

## A.5 FINDINGS: STATUS OF DESIGNATED USES

Current and recommended aquatic life, water supply and recreation uses are presented in Table A.14. This chapter discusses how uses are determined and the condition of the streams of the Big Darby watershed relative to the designated uses.

### A.5.1 Status of Aquatic Life Uses

A number of the tributary streams evaluated in this study were originally assigned aquatic life use designations in the 1978 and 1985 Ohio water quality standards (WQS) based largely on best professional judgement, while others were left undesignated. The current biological assessment methods and numerical criteria did not exist then. In this study, several sub-basin streams have been evaluated for the first time using a standardized biological approach as part of this study. Table A.15 provides the attainment status for sites sampled in 2001 and 2002 and is based on the current or recommended aquatic life use.

The existing Exceptional Warmwater Habitat aquatic life use designation should be retained for the Big Darby Creek mainstem. The only recommended change is to extend the EWH use designation further upstream in recognition of the improved performance of the biological communities in that segment and that all applicable EWH criteria were fully met at the majority of sites within that segment. The EWH aquatic life use designation should be extended to the very headwaters.

The ongoing and significant presence of obligate coldwater macroinvertebrate and fish taxa in the upstream three sampling locations on the Big Darby Creek mainstem support designation of Big Darby Creek as Cold water Habitat in addition to the current EWH use designation from its headwaters to RM 78.5, which is just upstream from the confluence with Flat Branch (RM 78.48). Several other tributaries have also been recommended to be designated as Cold Water Habitat. Rationale for these recommendations are provided in this chapter.

Use attainability analyses of small water courses resulted in the recommended designation of Modified Warmwater Habitat (MWH) and Limited Resource Water (LRW) segments where poor habitat quality was unlikely to improve in the foreseeable future. These streams were channelized and maintained to facilitate agricultural activities and offered very limited habitat. It is not realistic to expect typical WWH aquatic communities under these conditions. In most cases this survey is the first time these habitat limited segments have been evaluated using biological and habitat data and does not represent a downgrading of the previous WWH use which was based on unverified designations in the 1978 and 1985 Water Quality Standards. Other small streams were impacted by habitat modification but retained the WWH use where recovery of natural habitat features such as a wooded riparian and multiple cover types was evident. Additional habitat improvement is possible through the application of management practices to limit soil loss and restore wooded riparian areas. The rationale for assigning or retaining aquatic life use designations can be found in this chapter.

Table A.14. Waterbody use designations for the Big Darby Creek basin based on sampling conducted during 2001 and 2002.

Designations based on Ohio EPA biological field assessments appear as a plus sign (+). Designations based on the 1978 and 1985 standards for which results of a biological field assessment are now available are displayed to the right of existing markers. Designated uses based on results other than Ohio EPA biological data are marked with an circle (o). A delta (Δ) indicates a new recommendation based on the findings of this report.

Water Body Segment	Use Designations												
	Aquatic Life Habitat						Water Supply			Recreation			
	S R W	W W H	E W H	M W H	S S H	C W H	L R W	P W S	A W S	I W S	B W	PC R	S C R
Big Darby Creek (02-200) <sup>a</sup> - Headwaters to RM 79.2 RM 79.2 to mouth			Δ+			Δ+			Δ+	Δ+		Δ+	
Flat Branch (02-223) (RM 78.48) <sup>b</sup> Tributary to Flat Branch (02-365) (RM 1.5)			+	+					+	+		+	
Little Darby Creek (02-251) (RM 78.34) RM 3.5 to mouth			Δ+			Δ+			Δ+	Δ+		Δ+	
U.T. to B. Darby Cr. (02-361) (RM 74.91) RM 0.75 to mouth			Δ+						Δ+	Δ+			Δ+
Spain Creek (02-222) (RM 74.3) - Headwaters to RM 5.0 RM 5.0 to mouth		+				Δ+			+	+		Δ+	
Pleasant Run (02-221) (RM 72.01)			+						+	+		*+	
U.T. to Big Darby Creek (02-360) (RM 69.4) RM 1.8 to mouth		Δ+							Δ+	Δ+			Δ+
Hay Run (02-220) (RM 67.6) RM 1.1 to mouth			Δ+						+	+		*+	
Prairie Run (02-219) (RM 63.84)							Δ+		Δ+				Δ+
Buck Run (02-209) (RM 63.74)		+							+	+		Δ+	
Robinson Run (02-207) (RM 53.69)		+							+	+		*+	
Sweeney Run (02-357) (RM 52.11) RM 1.7 to mouth		Δ+							Δ+	Δ+		Δ+	
Sugar Run (02-206) (RM 50.92) - Headwaters to RM 7.0 RM 7.0 to mouth				Δ+					+	+		*+	
U.T. to Sugar Run (02-358) (RM 7.39)					Δ+				Δ+	Δ+		Δ+	
Worthington Ditch (02-2356) (RM 50.62) RM 0.4 to mouth		Δ+							Δ+	Δ+		Δ+	
Ballenger-Jones Ditch (02-355) (RM 49.68) RM 3.72 to mouth		Δ+							Δ+	Δ+		Δ+	
Yutzy Ditch (02-364) (RM 47.1) RM 1.38 to the mouth		Δ+							Δ+	Δ+		Δ+	

Table A.14. (Continued.)

Water Body Segment	Use Designations												
	S R W	Aquatic Life Habitat						Water Supply			Recreation		
		W H	E W H	M W H	S S H	C W H	L R W	P W S	A W S	I W S	B W	P C R	S C R
Fitzgerald Ditch (02-272) (RM Little Darby Cr.(02-210) (RM 34.1) Headwaters to RM 36.9 Little Darby Cr.(02-210) (RM 34.1) RM 36.9 to mouth Clover Run (02-218) (RM 39.8) Lake Run (02-216) (RM 36.9) Jumping Run (02-217) (RM 3.9) Treacle Creek (02-213) (RM 31.3) Howard Run (02-215) (RM 5.4) Proctor Run (02-214) (RM 3.69) Barron Creek (02-212) (RM 24.4) Wamp Ditch (02-363) (RM 23.0) Spring Fork (02-211) (RM 17.46) Bales Ditch (02-362)(RM 3.64) RM 1.72 to mouth Smith Ditch (02-353) (RM 31.69) Tributary to Smith Ditch (02-354)(RM0.06) Gay Run (02-298) (RM 26.48) Hellbranch Run (02-204) (RM 26.1) Headwaters to RM 5.0 Hellbranch Run (02-204) (RM 26.1) RM 5.0 to mouth Hamilton Ditch (02-259) (RM 11.19) -Hdwtrs to Feder Rd. Feder Rd. to mouth Clover Groff Ditch (02-245) (RM 11.19 - Hdwtrs to Feder Rd. Feder Rd. to mouth Springwater Run (02-203) (RM 24.0) U.T. to Big Darby Creek (02-352) (RM 23.77) U.T. to Big Darby Creek (02-270) (RM 20.2) U.T. to Big Darby Creek (02-366) (RM 18.41) Greenbrier Creek (02-202) (RM 16.75) Georges Creek (02-201) (RM 14.4) Lizard Run (02-273) (RM 12.93)		Δ+						Δ+	Δ+		Δ+		
			+			Δ+		+	+		+		
			+					+	+		+		
	Δ+							*+	*+			Δ+	
	Δ+							*+	*+		*+		
	Δ+							*+	*+		*+		
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			*+					*+	*+		*+		
			+					*+	*+		*+		
	Δ+							*+	*+			Δ+	
	Δ+							Δ+	Δ+			Δ+	
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	Δ+							Δ+	Δ+		Δ+		
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								+	+			Δ+	
						Δ+		+	+			Δ+	

a - River code of the river or stream segment  
b - River Mile of the confluence point with applicable receiving stream

Table A.15. Aquatic life use attainment status for the streams sampled in the Big Darby Creek watershed during July - October, 2001 and based on the recommended uses.

Additional sampling was conducted during July - October, 2002 to fill in gaps and further characterize and evaluate impacted areas (sites and results 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)	Mod. IBI	Mod. Iwb	ICIa	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>	<b>E</b>	93.0	Full	Dst US 42, dst Ranco Inc
52.5/ --	150	7.04	51	9.08 <sup>ns</sup>	-	-	(Full)	Ust SR 161&Sweeney 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
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
38.9/38.9	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
29.1/-	449	4.52	54.7	10.82	-	86.0	(Full)	Ust. Darbydale
/28.6	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	SR 762
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.
/15.1	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 RM 8.5)
/5.3	550	7.35	-	-	<b>52</b>	-	<b>(Full)</b>	Dst. Ag Trib. (Conflu RM 5.86)
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

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Table A.15. (Continued)

River Mile Fish/Invert.	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	IBI	Mod. Iwb	ICla	QHEIb	Attainment Status <sup>c</sup>	Comments
<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>U. T. to Flat Branch (02-365) (RM 1.5) (Undesignated/MWH Recommended)</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.
<b>Hay Run (02-220) (RM 67.6) (WWH/EWH Recommended)</b>								
0.3/0.2	5.8	7.35	54	NA	VG <sup>ns</sup>	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	-	<b>23.0</b>	<b>Full</b>	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	Partial	Orchard Rd.
<b>Robinson Run (02-207) (RM 53.69) (WWH)</b>								
/5.5	4.6	6.71	-	-	VP*	-	(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
7.0/6.9	9.5	7.52	<u>26</u>	NA	MG	29.5	Full	Taylor rd.,Dst.landfill

Continued

Table A.15. (Continued)

River Mile Fish/Invert.	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	IBI	Mod. Iwb	ICla	QHEIb	Attainment Status <sup>c</sup>	Comments
<b>Sugar Run (02-206) (RM 50.92) (WWH)</b>								
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.
<b>Worthington Ditch (02-356) (RM 50.62) (Undesignated/WWH Recommended)</b>								
0.2/0.2	4.4	20.83	24	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	G	56.5	Partial	P'city-G'ville Rd.
<b>Little Darby Creek (02-210) (RM 34.1) (EWH/ EWH + CWH Recommended)</b>								
41.2/41.2	3.3	43.47	42*/48	NA	VG <sup>ns</sup>	80.5/70	Part/Full	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.
- /33.2	28.0	4.50	-	-	54	-	(Full)	Ust. R.dale-Mford Center Rd.
29.5/29.4	70.0	2.67	45*	8.8*	50	66.5	Partial	Axe Handle Rd.
26.6 /26.5	72.0	21.7	54	10.0	52	58.0	Full	Dst. Chuckery
24.5/24.5	83.0	2.02	52	9.3 <sup>ns</sup>	58	62.5	Full	Rosedale-Plain City Rd.
23.1/23.2	89.0	2.02	48 <sup>ns</sup>	9.5	E	55.5	Full	Dst. Finley -Guy Rd.
20.5/20.5	98.0	3.18	56	9.3 <sup>ns</sup>	48	64.5	Full	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	-	-	46	-	(Full)	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.

