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Ohio Environmental Protection Agency
Division of Surface Water

Biological and Water Quality Study of the Portage River Basin, Select Lake Erie Tributaries, and Select Maumee River Tributaries, 2006 - 2008

Watershed Assessment Units 04100010 01, 02, 03, 04, 05, 07, and 04100009 09

Hancock, Lucas, Ottawa, Sandusky, Seneca and Wood Counties

OHIO EPA Technical Report EAS/2010-4-4

Ted Strickland, Governor
Lee Fisher, Lt. Governor
Chris Korleski, Director

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Hancock, Lucas, Ottawa, Sandusky, Seneca,
and Wood Counties, Ohio

March 9, 2010
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Prepared by

State of Ohio Environmental Protection Agency
Division of Surface Water
Lazarus Government Center
50 West Town Street, Suite 700
P.O. Box 1049
Columbus, Ohio 43216-1049

State of Ohio Environmental Protection Agency
Northwest District Office
347 North Dunbridge Road
Bowling Green, Ohio 43402

Mail to:
P.O. Box 1049, Columbus, Ohio 43216-1049

Ted Strickland, Governor
State of Ohio

Chris Korleski, Director
Environmental Protection Agency

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SUMMARY

All rivers and streams in Ohio are used for various purposes such as recreation or to support aquatic life. Ohio EPA evaluates each stream to determine the appropriate use designation and to also determine if the use is meeting the goals of the federal Clean Water Act. Thirty streams in the study area were evaluated for aquatic life and recreational use potential between 2006 and 2008 (see Figure 1 and Table 1 for sampling locations). Twenty-two of the streams listed in the Ohio Water Quality Standards for the study area are assigned the Warmwater Habitat (WWH) aquatic life use designation and four previously undesignated streams are being recommended for the WWH aquatic life use designation (Table 23). Otter Creek is the only stream designated Modified Warmwater Habitat (MWH) in the study area. Wolf Creek/William Ditch (tributary to Cedar Creek at RM .01) will retain the Limited Resource Water (LRW) aquatic life use designation, while two tributaries to Rocky Ford Creek are being recommended for WWH though their existing use is LRW. The two tributaries to Rocky Ford Creek are also being recommended for Primary Contact Recreation rather than the existing Secondary Contact Recreation Use. All remaining streams in this study should retain the Primary Contact Recreation use or Secondary Contact Recreation use, along with the Agricultural and Industrial uses (Table 23).

Nearly half of the sites within the Portage River basin did not meet the Clean Water Act biological integrity goal, as only 54% were in full attainment, 27% were in partial attainment, and 19% were in non-attainment of the assigned/recommended aquatic life use designation (Table 2). While 60% of the Portage River mainstem was in full attainment, siltation and nutrient/eutrophication from the surrounding agricultural activities combined with point sources, such as Brush Wellman and various wastewater treatment plants (WWTPs), contributed to the partial attainment (10%) and non-attainment (30%) noted in the lower reach of the mainstem. Portage River tributaries were negatively influenced by the surrounding agricultural landscape and poor sewage treatment with only 53% of sites in full attainment, 29% in partial attainment and 17% in non-attainment.

Specific point source and non-point source pollution related issues which should be addressed to improve water quality throughout the Portage River basin include the following.

- Fostoria has increased its discharge of ammonia in recent years, likely due to inadequate denitrification at the WWTP. This, in addition to the CSOs, should be addressed in order to improve water quality within the East Branch Portage River.

- Controls to reduce nitrate levels in source water obtained from the East Branch Portage River would be of great benefit to lake water quality and also reduce the cost of drinking water treatment. This would benefit Fostoria and other communities that rely on the East Branch Portage River for their drinking water supply.

- Elevated levels of PAHs were found in the sediments of the East Branch Portage River downstream from Fostoria. A request was made to Ohio EPA's Division of Emergency and Remedial Response (DERR) on January 25, 2010 to conduct a site assessment of the former Fostoria City Dump, aka Portage Park, to determine if there is an impact on the East Branch Portage River.

- Brush Wellman continues to negatively impact the water quality of the Portage River, accounting for 6 water quality violations in 2008: 4 for acute whole effluent toxicity (2 for *C. dubia* and 2 for *P. promelas*) and 2 for copper. The source of these violations should be addressed and possible limits on nitrate should be examined during the NPDES renewal process. In addition, legacy and potential ongoing PCB contamination within the sediments and fish of the Portage River are likely in part attributable to Brush Wellman. PCBs were again detected in a water sample of Hyde Run in 2008, so it is recommended that PCB monitoring be reinstated in the NPDES permit.

