	<b>85.0</b>	<b>Full</b>	Off Darby Rd.
<b>8.4 /8.4</b>	544	4.74	<b>48<sup>ns</sup></b>	<b>9.4</b>	<b>52</b>	<b>69.5</b>	<b>Full</b>	Dst. Ag Trib. (Conflu RM8.5)
<b>/5.3</b>	550	7.35	-	-	<b>52</b>	-	<b>(Full)</b>	Dst. Ag Trib. (Conflu RM5.86)
3./1/3.2	552	2.86	54	11.02	56	82.0	Full	SR 104
0.30/0.30	555	12.2	50	11.01	-	71.5	(Full)	Adj. NSCD project
<b>Smith Ditch (02-353) (RM 31.69) (Undesignated/EWH Recommended)</b>								
2.1/2.1	5.9	40.0	52	NA	E	77.5	Full	G'ville-W'ville Ditch
0.3/0.2	6.7	35.71	28*	NA	E	73.0	Partial	Biggert Rd.
<b>Trib to Smith Ditch (02-354) (RM 0.06) (Undesignated/EWH Recommended)</b>								
0.2/-	0.9	7692	50	NA	-	67.0	(Full)	Biggert Rd.
<b>Gay Run (02-298) (RM 26.48) (Undesignated/WWH Recommended)</b>								
2.2/2.2	1.2	55.56	46	NA	G	66.5	Full	Boyd Rd.
<b>Hellbranch Run (02-204) (RM 26.1) (WWH)</b>								
10.3/9.4	24.8	3.37	36 <sup>ns</sup>	6.76*	46	39.5	Partial	Dst. Conflu./dst. Al
7.4/7.4	27.9	7.52	32*	8.17 <sup>ns</sup>	48	51.0	Partial	Kunz Rd.
5.8/5.7	30.5	7.3	35*	8.16 <sup>ns</sup>	G	65.5	Partial	Dst Ohurst Knolls WWTP
<b>Hellbranch Run (02-204) (RM 26.1) (WWH/EWH Recommended)</b>								
3.7/3.7	32.6	16.67	47	9.02	50	83.5	Full	Beatty Rd.
1.0/0.9	35.3	11.36	49	9.18	VG <sup>X15</sup>	84.5	Full	Lambert Rd.
0.5/0.5	35.4	11.36	41	9.07	VG	83.5	Full	Dst. Timberlake WWTP
<b>/0.5</b>	35.4	11.36	-	-	<b>VG</b>	-	<b>(Full)</b>	Dst. Timberlake WWTP
<b>Hamilton Ditch (02-259) (RM 11.19) (MWH)</b>								
3.4/3.4	3.4	4.44	<u>16*</u>	NA	F	21.0	Non	Walker Rd.
<b>Hamilton Ditch (02-259) (RM 11.19) (WWH)</b>								
0.5/0.5	9.4	7.41	<u>24*</u>	NA	40	36.5	Non	US 40

Continued

Table A.28. Continued.

River Mile Fish/Invert.	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	Mod. IBI	Iwb	IC1a	QHE1b	Attainment Status <sup>c</sup>	Comments
<b>Clover Groff Ditch (02-245) (RM 11.19) (MWH)</b>								
4.7/4.7	3.8	3.39	<u>18*</u>	NA	<u>VP*</u>	22.0	Non	Roberts Rd.
<b>Clover Groff Ditch (02-245) (RM 11.19) (WWH)</b>								
0.8/0.8	6.7	9.90	28*	NA	20*	61.5	Non	Dst. US 40
<b>Springwater Run (02-203) (RM 24.0) (WWH)</b>								
0.8/0.2	1.8	50.0	50	NA	F*	48.5	Partial	US 62 at mouth
<b>U.T. to Big Darby Creek (02-352) (RM 23.77) (Undesignated/WWH Recommended)</b>								
0.1/-	0.8	111.11	30*	NA	-	61.5	(Non)	South of SR 762
<b>U.T. to Big Darby Creek (02-270) (RM 20.2) (Undesignated/WWH Recommended)</b>								
0.8/0/8	4.3	25.64	44	NA	G	77.5	Full	H'burg-D'ville Rd.
<b>U.T. to Big Darby Creek (02-366) (RM 18.41) (Undesignated/WWH Recommended)</b>								
0.1/0.1	<b>2.0</b>	27.78	42	NA	<b>F*</b>	52.5	<b>(Partial)</b>	Mouth
<b>Greenbriar Creek (02-202) (RM 16.75) (WWH)</b>								
2.7/2.7	4.4	34.48	40	NA	MG <sup>ns</sup>	57.0	Full	Mt.Ster.-Com. Pt. Rd.
1.3/1.3	8.2	17.86	46	NA	<b>VG</b>	74.5	<b>Full</b>	H'burg-D'ville Rd.
<b>Georges Creek (02-201) (RM 14.4) (WWH)</b>								
0.5/0.5	1.2	58.82	46	NA	MG <sup>ns</sup>	61.0	Full	C.Ville-London North Rd.
<b>Lizard Run (02-273 ) (RM 12.93) (Undesignated/LRW)</b>								
0.2/0.2	1.2	41.67	-	-	<u>VP*</u>	-	(Non)	London Northern Rd.

\* Significant departure from ecoregion biocriteria; poor and very poor results are underlined.

\*\* Attainment status not applied to mixing zones.

ns Nonsignificant departure from ecoregion biocriteria (4 IBI or ICI units; 0.5 Iwb units).

a Narrative evaluation is used in lieu of ICI for qualitative samples (E=Excellent, VG=Very Good, G=Good, MG=Marginally good, F=Fair, P=Poor, VP=Very Poor).

b Qualitative Habitat Evaluation Index (QHEI) values based on the most recent version (Rankin 1989).

c Use attainment status based on one organism group is parenthetically expressed.

X15 Less than optimal flow over artificial substrate samplers

**Ecoregion Biocriteria: Eastern Corn Belt Plains (ECBP)**

<u>INDEX - Site Type</u>	<u>WWH</u>	<u>EWH</u>	<u>MWHd</u>
IBI - Headwaters/Wading	40	50	24
Mod. Iwb - Wading	8.3	9.4	5.8
ICI	36	46	22

d - Modified Warmwater Habitat for channel modifications.