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Table A.15. (Continued)

River Mile Fish/Invert.	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	IBI	Mod. Iwb	ICla	QHEIb	Attainment Status <sup>c</sup>	Comments
<b>Treacle Creek (02-213) (RM 31.3) (EWH)</b>								
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.
<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	69.0	Partial	Ust. Cemetery Rd.
7.8/7.7	19.3	3.33	48 <sup>ns</sup>	NA	G*	54.5	Partial	R'dale-M'Ctr. Rd
/3.4	32	8.3	-	-	E	-	(Full)	Dst. SR 38
/3.3	32	8.3	52	9.8	56	67.5	Full	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.
<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 <sup>ns</sup>	9.02 <sup>ns</sup>	50	83.5	Full	Beatty Rd.
1.0/0.9	35.3	11.36	49 <sup>ns</sup>	9.18 <sup>ns</sup>	VG <sup>X15ns</sup>	84.5	Full	Lambert Rd.
0.5/0.5	35.4	11.36	41*	9.07 <sup>ns</sup>	VG <sup>ns</sup>	83.5	Partial	Dst. Timberlake WWTP
/0.5	35.4	11.36	-	-	VG <sup>ns</sup>	-	(Full)	Dst. Timberlake WWTP
<b>Hamilton Ditch (02-259) (RM 11.19) (MWH)</b>								
3.4/3.4	3.4	4.44	16*	NA	F	21.0	Non	Walker Rd.

Continued

Table A.15. (Continued)

River Mile Fish/Invert.	Drainage Area (mi <sup>2</sup> )	Gradient (ft/mi)	IBI	Mod. Iwb	ICla	QHEIb	Attainment Status <sup>c</sup>	Comments
<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
<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	F*	52.5	<b>(Partial)</b>	Mouth
<b>Greenbrier 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	VG	74.5	<b>Full</b>	H'burg-D'ville Rd.
<b>Georges Run (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)

INDEX - Site Type	WWH	EWH	MWH <sup>d</sup>
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.

### A.5.1.1 Understanding Use Attainability

Until recently the process of determining use attainment status was largely an exercise of checking to see if there should be any changes to existing, previously verified aquatic life uses. Determining and assigning new uses for previously undesignated segments or streams were infrequent occurrences. However, more intense interest in watershed-wide analysis, hastened by the Total Maximum Daily Load (TMDL) program, has resulted in more and smaller drainage area streams being sampled, the majority of them previously undesignated. The use attainability process and the rationale for assigning uses to particular streams and segments is provided below. Much of the text in this section is abstracted from Rankin and Yoder (1998).

#### A.5.1.1.1 Background

A principle goal of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the surface waters of the United States. A critical step towards meeting this goal is the requirement that each state must establish water quality standards. Water quality standards have three major components; 1) use designations, 2) water quality criteria to support each use which includes chemical, physical, and biological criteria, and 3) an anti-degradation policy.

Aquatic life uses constitute the goals set for individual rivers and streams. Aquatic life uses are defined as designations (classifications) assigned to a waterbody based on the *potential* aquatic community that can realistically be sustained given the regional reference conditions and the level of protection afforded by the applicable criteria. These chemical, physical, and biological criteria have been documented to achieve and maintain the aquatic life goals. Ohio EPA has developed a set of tiered aquatic life uses that reflect the range of aquatic life potential that exists in Ohio streams.

Most natural streams and rivers in Ohio have a variety of habitat features dominated by a meandering channel with numerous riffles, runs, pools, islands, gravel bars, backwater areas and other channel features which in the aggregate comprise its aquatic habitat. The combination of these features are essential for supporting diverse and healthy assemblages of aquatic organisms. The majority of streams in Ohio have been assigned the Warmwater Habitat (WWH) aquatic life use designation. Streams and rivers which support a much higher diversity of aquatic organisms (fishes, mussels, and other aquatic invertebrates) are classified as Exceptional Warmwater Habitats (EWH). EWH streams generally exhibit an unusually diverse array of natural habitat characteristics, have high biological integrity, and frequently harbor the largest populations of rare and endangered species.

Some Ohio streams and watersheds have been modified extensively for agricultural drainage and/or flood control and, through ongoing maintenance activities, have stream channels kept continuously in an altered state. The Modified Warmwater Habitat (MWH) aquatic life use designation was developed in recognition of the essentially permanent nature of these modifications. The biological criteria for these streams has been adjusted to account for the tolerant assemblages of aquatic life yielded by these constant and officially sanctioned habitat modifications.

Very small streams (usually draining <3 sq. mi.) that have a very limited biological potential are classified as Limited Resource Waters (LRW). This is the lowest level of protection afforded to our streams by the Ohio Water Quality Standards.

#### A.5.1.1.2 Requirements

Properly assigning an aquatic life use to a stream or stream segment requires conducting a Use Attainability Analysis using a procedure with minimum data requirements and a logical and step-wise procedure to ultimately derive the appropriate aquatic life use. UAA requirements and the steps involved in the process follow.

##### Minimum Data Requirements

Ambient biological data collected in accordance with Ohio EPA protocols (Ohio EPA 1987, 1989a,b; Rankin 1989) are usually needed when conducting an UAA, especially to support assigning a use to a stream segment that does not meet Clean Water Act goals. In Ohio these uses are Modified Warmwater Habitat (MWH) and Limited Resource Water (LRW). If these data are not available, recommendations to assign or change a use may be deferred until adequate data are available to ensure that an accurate and adequately protective aquatic life use is assigned. Biological sampling results are the most definitive determinant of aquatic life use attainment and, therefore, for the appropriateness of the designation. In a few cases (e.g., small streams in the HELP ecoregion), QHEI results alone may be sufficient to justify the MWH or LRW use. Generally, fish and macroinvertebrates are both used in an UAA. However, in some instances one organism group, typically fish, may be sufficient. The number of sampling sites needed for an UAA will vary in response to the complexity of the stream segment and changes in habitat. The importance of having credible data for performing an UAA cannot be overemphasized. Poor quality or insufficient data results in underestimates of either the current state or the potential of a stream which could lead to an inappropriate use designation.

##### Water Quality Standards (WQS)

Prior to initiating an UAA, it is necessary to determine if the stream or stream segment being evaluated has been previously assigned an aquatic life use. Ohio WQS are rules in the Ohio Administrative Code (OAC) at Section 3745, Chapter 1. Sections 3745-1-08 (Hocking River) through 3745-1-26 (Cuyahoga River) of the Ohio WQS are organized by major river basins. Individual rivers and streams are listed by drainage order within each basin. Many smaller Ohio streams either lack an existing designation or were assigned a “default” use designation that may not yet have been verified by the results of a biosurvey (typically denoted with a ‘\*’ in the WQS). Streams that have been evaluated and confirmed are usually (but not always) designated with a ‘+’ which indicated that an UAA has been performed. Ohio EPA routinely updates these designations in the WQS based on UAAs conducted, according to administrative procedures for rule-making set forth by the State of Ohio.

### Are Clean Water Act Goal Uses Attainable?

The first step in the process, if a stream or stream segment has an assigned use, is to determine if the goals are attainable. U.S. EPA regulations (40 CFR Part 131.10 (g)(1-6)) allow lower than Clean Water Act goal uses where they are precluded by:

- naturally occurring pollutant levels;
- natural flow conditions (i.e., ephemeral - does not apply when flow is augmented by an effluent discharge)
- human - induced conditions which can not be remediated;
- hydrological modifications (dams, diversions, channel modifications) which cannot be operated in a manner consistent with the CWA goal use;
- natural physical features (substrate, flow, depth); controls to attain use would cause widespread, socioeconomic impacts.

If the stream or stream segment does not fall into any of these categories then the following steps need to be taken.

### Process and Information Requirements

The Use Attainability Analysis requires the following information and knowledge:

- existing status of waterbody based on biocriteria;
- habitat assessment to evaluate potential;
- reasonable relationship between impaired state and precluding activity based on assessment of multiple indicators used in appropriate roles;
- recommendation subject to WQS rulemaking process reviewable every three years - a “temporary” designation.

### Existing Use and Attainability Criteria in Federal WQS Regulations (40 CFR Part 131)

Existing use:

- existing condition of a waterbody on November 28, 1975;
- existing uses must be maintained - uses reflecting a lower condition may not be assigned;
- applies to all waters regardless of designation status.

Uses are considered to be attainable if

- point source loadings can be reduced via technology or WQS based limitations;
- nonpoint sources can be abated with the application of “reasonable” best management practices.

### A.5.1.2 Results

Aquatic life uses were assessed at 128 sites ranging in drainage area from 0.8 mi<sup>2</sup> to 555 mi<sup>2</sup> (Table A.15) for the evaluation period of 2001 and 2002. Eighty-five (66.41%) of these sites fully met either the currently designated or the recommended use. Thirty (23.62%) sites partially met and 12 (9.38%) sites were not attaining their designated or recommended use.

In this section, the results from the recent sampling are discussed. The streams are discussed individually, from upstream to downstream. Some streams are also assigned a second use, as discussed in the next section of this chapter.

#### A.5.1.2.1 General Assigned Use Recommendations

During the 2001/2002 sampling effort, over 83 miles of the Big Darby Creek mainstem were assessed (Table A.15). The evaluation was based upon biological, chemical and physical sampling and evaluated the creek from its very headwaters to its mouth. Of the 83.2 miles of stream evaluated, 59.4 miles (71.4%) were in full attainment, 21.75 miles (26.1%) in partial attainment and only 2.05 miles (2.5%) in non attainment of the designated or recommended aquatic life use biocriterion. The non-attaining segment was limited to the headwaters in an area recovering from the sedimentation associated with the relocation of U.S. Route 33 and Logan Country Road 152. Partial attainment of biological criteria was limited to three segments: downstream from the confluence with Flat Branch, from Milford Center to downstream from Buck Run and downstream from the Plain City WWTP.

##### Big Darby Creek Headwaters (Headwaters - 79.2) (WWH/EWH Recommended)

The headwaters of Big Darby Creek have been subjected to channel modifications associated with the initial construction of U.S. Route 33 and subsequent relocations of portions to accommodate the expansion of the Honda Corporation manufacturing complex. The contribution of a significant sediment bed load to the stream channel from the lack of sediment erosion control BMPs during and post construction and the simplification of channel morphology associated with straightening of the channel resulted in declines in instream biological performance and habitat quality. Re-design and re-construction of the stream channel using natural stream channel design have subsequently resulted in improved local habitat quality. Flushing of contributed sediments downstream have resulted in gradually improving habitat scores in the immediate impact area. However, this movement of sediments downstream also has had the consequence of shifting impacts downstream causing declines in biological community performance. Based on the response pattern documented upstream, this should be a temporary situation with eventual improvement to close to pre-impact conditions.

Data from 1983, collected as part of the Environmental Impact Assessment for the re-location of U.S. Route 33, documented EWH quality fish communities within the project area. However, sampling coverage was sparse and the original designation of this area was based on subsequent Ohio EPA sampling conducted further downstream. Communities in this segment at that time were performing largely in the WWH range. Habitat quality similarly indicated this segment was suitable for supporting at least WWH communities and that designation was applied from the confluence with Flat Branch upstream to the headwaters. Follow-up monitoring conducted by the Ohio EPA and consultants hired by ODOT since the initial channel relocation and reconstruction has documented gradual recovery and improvement of both habitat quality and biological performance. Full attainment of EWH criteria was documented at RM 83.2 (in 1997 and 1999), Logan County Road 152 (RM 82.5) and Township Road 157 (RM 79.2) in 2001; therefore, it is recommended that the existing EWH designation be extended to include the very headwaters of Big Darby Creek.

Big Darby Creek Mainstem (RM 79.2 -0.0) (EWH)

Habitat quality immediately downstream from the confluence with Flat Branch has declined for a short distance in recent years as a result of problems emanating from the Flat Branch watershed. Honda Corporation was notified and they are currently evaluating the situation and developing a plan to address this problem and other identified water quality problems. The balance of the sites along the mainstem retain the high quality habitat documented in previous evaluations.

Exceptional Warmwater Habitat biological communities have been documented repeatedly since 1979 throughout this reach and, therefore, the existing EWH use is recommended to be retained.

Big Darby Creek Tributary Attainment Status

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

Flat Branch is currently designated as MWH. This use had been verified based on a previous biological survey. Three sites were sampled along the mainstem of Flat Branch in 2001. All three sites fully met and in fact exceeded MWH criteria. Therefore the existing MWH is judged appropriate and is recommended to be retained.

Habitat improvement projects have been proposed by the U.S. Army Corps of Engineers, The Nature Conservancy and Honda Corporation for Flat Branch that should result in significantly improved habitat and water quality if implemented. These efforts should go a long ways towards resolving the water quality problems emanating from Flat Branch. Sampling will be conducted post - construction to determine if adequate improvement has taken place.

Unnamed Tributary to Flat Branch (02-365) (RM 1.5) (Undesignated/ MWH Recommended)

This small tributary flows from the north across the Honda Property. The stream channel has been modified throughout its entire length. Habitat quality at the site sampled yielded a QHEI of 36.5, in the poor range. The pervasiveness of the channel modification in this small subwatershed and the preponderance of modified habitat attributes coupled with the instream biological performance support the MWH aquatic life use designation.

Little Darby Creek (02-251) (RM 78.34) (Undesignated/EWH Recommended)

This Little Darby Creek in Logan County is currently undesignated. With the exception of the earliest sampling in 1988, which was conducted during one of the most severe droughts on record, historical sampling as well as the sampling conducted during 2001 has documented full attainment of EWH biological criteria from RM 3.5 to the mouth. Therefore this segment of Little Darby Creek is recommended to be designated as EWH.

Unnamed Tributary to Big Darby Creek (02-361) (RM 74.91) (Undesignated/EWH Recommended)

This small unnamed tributary to Big Darby Creek was sampled at Cratty Road (RM 0.2/0.3). Both organism groups met EWH criteria at that site. The EWH aquatic life use designation is recommended to extend from the confluence of the first significant tributary upstream from the Erie-Lackawanna Rail Line (RM 0.75) to the mouth (RM 0.0). The balance of the tributary will remain undesignated pending further sampling.

Spain Creek (02-222) (RM 74.3) (WWH - Headwaters to RM 5.0) (WWH/EWH Recommended RM 5.0 to mouth)

Spain Creek is currently designated WWH. Spain Creek has been repeatedly sampled since 1981, primarily at the mouth and downstream from North Lewisburg and the North Lewisburg WWTP. Except for the drought in 1988 and the sampling site in the very headwaters, all samples have met or exceeded EWH criteria for both organism groups. Sampling results from 2001 documented EWH performance in both fish and macroinvertebrates from Gilbert Road (RM 3.7) to the mouth. Spain Creek is recommended to be redesignated EWH from Erie - Lackawanna Railroad Crossing (RM 5.0) to the mouth and retain the existing WWH for the balance of the subwatershed.

Pleasant Run (02-221) (RM 72.01)

Pleasant Run is currently designated as EWH based on sampling conducted in 1988, one of the worst droughts in Ohio history. It performed at the EWH level at that time and during subsequent sampling in 1989, 1997 and 2001. In 2001 sampling in addition to the site at Middleburg - Plain City Road was also conducted further upstream in the watershed. Sampling at River Mile 4.6 yielded exceptional fish and very good macroinvertebrate communities confirming the accuracy of the EWH use designation. Therefore, it is recommended that the existing EWH aquatic life use be retained for Pleasant Run.

Tributary to Big Darby Creek (02-360) (RM 69.40)

This small direct tributary to Big Darby Creek confluences just upstream from the Collins Road bridge from the west. It has not been sampled previously. Evaluation of instream habitat quality revealed a preponderance of high quality warmwater habitat attributes and the potential to support better than average WWH biological communities. Fish communities affirmed the accuracy of that assessment, actually meeting the EWH criterion. Macroinvertebrate communities did well but only at the WWH level. Based on the mixed performance of the biota and good habitat, it is recommended that this tributary be designated WWH from the confluence of the north and south source tributaries at RM 1.8 to the mouth.

Hay Run (02-220) (RM 67.6)

Significant portions of Hay Run, from approximately RM 1.1 upstream to RM 3.75, have been formally petitioned under the County Ditch Law and are under the jurisdiction of the Union County Soil and Water Conservation District and, therefore, kept in a maintained state. Despite this routine maintenance upstream and the less than optimal habitat (i.e. QHEI = 52.5) within the sampling zone, biological communities performed in the EWH range at Middleburg - Plain City Road. Hay Run is recommended to be designated EWH from RM 1.1 to the mouth. Although maintained throughout much of the rest of its length, due to the unusual character of the stream (i.e., performing much better than habitat would normally suggest and probably as a result of good ground water inflow to the stream), assigning an aquatic life use designation upstream from this segment will be reserved until additional sampling can be conducted.

Prairie Run (02-219) (RM 63.84) (Undesignated/ LRW)

Prairie Run is incorrectly designated in the Ohio WQS as having a verified WWH use based on previous sampling. It has never been sampled biologically by the Ohio EPA. On several occasions during the 2001 and 2002 field seasons Prairie Run at Middleburg-Plain City Road

was found to be dry and was determined to be a genuine ephemeral stream. Based on the small size of the subwatershed it is being recommended to be redesignated as Limited Resource Water.

Buck Run (02-209) (RM 63.74) (WWH)

Buck Run has a verified WWH aquatic life use based on prior sampling. It was first sampled in 1981 and subsequently in 1992, 1993 and 2001. Although there have been some changes in habitat quality, including noteworthy declines at RM 7.8, Wilber Road, and comparable improvements at RM 0.4, adjacent State Route 38, overall habitat quality remains in the range consistent with the WWH aquatic life use and, therefore, the existing WWH aquatic life use is recommended to be retained.

Robinson Run (02-207) (RM 53.69) (WWH)

Robinson Run is currently listed in the Ohio WQS as WWH based on sampling conducted at RM 0.7, U.S. Route 42, in 1992. Sampling in 2001 extended further upstream into the watershed. Habitat quality in the segment that included RM 2.1, at Hickory Ridge Road and State Route 736 was judged suitable for supporting WWH communities. Although macroinvertebrate sampling was conducted further upstream, no habitat evaluation was conducted due the lack of fish sampling. However, given the average habitat quality, the recommendation is to preserve the existing WWH use designation.

Sweeney Run (02- 357) (RM 52.11) (Undesignated/ WWH Recommended)

Sweeney Run is currently undesignated. Sampling just upstream from the mouth in 2001 revealed mixed biological results. Fish communities did very well, marginally meeting the EWH IBI biocriterion. Macroinvertebrate communities, however, did not fare as well with only fair performance reported. However, during the summer, lower Sweeney Run routinely receives overspray from mosquito fogging which may explain the macroinvertebrate decline. The QHEI at RM 0.1 was 58 and, while slightly less than desired, was suitable for WWH support. The segment being designated extends from Lafayette - Plain City Road (RM 1.7) to the mouth.

Sugar Run (02-206) (RM 50.92) (WWH/ MWH Recommended - headwaters to RM 7.0)  
(WWH RM 7.0 to mouth)

The headwaters of Sugar Run have been subjected to a wide variety of stressors which have kept instream biological performance low (i.e., habitat disruption, spills, toxic leachate from landfills, poorly operated package WWTPs, etc.). Additionally, the two source tributaries have been petitioned and are under routine maintenance by the Union County Soil and Water Conservation District and kept in a habitat impacted condition. Although the headwaters of Sugar Run itself has not been petitioned, it has been extensively altered in the past to the point that it will not support WWH biological communities. Historical sampling has documented Sugar Run with habitat suitable for supporting WWH communities from upstream U.S. Route 42 to the mouth. Therefore, Sugar Run is recommended to be redesignated MWH from its headwaters to Taylor Road (RM 7.0) and WWH from Taylor Road to the mouth (RM 7.0 to 0.0).

Tributary to Sugar Run (02- 358) (RM 7.39) (Undesignated/MWH)

The entire length of this small stream has been petitioned under the County Ditch Law. It is under routine maintenance by the Union County Soil and Water Conservation District and kept in a habitat impacted condition. The evaluation of instream habitat revealed a channelized,

shallow and mostly pooled stream with very low flow and slow current due to its gradient and modified channel. The banks were mostly grass or lined with rip rap. Additionally, some areas had slumped banks. The resultant QHEI of 27 fell in the very poor range. Modified Warmwater Habitat is the recommended aquatic life use for this currently undesignated stream.

Worthington Ditch (02-356) (RM 50.62) (Undesignated/WWH Recommended)

Worthington Ditch is a previously unsampled stream that enters Big Darby Creek from the west just south of Plain City. Although channelized upstream from Plain City - Georgesville Road, groundwater influx and shading from a modest amount of wooded riparian vegetation in the lower reach downstream from State Route 142 has yielded cooler instream water temperatures and ameliorated some of the effects from nutrient enrichment introduced to the channelized open stream segment upstream. The macroinvertebrate communities marginally meet the WWH criterion for WWH between State Route 142 and the confluence with Big Darby Creek. As such, this is the recommended aquatic life use for this segment (i.e., RM 0.4 to the mouth). Increasing the grass and/or wooded riparian buffer upstream from State Route 142 would improve water quality of Worthington Ditch and the water quality being delivered to Big Darby Creek at RM 50.62.

Ballenger-Jones Ditch (02-355) (RM 49.68 ) (Undesignated/ WWH Recommended)

Although Ballenger -Jones has had much of the riparian vegetation removed from the stream bank upstream from State Route 142, the meander pattern of the stream channel and its instream habitat structure have been retained. Additionally, downstream from State Route 142, the wooded riparian vegetation has been retained as well. As a consequence instream habitat quality was judged as good (i.e., QHEI - 69.0) which was reflected in the instream biological community performance. Ballenger - Jones Ditch is recommended to be designated WWH from RM 3.72 to the mouth. County Ditch maintenance extends from RM 7.35 - 3.72.

Yutzy Ditch (02-364) (RM 47.1) (Undesignated/ WWH Recommended)

Yutzy Ditch was of marginally good quality at the site near State Route 142, RM 0.4, and met the recommended WWH aquatic life use biocriterion for macroinvertebrates. There was still some slight flow and groundwater recharge or supplemental interstitial flow and modest canopy in the lower reach that moderated water temperatures (~70° F.). A more natural stream channel was present about 400-500 yards upstream from State Route 142 with riffles and functional pools comprised of predominately rocky substrates. This pattern continued downstream to the mouth (confluence with Big Darby Creek at RM 47.1). Yutzy Ditch is recommended WWH from where county ditch maintenance ends to its mouth (RM 1.38 -0.0)

Fitzgerald Ditch (02-272) (RM 44.96) (Undesignated/WWH Recommended)

Another tributary originating from the western side of Big Darby Creek confluences with Big Darby Creek 0.5 mile upstream from the Lucas Road/Beach Road Suspension Bridge. Much of the upper reaches of Fitzgerald Ditch have been channel modified. Lower reaches (i.e., ~RM 1.5 downstream) have been modified to a much lesser degree. The instream habitat evaluation conducted downstream from State Route 142 yielded a QHEI of 56.4. Moderate influence negative habitat attributes were the main factors resulting in the slightly less than optimal habitat but were not judged to preclude eventual full attainment of the WWH use with improvements at

the MHP WWTP. Fitzgerald Ditch is recommended to be designated WWH from RM 1.75 to the mouth.

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

Only one site along the length along the mainstem of Little Darby Creek did not fully meet the current EWH aquatic life use designation. The rest of the sites either marginally or fully meet the applicable EWH biocriteria. Repeated sampling over the last 15 years has yielded the same result; the Exceptional Warmwater Habitat aquatic life use designation is appropriate for Little Darby Creek and should be retained.

Clover Run (02-218) (RM 39.8) (EWH/WWH Recommended)

This small tributary originates in the very headwaters of Little Darby Creek and confluences with it immediately south of Mechanicsburg. Previously unsampled by the Ohio EPA, Clover Run was assigned the EWH aquatic life use designation based on best professional judgement in the 1978 Water Quality Standards. Sampling in 2001 yielded a good headwater Warmwater Habitat fish community and a very good macroinvertebrate community. The relative high number of blacknose dace and mottled sculpin suggest perennial pools and cool water potential from ground water sources. The habitat evaluated affirmed the WWH potential ( $QHEI \geq 60$ ) for Clover Run absent other mitigating factors and Clover run is therefore recommended to have the aquatic life use revised from EWH to WWH.

Lake Run (02-216) (RM 36.9) (EWH/ EWH Retained)

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 at which time the decision will be made and whether to retain or revise the EWH designation.

Jumping Run (02-217) (RM 3.9) (EWH/WWH Recommended)

Jumping Run is a small headwater stream (i.e., 2.4 mi.<sup>2</sup> drainage) that empties into Lake Run at RM 3.00 north of Mechanicsburg. Like many other Little Darby Creek subwatershed, Jumping Run was assigned the EWH aquatic life use designation based on best professional judgement in the 1978 Water Quality Standards. Habitat evaluations conducted in 2001 revealed a channel mainly consisting of pools with bottoms of unconsolidated sediments and some detritus from agricultural sources. Included in this segment was a rocky riffle comprised of cobble, and smaller substrates along with some woody debris. A decent forest corridor was also present downstream and water temperatures were cooler. The resultant QHEI of 63.0 fell into the good range and was judged suitable for supporting WWH communities.

Treacle Creek (02-213) (RM 31.3) (EWH)

Treacle Creek has been sampled several times over the years since first evaluated in 1992. Although there have been localized problems associated with severe nutrient enrichment and sedimentation at the mouth, almost all of the other sites sampled either fully or partially met the applicable EWH biocriteria over the years. That pattern was replicated in 2001. The EWH aquatic life use designation is appropriate and should be retained.

Howard Run (02-2215) (RM 5.4) (EWH)

Previously unsampled by the Ohio EPA, Howard Run was assigned the EWH aquatic life use designation based on best professional judgement in the 1978 Water Quality Standards. Sampling in 2001 fully met applicable EWH biocriteria and therefore documented the appropriateness of the current EWH aquatic life use. Evaluation of the instream habitat revealed a site having a mix of positive and negative habitat attributes yielding a QHEI of 55.5. Only one high influence, modified habitat attribute was noted - low sinuosity. However, the site was recovering from historical channelization and given the steep overall gradient of the stream, there is sufficient energy for this site to revert to the high quality present in the rest of the stream.

Proctor Run (02-214) (RM 3.69) (EWH)

Proctor Run originates in Champaign County in the boulder belt of the Cable Moraine. It then flows almost directly east downslope through the rest of the Cable moraine and into ground moraine and Union County. Proctor Run is six miles long with a local gradient of 21.4 ft/mi, in the high range. Three sites were evaluated in Proctor Run in 2001 yielding QHEI scores ranging from 65 to 73. Positive warmwater habitat attributes predominated at all three sites. No high influence modified habitat attributes were found although moderate amounts of silt and embeddedness somewhat lowered habitat quality. A single site, RM 1.7 - upstream from Mc-Magill Road, had been evaluated previously in 1992 as well as in 2001. Although slight differences were noted between the years, overall habitat quality was judged very similar and of very good quality. Biological sampling in 1992 yielded exceptional biological communities which resulted in the EWH aquatic use designation assignment. Sampling was extended further upstream in 2001 to determine the appropriateness of the EWH use for the rest of the subwatershed. All three sites either fully or partially met EWH biocriteria verifying the accuracy of the EWH designation.

Barron Creek (02-212) (RM 24.4) (EWH/WWH)

Barron Creek, a direct tributary to Little Darby Creek, confluences just downstream from the Rosedale- Plain City Road bridge over Little Darby Creek in Madison County. Previously unsampled by the Ohio EPA, Barron Creek was assigned the EWH aquatic life use designation based on best professional judgement in the 1978 Water Quality Standards.

Barron Creek is listed in the Gazetteer of Ohio Streams as intermittent. Despite this notation, discernable flow was present during the summer of 2001, one of the driest periods on record in central Ohio. Barron Creek is a strongly groundwater influenced stream with a spring noted within the sampled reach and low water temperatures recorded (~60° F). Habitat at the sites sampled has been impacted by channelization yielding low to no sinuosity, fair to poor development, silt substrates in spots, slower currents and moderate overall and riffle embeddedness. The QHEI was 44.5, in the poor range at the sampling site (RM 2.1). Currently,

a large percentage of Barron Creek is under maintenance conducted by the Madison County Engineer Office. This includes the segment that was sampled downstream from the Rosedale - Plain City Road bridge over Barron Creek. Despite habitat reflective of the maintained nature of the stream channel (i.e., QHEI = 44.5), the fish community did very well and the macroinvertebrate communities did moderately good in 2001. This has led to the recommendation of a change from EWH to WWH. There is a strong suspicion that establishment of a riparian buffer would result in much better biological performance.

Wamp Ditch (02-363) (RM 23.0) (Undesignated/WWH)

Wamp Ditch originates on the east side of Little Darby Creek entering about one mile upstream from the Morris Road bridge. Local gradient is 12.5 ft/mi, in the moderate range. Habitat quality is poor (QHEI=44.5) with four high influence modified habitat attributes including recent or no recovery from channelization, no sinuosity, sparse cover and little residual pool volume. A number of moderate influence modified habitat attributes drive habitat quality further down including fair to poor development and moderate overall embeddedness. Wamp Ditch is similar to Barron Creek in many respects. A large portion of Wamp Ditch, including the segment evaluated, is under maintenance conducted by the Madison County Engineer's Office which has led to the reduced habitat quality detailed above. It is also strongly influenced by ground water with low water temperatures recorded instream (61° F). Instream biological results yielded mixed results. The macroinvertebrate communities were marginally good and in the WWH range while the fish communities were in the fair range with an IBI of 30. Given identical habitat quality ratings and similar thermal regimes, it is suspected that water chemistry problems are more pronounced than that found in Barron Creek. Since the biological communities partially meet WWH criteria, Wamp Ditch is recommended to be designated as WWH.

Spring Fork (02-211) (RM 17.46) (EWH)

Spring Fork's designation as an EWH stream was verified based on sampling conducted in 1992 just upstream from the mouth (~ RM 0.9). Sampling results recorded there rank amongst the highest in the state. The IBI of 58 places it in the 99.5th percentile. A total of 18,230 samples have been taken over the state in the past 26 years and in that time only 92 samples have achieved an IBI of 58. Sampling in 2001 extended further up along the mainstem and all sites along the length of Spring Fork either fully or partially met the EWH criteria supporting the accuracy of that aquatic life use designation for the entirety of Spring Fork.

Bales Ditch (02-362) (RM 3.64) (Undesignated/WWH Recommended)

Bales Ditch, a small tributary to Spring Fork, originates in ground moraine and flows in a general easterly direction confluencing with Spring Fork close to Plumwood, Ohio. The local gradient at the site sampled was 17.86 ft/mi placing it in the moderate high range. The stream appears to possess the potential energy adequate for recovery from habitat disruptions and the ability 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. Habitat quality was judged very good (QHEI=70) and easily capable of supporting WWH aquatic biological communities. Fish community results were excellent with macroinvertebrate community scores in the good range. Therefore, the recommendation is being made for Bales Ditch to be designated WWH.

Smith Ditch (02-353) (RM 31.69) (Undesignated/ EWH Recommended)

Smith Ditch originates in Madison County just north of the village of Lily Chapel. It flows in a southeasterly direction to the Madison - Franklin County line near Wrightsville where it takes on a more direct easterly course flowing through the Battelle- Darby Metropark before joining with Big Darby Creek less than 2.5 miles downstream from the confluence with Little Darby Creek. Gradient in this small direct tributary is very steep ranging between 35-40 ft/mi, in the very high range. Habitat quality was judged to be very good to excellent as a result of its coarse substrates, highly sinuous course, wooded canopy and well developed channel features. Confirmation of its ability to support EWH aquatic biological communities was secured during sampling in 2001. EWH criteria were fully met at the upstream site and partially met at the downstream site where fish did not perform to expectations.

Tributary to Smith Ditch (02-354) (RM 0.06) (Undesignated/EWH Recommended)

This very small tributary enters Smith Ditch almost at its mouth. Gradient is even steeper than found in sites sampled in Smith Ditch (i.e. 76.92 ft/mi). Gradients this steep are not optimum for supporting normal aquatic life. However, other habitat attributes were very good with coarse substrates and a good representation of cover types with deep pools and aquatic macrophytes the only significant missing elements. The stream channel was moderately to highly sinuous and possessed a wide forested buffer for a good percentage of the sampling zone. In all, the stream was judged capable of supporting very good aquatic biological communities. The fish community, in fact, was performing at the Exceptional Warmwater Habitat level. Given that level of performance and the similarities of this tributary to Smith Ditch, the decision was made to designate this small stream EWH.

Gay Run (02-298) (RM 26.48) (Undesignated/WWH Recommended)

Gay Run enters Big Darby Creek from the west approximately halfway between Darbydale and Harrisburg. Gay Run at its mouth is a losing stream, losing surface water flow to the thick layer of glacial till found along the lower valley of Big Darby Creek. As a consequence, the lower site was found to be dry when sampling was attempted during the drought conditions of 2001. In contrast the upstream site had deep pools and perennial flow with springs observed within the sampling zone. It was evaluated and sampled in 1997 and 2001 and yielded QHEIs in the mid sixties on both occasions. Gay Run clearly has habitat adequate to support WWH biological communities. The presence of perennial pools, ground water flow contribution in its upper reaches and the proximity to the high quality repopulation resource of the mainstem of Big Darby Creek are more than adequate to supercede the occasional intermittency found at the mouth and support the assignment of the WWH designation.

Hellbranch Run (02-204) (RM 26.1) (WWH - Headwaters to RM 5.0, EWH - RM 5.0 to mouth)

Concern about the effects of suburban encroachment on this significant and major tributary to Big Darby Creek has resulted in repeated sampling of this subwatershed since 1981. Although the upper reaches of the mainstem are still impacted by stressors emanating from its source tributaries, Hellbranch Run is still judged suitable for supporting WWH communities. Additionally, in the lower reaches of Hellbranch Run, instream habitat quality improves dramatically. This occurs where Hellbranch Run transitions through an area where geological settings has been characterized by the ODNR Division of Geological Survey as ground moraine/silty loam till/boulder field. In addition to a significant increase in local gradient, the

stream channel have been left relatively natural with intact riparian buffers. There was also an almost total absence of modified habitat attributes and a preponderance of WWH attributes including coarse substrates, good sinuosity, extensive cover, variety of current types, low riffle/run and overall embeddedness, and adequate residual pool volume. Based on this excellent habitat, it has long been felt that following improvements in water quality this segment of Hellbranch Run held the potential to support EWH biological communities. As improvements have been made to some of the small package WWTPs, there have been gradual improvements in biological performance to the point where marginal attainment of the EWH aquatic life use has been met in lower Hellbranch Run. Elimination of the Timberlake WWTP by 2005 will remove the main reason the most downstream site only partially meets EWH. Hellbranch Run is being recommended to be re-designated as EWH from RM 5.0 to the mouth.

Hamilton Ditch (02-259) (RM 11.19) (MWH - Headwaters to Feder Road (RM 2.1), WWH - Feder Road (RM 2.1) to mouth)

Although habitat quality has declined in the very headwaters of Hamilton Ditch due to construction and agricultural run-off, there are no recommendations to change use designations. Several studies are underway to determine how to improve the quality of Hellbranch Run's source tributaries. Future sampling subsequent to the implementation of any habitat improvement/water management plans will be conducted to determine the need to change the designated aquatic life uses.

Clover Groff Ditch (02-245) (RM 11.19) (MWH - Headwaters to Feder (RM 2.5), WWH - Feder Road (RM 2.5) to mouth)

Although habitat quality has declined in the very headwaters of Clover Groff Ditch due to construction run-off, there are no recommendations to change use designations. Several studies are underway to determine how to improve the quality of Hellbranch Run's source tributaries. Future sampling subsequent to the implementation of any habitat improvement/water management plans will be conducted to determine the need to change the designated aquatic life uses.

Springwater Run (02-203) (RM 24.0) (Harrisburg) (Undesignated/WWH Recommended)

This small tributary happens to drain a very narrow end moraine from the late Wisconsinan glaciation which occurs as hummocky ridges that are higher than the adjacent terrain. Local gradient was 50 ft./mi. which exceeds the very high range and, although capable of flushing fines downstream, would not be optimal for supporting aquatic life. This small tributary flows through the center of Harrisburg and was obviously channelized in the past and was observed to be recovering from that impact. The QHEI for the stream segment downstream from Main St. was 50, in the fair range. Although coarse substrates in the form of boulders, cobble and gravel were present, the moderate amount of sand also present contributed to the moderate overall and riffle embeddedness noted for this site. While not possessing optimum habitat for supporting aquatic life, this site did possess an adequate number of WWH attributes which, when associated with the ameliorative effects of the ground water augmenting the stream base flow, permitted the maintenance of a WWH aquatic community in this stream.

Tributary to Big Darby Creek (02-352) (RM 23.77) (Undesignated/WWH)

This small tributary flows from the west and confluences with Big Darby Creek just south of the State Route 762 bridge opposite of the small village of Orient. Stream gradient of this very small stream was the highest in the study area at 111.1 ft/mi. Streams with this high of gradient characteristically have a flashy hydrograph. Although water fills the stream channel after rainfall or snowmelt in many cases during normal to low flow conditions the channel will dry up to isolated pools or if receiving groundwater to interstitial flow. This was indeed the case during the sampling accomplished in 2001. The stream had interstitial flow. Despite the very low flow there were a preponderance of WWH attributes that would have scored higher under higher flow. This site received a QHEI of 61.5 and is recommended to be designated WWH.

Tributary to Big Darby Creek (02-270) (RM 20.20) (Undesignated/WWH Recommended)

This small tributary enters Big Darby Creek from the west away from any major road crossing at RM 20.2 feeds to a segment that supports some of the rarest species encountered in the Big Darby mainstem. Habitat at RM 0.8 upstream from Harrisburg - Darbyville Road had been evaluated in 1994 and during the 2001 survey. Though largely similar between the years and yielding an evaluation of excellent a slight decline was noted in 2001 (i.e., from a QHEI of 80.5 to 77.5). This was mainly due to an increase in the amount of embeddedness noted. There has been an increase in large lot residential development in the subwatershed that is probably responsible for this shift. Although this small stream is being recommended to be designated WWH based on the current instream biological performance, this stream probably has the potential to support an EWH community when water quality conditions resulting from the poorly operated package WWTPs upstream are eliminated. The only WWH attribute missing from this stream was silt free substrates, which also contributed to some of the negative attributes noted. Ground water was a strong influence on the biological composition of this stream. One fish species, the central mottled sculpin, an obligate cold water species, comprised a large percentage of the resident fauna. Sampling should be conducted after the elimination of the Dot-Mar MHP WWTP, Foxlair Farms WWTP and Clark's Lake WWTP from the subwatershed to determine at that point whether or not to retain the WWH designation or upgrade to EWH.

Greenbrier Creek (02-202) (RM 16.75) (Undesignated/WWH Recommended)

This creek debouches into Big Darby Creek from the east and some distance downstream from the Scioto-Darby Creek Road bridge. A small reservoir is situated on its very headwaters with the balance of the watershed agriculture in land use. Local gradient was >27ft./mi. which would place it in the high range. Positive WWH attributes included normal overall and riffle embeddedness. High influence modified habitat attributes included no sinuosity, sparse cover and shallow maximum depths. The QHEI score for this site was 52.5. Although less than optimal, partial attainment of the WWH use was recorded here and, therefore, that aquatic life use is being recommended.

Georges Run (02-201) (RM 14.4) (WWH)

Georges Creek enters Big Darby Creek from the west ~1.4 miles upstream from the small village of Darbyville. The stream channel for most of its course flows through a steep valley coming off the edge of Late Wisconsinan ground moraine. Local stream gradient was >58 ft/mi. which is steeper than the very high range. Due to the velocity of flows encountered at this steepness of gradient, particularly at flood stage, it is felt to be more than is optimal for the support of aquatic

life. Other habitat attributes, however, were positive. These included no channelization, coarse substrates including boulder, cobble and gravel, moderate sinuosity, moderate cover amounts, slightly greater than normal embeddedness, and deep pools. This yielded a QHEI of 61.0 with the stream judged capable of supporting WWH aquatic communities. This was verified by the concurrent biological sampling conducted.

#### Lizard Run (02-273) (RM 12.93) (Undesignated/LRW Recommended)

This small tributary which also flows from the west and discharges to Big Darby Creek at the village of Darbyville was found to be dry when attempted to be sampled mid-field season 2001. Subsequent trips to sample or evaluate Lizard Run have yielded similar results; Lizard Run is a true ephemeral stream. This is largely a function of the glacial geology that underlies the stream channel and results in Lizard Run becoming a losing stream with little or no flow except after rain events or snow melt periods. As a consequence of the natural ephemeral nature of this stream and the limitations imposed by this stressor, this stream is recommended to be designated as a Limited Resource Water.

#### A.5.1.2.2 Dual Assigned Use Recommendations

Sampling in the past in the upper Big Darby Creek watershed has provided positive indications that some of the tributaries and portions of the Big Darby Creek mainstem might be suitable for the Cold Water Habitat aquatic life use designation. The sampling conducted in 2001 and 2002 provided the opportunity to analyze the more extensive database and provide recommendations for assigning the Cold Water Habitat use (see Table A.16). The rationale and justification for assigning the Cold Water Habitat Aquatic Life use follows. It should also be pointed out that in all cases the Cold Water Habitat use designation is being recommended in concert with another aquatic life use designation, typically either Warmwater Habitat or Exceptional Warmwater Habitat. Dual aquatic life use designations have precedence in the Water Quality Standards and are appropriate. They are assigned to protect this very sensitive component of Ohio's aquatic fauna.

#### Big Darby Creek Mainstem (02-200)

The upper Big Darby Creek site at RM 83.2 could be classified with a Cold Water Habitat (CWH) use. Seven cold water taxa, including the caddisfly *Diplectrona modesta*, comprised 9.1 percent of the total taxa collected. The cold water taxa totaled > 11 percent of the macroinvertebrate population collected. There was 100 feet of large, mature trees adjacent to both banks (25% open to closed canopy).

Table A.16. Cold water (CW) fish and macroinvertebrate taxa collected in the Big Darby Creek watershed during sampling conducted in 2001 and 2002

Stream	RM	#CW macroinvertebrates	#CW caddisflies	#CW mayflies	#CW stoneflies	#CW midges	Total % CW taxa	Total % CW population	#CW fish taxa	% CW fish (by no.)
Big Darby Creek	83.2	7	1			6	9.1 %	>11%	1 <sup>a</sup>	1.3-4%
	82.5 to 82.6*	2				2	3 %	1.1%	1	2.9-3.4 %
	80.8								1	14-19.2 %
	79.2 to 79.3	3	1			2	3.5 %	< 2 %	1	8.4 - 14 %
Little Darby Creek	41.2	6	2	1		3	11 %		1	64-85%
	39.3 to 39.6	4	1			3	4.9 %	7 %	1	38.8 %
	38.8	5	2			3	6 %	6 %	1	11.2 -12.8 %
Spain Creek	5.7	1				1	1.85%		1	17.1%
	3.4	5	1			4	6.9 %	2 %	1	18.7 %
	0.1	3	1			2	4.5 %	2.2 %	1	0.9-2%
other Little Darby Creek (to BDC @ RM 78.34)	3.4	6	1	1		4	8.3 %	4-5 %	1	16.7 %
	0.4	4			1	3	4.8 %	4-5 %	1	7.25 %

<sup>a</sup> No available sample at that location in 2001/2002 but was sampled in 1997 and 1999.

\* Past ODOT project - moved Big Darby Creek and still in recovery.

The mottled sculpin, a cold water fish, was present at the upper three sites and slightly further downstream, but the cold water component of the macroinvertebrate population sampled at RM 82.5 had decreased to two taxa (site was downstream from the ODOT project where stream was relocated and still with limited canopy). The cold water macroinvertebrates were further affected by the lack of thick mature riparian corridor in this area where only 30-40 feet of short shrubs and grass lined the streambanks with very limited shading (50% to 25% open canopy). Eventually the riparian canopy should expand and vertical shading should increase.

The next downstream site at RM 79.3, with 40 to 100 feet of large trees and increased shading adjacent Big Darby Creek (50% open to closed canopy), had three Cold water taxa present including the caddisfly *Ceratopsyche slossonae*, but they comprised < 2 percent of the macroinvertebrate community population. The mottled sculpin still comprised 8.4 - 14.1 percent of the population collected in 2001. With the cold water macroinvertebrate taxa showing increased representation further downstream from the ODOT stream segment and mottled sculpin represented well past the confluence with Flat Branch, it is recommended to also designate Big Darby Creek with a CWH use designation from the headwaters to RM 78.5 which is just upstream from the confluence with Flat Branch (RM 78.48).

#### Little Darby Creek (02-251) (RM78.34)

The Little Darby Creek (Logan County) (at RM 78.34) supported six cold water macroinvertebrate taxa that comprised 8.3 percent of the taxa collected. The cold water caddisfly *C. slossonae* and the mayfly *Baetis tricaudatus* were among those collected, and the cold water macroinvertebrates were 4 - 5 percent of the collected sample population. There was 30 to 75 feet of large trees adjacent to the stream with primarily a closed canopy keeping water temperatures cooler. The cold water mottled sculpin totaled nearly 17 percent of the sampled population at RM 3.4

At RM 0.4 there was still four cold water taxa despite a thinner riparian corridor on one side. There were > 100 feet of trees on the other side, so the stream was still largely shaded with a range of only 25 percent open canopy to a completely closed canopy. Temperatures were still 66 to 68 ° F, and two cold water taxa collected included a stonefly and the cold water midge *Paratanytarsus n. sp. 1*. Cold water fish were still over 7 percent of the sampled population near the mouth at RM 0.4. Based on these biological findings, the Little Darby Creek (unnamed tributary to Big Darby Creek at RM 78.34) should be also classified as CWH use designation.

#### Spain Creek (02-222) (RM74.3)

Spain Creek in its upstream reach was negatively affected by storm water and sediment runoff, from slumpage in open pastures, development, and a lack of consistent woody canopy. Habitat in the reach was mostly grass/weeds with small trees at 10-30 feet width with less cover further downstream. This diminished representation by macroinvertebrate cold water taxa that were present further downstream. Only one cold water midge taxon, *Parametriocnemus sp.*, was present, even though the mean temperature was 16.5° C or 61-62° F. The cold water fish, the mottled sculpin, was abundant. Decreasing the negative inputs by widening the riparian buffers and fencing pastures would allow more sensitive cold water taxa to reinhabit this reach, as was demonstrated downstream.

At RM 3.4, with better habitat (QHEI = 72.0) and less negative NPS inputs, five cold water macroinvertebrate taxa were present which comprised approximately seven percent of the total taxa collected and two percent of the total sampled population. Total canopy cover and shading increased significantly (>100 ft. wide riparian corridors with 25 percent open to closed canopy present), yielding a mean temperature of 65° F.

Similar closed canopy and > 100 foot corridors of large trees adjacent to Spain Creek at RM 0.1 (mean water temperature of 68° F.) ameliorated some of the effects of the North Lewisburg

WWTP discharge. Three cold water taxa, including the caddisfly, *C. slossonae*, were still present (4.5 percent of taxa collected) despite consistent and numerous permit violations through the 1990s. With improved treatment the sensitive cold water component of the macroinvertebrate community will increase. The cold water fish, the mottled sculpin, was represented throughout Spain Creek from 2 percent (below the WWTP) to 18 percent of the sampled population. Based on these biological findings, the recommendation is for Spain Creek to be classified also as CWH.

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

Little Darby Creek at Allison Road (RM 41.2), with its water temperature at 57° F., had six cold water macroinvertebrate taxa which represented 11 percent of the total taxa collected. Cold water taxa collected included the mayfly *Baetis tricaudatus* and caddisflies *Glossosoma sp.* and *Ceratopsyche slossonae*. The cold water sculpin dominated the fish community at RM 41.2 with 64 to 85 percent of the population collected.

Despite excess nutrient inputs near RM 39.3 from NPS agricultural sources (open canopy and open pasture with cows in stream and Clover Run) and municipal run-off (Mechanicsburg and possibly from the fertilizer plant), there were still four cold water taxa present, including *C. slossonae*, representing approximately seven percent of the collected total population. Temperature at sampling was 64 ° F., and the mottled sculpin population still comprised ~39 percent of the total population.

At RM 38.8 five cold water taxa were present downstream from the Mechanicsburg WWTP discharge. The cold water taxa, which included the caddisflies *C. slossonae* and *Glossosoma sp.* and the midge *Micropsectra sp.*, totaled six percent of both the collected taxa and the sampled population. The instream temperature can be decreased if the canopy is increased by allowing more trees to grow along right bank and fencing out cows with only a couple of smaller crossing areas.

The obligate cold water fish, mottled sculpin, was found in significant numbers within the same reach ranging in abundance from almost over 85 percent at RM 41.2, Allison Road to 12 percent at RM 38.8, Wing Road.

The CWH designation is recommended for Little Darby Creek from the headwaters to ~RM 37.0 which is upstream from the confluence with Lake Run (RM 36.9).

These recommendations have been incorporated into the 2001/2002 attainment table (Table A.15) and other tables in the fish and macroinvertebrate community discussions.

Table A.17. Watercourses petitioned to be maintained under the provisions of the County Ditch Law (Chapters 6131, 6133, and 6135) by County Engineer offices within the Big Darby Creek watershed based on interviews and file searches conducted during January, 2003.

County Name	Stream Name	Maintained Segment	Distance Maintained
Logan	None in watershed	NA	NA
Champaign	Jumping Run	1.5-2.4	0.9 miles
	McMullen Ditch (Howard Run)	1.15-3.8	2.65 miles
	Fullington Ditch	0.1-2.8	2.7 miles
	Crowder Ditch	2.4-2.9	0.8 miles
Union	Bailey Ditch	0.2-0.5	0.3 miles
	Bown Ditch	13.3-14.2	0.9 miles
	Hay Run	1.1-3.85	3.75 miles
	L.R. Sugar Run	Entire length	
	Post Road Ditch		
	Prairie Run	Entire length	2.2 miles
	S.C.S. Sugar Run	Entire length	
Madison	Wildcat Pond Ditch	Entire length	1.2 miles
	Big Darby Creek	None	
	Sweeny Run	RM 4.55-3.37	1.18 miles
	Bidwell Elsey Ditch	None	
	Sugar Run	None	
	Worthington Ditch	None	
	Cary Ditch	None	
	Heafy Ditch	RM 2.90-1.60	1.30
	Ballenger Jones Ditch	RM 7.35- 3.72	3.63
	Ballenger Ditch	None	
	Powell Ditch	RM 2.73-0.81	1.92
	H.B. Beachy Ditch	RM 0.26-0.19	0.07
	Converse Ditch	None	
	Yutzy Ditch	RM 4.85-1.38	3.47
	A.W. Wilson Ditch	RM 2.85-0.75	2.10
	Ella Beach Ditch	RM 2.27-1.03	1.24
	Chandler Ditch	None	
D.A. Fitzgerald Ditch	RM 4.65-1.75	2.90	
Bidwell Ditch			
Bridenstine Ditch	None		

Continued

Table A.17. Continued.

County Name	Stream Name	Maintained Segment	Distance Maintained
Madison	Dry Ditch	None	
	Silver Ditch	None	
	McGuire Ditch	RM 1.42-0.60	0.82
	Thomas Ditch	None	
	Smith Ditch	RM 6.59-5.51	1.08
	McGuire Guilliland Ditch	RM 1.78-1.47	0.31
	Barron Creek	RM 5.43-0.81	4.62
	Little Darby Creek		None
	Boerger Ditch	None	
	Wamp Ditch/ Cleo Lawr. Ditch	RM 1.65-0.0	1.65
	Straley Ditch	RM 0.63-0.26	0.37
	Sanford Ditch	RM 1.08-0.40	0.68
	Bridgman Ditch	RM 1.73-0.29	1.44
	Hamilton Ditch	RM 0.83-0.58	0.25
	Kent Ditch		
	Spring Fork	None	
	Patrick Ditch	None	
	Booth Ditch	RM 2.13 - 0.43	1.70
	Bales Ditch	RM 4.26-1.72	2.53
	Chenoweth Ditch	RM 2.0-0.5	1.50
Dun Ditch No. 2	RM 3.8-1.35	2.45	
Franklin	None in watershed	NA	NA
Pickaway	Greenbrier Run	Entire length as needed	
	Georges Run	Entire length as needed	
	Springwater Run	Entire length as needed	

## A.5.2 Recreation Uses

Individual water bodies are considered to attain their assigned recreation use designation when both the mean and maximum criteria values of either fecal coliform or *E. coli* associated with the assigned use are met.

In the vast majority of cases, the stream reaches in the Big Darby Creek watershed were in non-attainment of the *E. coli* bacterial criteria. However, some of the subwatershed and their individual tributaries were attaining recreational uses for fecal coliform bacteria; thus, these assessment units were deemed in attainment of the recreational standard in spite of the *E. coli* results, according to the current criteria.

Because the primary contact recreation *E. coli* criteria listed in the Ohio Water Quality Criteria (WQS) is the same as the bathing waters criteria (126 per 100 ml mean, 298 per 100 ml maximum), some view the criteria as being somewhat over protective, since the recreation use of these streams is Primary Contact Recreation (PCR). An *E. coli* target estimated to convey a similar level of public health protection as the existing PCR fecal coliform standard was developed and used for comparison in this study (336 per 100 ml mean, 626 per 100 ml maximum).

Each of the bacterial water quality criteria has a mean, expressed as a geometric mean, and a maximum value. All mean values indicated in this evaluation are geometric means. The WQS specify that the maximum bacterial criteria not be exceeded in more than 10% of the samples. Therefore, a 90<sup>th</sup> percentile was calculated from the sampling results and compared to the maximum bacterial water quality criterion. Where the geometric mean or the 90<sup>th</sup> percentile exceeded the respective targets for both of the bacterial groups (fecal coliform or *E. coli*), the stream was judged to be in non-attainment of its recreation use.

The WQS specify that the geometric mean bacterial standard not be exceeded, based on not less than 5 samples collected in a 30 day period. The sampling regime for the 2001 and 2002 water quality survey did not provide for all samples to be collected in a 30 day period. However, it is important that the recreation use be evaluated. U.S. EPA's draft Implementation Guidance for Ambient Water Quality Criteria (November, 2003) recommends the following guidance on this situation:

With regard to the geometric mean component of the criteria, there has been a common misconception of how water quality data should be used to determine whether or not a waterbody has attained the applicable geometric mean value. Some states and authorized tribes have mistakenly interpreted the water quality criteria as requiring a minimum number of samples in order to determine the attainment of the geometric mean component of the water quality criteria. The confusion may have arisen because the water quality criteria recommend a monitoring frequency of five samples taken over a 30-day period. The recommendation does not intend to imply that five samples are needed before a geometric mean can be calculated. The minimum number of samples used in the 1986 water quality criteria for bacteria is for accuracy purposes only; clearly, more frequent sampling yields more accurate results when determining the geometric mean. Further in some instances averaging periods greater than 30 days may be appropriate (e.g., data collected over a recreation season). Unless specified otherwise in a state or authorized tribe's water quality standards or assessment methodology, the geometric mean should be calculated based on the *total number of samples collected* over the specified monitoring period, and used in conjunction with an upper percentile value to determine attainment of

the numeric water quality criteria (e.g. CWA §303(d) listing for fresh and marine waters.) This interpretation encourages the collection and use of data and is what has always been intended. EPA notes that this interpretation was used by the Agency when promulgating water quality standards for the Colville Confederated Tribes (40 CFR 131.35).

Ohio EPA considered the above guidance when evaluating recreation use attainment. Since the samples did not meet the 30 day window of time for strict evaluation versus the water quality criteria, it was determined that larger sample sizes would overcome this deficiency. Therefore, data was pooled by WAU (watershed assessment unit; for more information on Big Darby Creek watershed's four WAUs, see Chapter A.6), and by reach with the objective of maintaining sample sizes sufficiently large to give a good representation of the bacterial quality of the streams, as opposed to making a sampling site by sampling site analysis.

#### Upper Big Darby Creek (headwaters to downstream Sugar Run) Subwatershed

Recreational uses in the upper watershed were in non-attainment of the maximum PCR criteria for fecal coliform bacteria and *E. coli* when evaluating data from the entire subwatershed (Table A.18). Only two tributary streams, Flat Branch and the mainstem of Spain Creek, exceeded both the geometric mean and maximum values for both types of bacteria. Most streams exceeded the maximum for both *E. coli* and fecal coliform bacteria. Only one tributary within this subwatershed completely met both the mean and maximum fecal coliform recreational criteria, the Little Darby Creek in Logan County (Table A.18). The mainstem of Big Darby Creek and its tributaries are impaired in this subwatershed by bacterial contamination. Point sources of this contamination include the Flat Branch WWTP and North Lewisburg WWTP and small package WWTPs. Nonpoint sources of bacteria include runoff from urbanized areas, Honda of America, and agricultural runoff, land application of manure, runoff from feedlot, breeding facilities and pastures as well as unrestricted access of livestock to various streams in this subwatershed.

#### Middle Big Darby Creek (downstream Sugar Run to upstream Little Darby Creek) Subwatershed

Recreational uses in this subwatershed fell within attainment ranges for primary contact fecal coliform recreational criteria for both mean and maximum concentrations of bacteria (Table A.18). The main channel of Big Darby Creek in this segment showed complete attainment of PCR use as did most of its tributaries (Table A.18). In this subwatershed, many of the tributary streams appear to exhibit a threatened recreational attainment status as their 90<sup>th</sup> percentile values are within a few percent of the 90<sup>th</sup> percentile maximum of 2000/100 ml and in excess of the *E. coli* target of 626/100 ml. Both Fitzgerald Ditch and Yutzy Ditch exceeded the maximum recreational criteria for both *E. coli* and fecal coliform bacteria. Canaan Community MHP may be a source of bacteria as well as nonpoint sources related to agribusiness.

#### Little Darby Creek (headwaters to Big Darby Creek) Subwatershed

This entire subwatershed should be listed in non-attainment of the maximum recreational bacterial criteria. While the mainstem of Little Darby Creek was shown to be in attainment of fecal coliform criteria, all of the tributary streams exhibited non-attainment of the bacterial maximums except for Treacle Creek and Howard Run. Barron Creek was an example of a small stream within the Little Darby subwatershed that had extremely serious bacterial contamination which exceed both the mean and maximum criteria, likely resulting from unlimited access of livestock to the stream (Table A.18).

There are various sources of bacterial pollution in this watershed ranging from point sources such, as the Mechanicsburg WWTP and the Green Meadows MHP WWTP, to non point sources, including failing or poorly managed on-lot sewage treatment, runoff from urbanized areas, and livestock feedlots or pastures, including the reaches with unlimited access of livestock to the stream (e.g., the mouth of Spring Fork). Stream reaches that are attaining recreational criteria should be closely monitored to ensure continued attainment in this threatened subwatershed. Those streams in non-attainment should be considered as candidates for the application of best management practices to limit the input of bacteria to streams.

Lower Big Darby Creek (*Little Darby Creek to mouth*) *Subwatershed*

The lower Big Darby Creek subwatershed exhibited attainment of the mean and maximum PCR criteria when evaluated as a whole. Individual streams such as Georges Run, and Greenbrier Creek also showed attainment based on meeting the fecal coliform criteria. The Hellbranch Run subwatershed including Springwater Run were in non-attainment of the maximum PCR fecal coliform criteria. Development pressures along with poorly operated or aging WWTPs and failing on-site sewage disposal systems found in the Hellbranch Run subwatershed are contributing to non-attainment. Springwater Run was the only stream in this subwatershed to exceed both the mean and maximum criteria, likely due to failing on-site sewage disposal systems.

Attainment of recreational criteria in the Big Darby Creek watershed may be related to many factors including the presence of WWTPs, urbanized areas, agricultural activities, and on-site sewage disposal facilities with an important variable being available stream flow or dilution. Generally, waterbodies in the Darby watershed exhibit non-attainment where there is little or no available dilution. Watersheds with sufficient dilution, either from a large drainage area or high groundwater input (such as Big Darby Creek and Little Darby Creek), exhibit attainment of the PCR use (Table A.18). Obviously, this is not the case in areas where ongoing development<sup>b</sup> and its associated runoff is a factor (e.g., Hellbranch Run). Streams like Spring Fork are also in need of restoration where a combination of point source (e.g., Green Meadows WWTP) and non-point source loadings of bacteria (e.g., unlimited access of livestock to the stream) inhibit recreational use attainment.

Table A.18. Analysis of Primary Contact Recreation (PCR) use attainment in the Big Darby Creek watershed based on ambient survey data collected during 2002.

(FC - fecal coliform; EC - *E. coli*) Values in bold exceed the respective target.

Unit	Geometric Mean			90 <sup>th</sup> Percentile		
	FC	EC		FC	EC	
<b>Recreation Standard</b>	1000	126 <sub>a</sub>	336 <sub>b</sub>	2000	298 <sub>a</sub>	626 <sub>b</sub>
<b>Upper Big Darby (Headwaters to downstream Sugar Run) [05060001 190]</b> (FC n=167, EC n=139)	850.2	<b>1131.9</b>	<b>1131.9</b>	<b>6901</b>	<b>8802</b>	<b>8802</b>
Upper Big Darby Creek RM 82.5-52.0 (mainstem only) (FC n=52, EC n=43)	855.4	<b>1282.1</b>	<b>1282.1</b>	<b>7844</b>	<b>12250</b>	<b>12250</b>
Flat Branch and tribs incl. Little Darby (Logan Co.) (FC n=30, EC n=24)	906.9	<b>1475.8</b>	<b>1475.8</b>	<b>22000</b>	<b>30027</b>	<b>30027</b>
Flat Branch and tribs. (FC n=20, EC n=16)	<b>1418.9</b>	<b>2810.1</b>	<b>2810.1</b>	<b>22616</b>	<b>35986</b>	<b>35986</b>
Little Darby (Logan Co.) (FC n=10, EC n=8)	370.4	<b>407.1</b>	<b>407.1</b>	1231	<b>1265</b>	<b>1265</b>
Spain Creek incl. Pleasant Run and U.T. to BDC at RM 74.91 (FC n=30, EC n=24)	<b>1058.8</b>	<b>994.1</b>	<b>994.1</b>	<b>3936</b>	<b>4612</b>	<b>4612</b>
Spain Creek (FC n=15, EC n=12)	<b>1208.4</b>	<b>1249.8</b>	<b>1249.8</b>	<b>4692</b>	<b>4736</b>	<b>4736</b>
Pleasant Run (FC n=10, EC n=8)	902.4	<b>754.9</b>	<b>754.9</b>	<b>3010</b>	<b>2586</b>	<b>2586</b>
Hay Run incl. U.T. to BDC at RM 69.40 (FC n=10, EC n=8)	780.4	<b>618.1</b>	<b>618.1</b>	<b>2209</b>	<b>1726</b>	<b>1726</b>
Buck Run (FC n=20, EC n=16)	684.1	<b>1133.3</b>	<b>1133.3</b>	<b>8009</b>	<b>6970</b>	<b>6970</b>
Robinson Run incl. Sweeney Run (FC n=14, EC n=12)	655.8	<b>825.1</b>	<b>825.1</b>	<b>3843</b>	<b>5963</b>	<b>5963</b>
Sugar Run (n=16)	405	<b>361</b>	<b>361</b>	1470	<b>740</b>	<b>740</b>

Unit	Geometric Mean			90 <sup>th</sup> Percentile		
	FC	EC		FC	EC	
<i>Recreation Standard</i>	1000	126 <sub>a</sub>	336 <sub>b</sub>	2000	298 <sub>a</sub>	626 <sub>b</sub>
<b>Middle Big Darby (Sugar Run to Upstream Little Darby Creek) [050600001 200] (n=28)</b>	324.6	<b>300.5</b>	300.5	1704	<b>790</b>	<b>790</b>
Middle Big Darby Creek RM 49.5-34.1 (mainstem only) (n=12)	138.4	<b>146.5</b>	146.5	494	<b>562</b>	562
Ballenger-Jones Ditch and Worthington Ditch (n=8)	368.3	<b>301.9</b>	301.9	1858	<b>704</b>	<b>704</b>
Fitzgerald Ditch and Yutzy Ditch (n=8)	659.9	<b>609.0</b>	<b>609.0</b>	<b>2274</b>	<b>3749</b>	<b>3749</b>
Ballenger-Jones, Worthington, Fitzgerald, and Yutzy Ditches (n=16)	493.0	<b>428.8</b>	<b>428.8</b>	1897	<b>1810</b>	<b>1810</b>
<b>Little Darby Creek (headwaters to Big Darby Creek) [050600001 210] (n=132)</b>	476.5	<b>430.0</b>	<b>430.0</b>	<b>3790</b>	<b>3723</b>	<b>3723</b>
Little Darby Creek (mainstem) (n=49)	207.5	<b>158.6</b>	158.6	967	<b>928</b>	<b>928</b>
Clover Run, Lake Run, Jumping Run (n=15)	782.1	<b>842.6</b>	<b>842.6</b>	<b>4282</b>	<b>3363</b>	<b>3363</b>
Treacle Creek incl. Howard Run and Proctor Run (n=40)	641.0	<b>522.3</b>	<b>522.3</b>	<b>3329</b>	<b>2708</b>	<b>2708</b>
Howard Run and Proctor Run (n=20)	600.0	<b>530.5</b>	<b>530.5</b>	<b>4029</b>	<b>4273</b>	<b>4273</b>
Howard Run (n=5)	833.9	<b>806.7</b>	<b>806.7</b>	1097	<b>1720</b>	<b>1720</b>
Proctor Run (n=15)	537.6	<b>461.3</b>	<b>461.3</b>	<b>7075</b>	<b>6750</b>	<b>6750</b>
Treacle Creek (n=20)	684.8	<b>514.3</b>	<b>514.3</b>	1864	<b>2300</b>	<b>2300</b>
Spring Fork incl. Bales Ditch and Barron Creek (n=28)	<b>1025.0</b>	<b>988.0</b>	<b>988.0</b>	<b>17108</b>	<b>12741</b>	<b>12741</b>
Spring Fork incl. Bales Ditch (n=23)	526.3	<b>553.5</b>	<b>553.5</b>	<b>4733</b>	<b>5258</b>	<b>5258</b>
Barron Creek (n=5)	<b>21999.7</b>	<b>14203.1</b>	<b>14203.1</b>	<b>40166</b>	<b>39952</b>	<b>39952</b>

Unit	Geometric Mean			90 <sup>th</sup> Percentile		
	FC	EC		FC	EC	
<i>Recreation Standard</i>	1000	126 <sub>a</sub>	336 <sub>b</sub>	2000	298 <sub>a</sub>	626 <sub>b</sub>
<b>Lower Big Darby Creek (Little Darby Creek to the Mouth) [05060001 220]</b> (n=122)	340.6	<b>315.3</b>	315.3	1690	<b>1202</b>	<b>1202</b>
Lower Big Darby Creek RM 27.0-3.1 (mainstem) (n=30)	104.3	116.6	116.6	292	221	221
Smith Ditch and tribs. (n=10)	377.1	<b>352.1</b>	<b>352.1</b>	955	<b>851</b>	<b>851</b>
Hellbranch Run and tribs. incl. Springwater Run (n=54)	602.2	<b>514.0</b>	<b>514.0</b>	<b>2200</b>	<b>2606</b>	<b>2606</b>
Hellbranch Run and tribs. (n=49)	541.8	<b>506.3</b>	<b>506.3</b>	<b>2038</b>	<b>2457</b>	<b>2457</b>
Springwater Run (n=5)	<b>1694.6</b>	<b>382.3</b>	<b>382.3</b>	<b>6534</b>	<b>1565</b>	<b>1565</b>
Unnamed Trib. at RM 20.20 (n=5)	606.1	<b>548.1</b>	<b>548.1</b>	1739	<b>1477</b>	<b>1477</b>
Georges Run and Greenbrier Creek (n=13)	335.3	<b>280.6</b>	280.6	730	<b>679</b>	<b>679</b>
FC = Fecal Coliform bacterial standard found in the Ohio Water Quality Standards (WQS), (OAC 3745 -1) EC = <i>E. coli</i> bacteria a = The current <i>E. coli</i> primary contact recreation (PCR) standard found in the Ohio WQS b = A target <i>E. coli</i> value under evaluation as a more appropriate concentration for streams designated PCR n = # of observations boldface type indicates non-attainment of the recreational use, or a value exceeding the target						