- Construction activities during the sampling period at the Port Clinton WWTP may be responsible for recent ammonia spikes. Now that construction is completed, follow-up sampling should be conducted to make sure that adequate treatment is occurring.

- Proposed 'cleaning' of 46 miles of the East Branch Portage River and South Branch Portage River will result in decreased aquatic life use attainment for these streams and increased nutrient loads to Lake Erie Western Basin. Outreach efforts with county engineers and the agricultural community should be undertaken to determine if alternatives to traditional stream cleaning should be utilized for this project.

- Construction of the Risingsun WWTP was completed after the 2008 sampling, so the potential positive influence of this newly sewered area on the water chemistry of Sugar Creek is as of yet undocumented. Water chemistry results from 2008 showed evidence of nutrient enrichment, though the degree of influence from Risingsun was undetermined.

- The two-stage channels constructed near Needles Creek RM 8.35 and Bull Creek RM 8.45 were judged inadequate in channel width and size of constructed benches to provide aquatic life use benefits in the form of adequate habitat for macroinvertebrates. Future projects may need additional width in order to act as adequate depositional areas for sediment and nutrients to improve water quality. Incorporation of habitat features to benefit aquatic life should be considered if attainment of WWH criteria is a goal in future two-stage channel projects.

- Failing home sewage treatment systems (HSTS) and unsewered areas, such as the extensive sewage discharge immediately downstream from Rudolph Road into the Middle Branch Portage River, contributed to nutrient and organic enrichment throughout the study area. Additional sites where failing HSTS were observed are listed in Table 2. The sources should be identified and coordination should occur with the appropriate county health departments to correct the problems.

- An unpermitted discharge from Reyskens Dairy was found to be negatively influencing the water quality of Needles Creek in 2008. The dairy has proposed plans to prevent a recurrence of the incident. Future surveys should bracket this facility to determine if the issue was addressed successfully.

- Several CAFOs are at various stages of construction throughout the study area. Baseline data was collected during this survey to determine the potential negative influence these facilities have on water quality once they are in operation.

Maumee River tributaries reflected the surrounding urbanized environment with only 20% of sites in full attainment of the WWH aquatic life use. Siltation and sedimentation resulted in 20% partial attainment and 60% non-attainment for the remaining Maumee River tributaries sites. The Lake Erie tributaries had similar results of attainment with only 21% of sites in full attainment, 32% in partial attainment, and 47% in non-attainment of the Clean Water Act. A combination of urban and industrial sources negatively influenced Otter Creek while agricultural activities and improper sewage treatment negatively influenced the remaining Lake Erie tributaries.

Specific point source and non-point source pollution related issues which should be addressed to improve water quality throughout the select Lake Erie tributaries and Maumee River tributaries include the following.

- Failing HSTS negatively impacted the water quality of South Branch Turtle Creek and Wolf Ditch/Berger Ditch. The sources should be identified and coordination should occur with the appropriate county health departments to correct the problems.

- Contaminated sediments from the surrounding industrial landscape negatively impacted the water quality of Otter Creek. An investigation to determine and address the sources of contamination should be conducted.

- Excessive siltation and sedimentation from storm water run-off have negatively affected the water quality of Duck Creek and Grassy Creek. Pesticides and related run-off contaminants also negatively influenced the water quality of Delaware Creek. Steps should be undertaken to address storm water issues within the watersheds of these streams.

Table 1. Portage River basin, select Maumee River tributaries, and select Lake Erie tributaries sampling locations between 2006-2008. Site number corresponds to sampling location on Figure 1.

Site Number*	RIVER	River Mile	LOCATION	Drainage area	Longitude	Latitude
1	Portage River	35.28	Bridge Street	353	-83.457011	41.409302
2	Portage River	32.1	US 23	418	-83.415472	41.422283
3	Portage River	28.08	Gauge at US 20	429	-83.360589	41.449473
4	Portage River	24.2	Upstream Ohio Turnpike	430	-83.30888	41.466409
5	Portage River	22.13	Downstream Elmore WWTP	432	-83.28676	41.482828
6	Portage River	17.03	SR 590	495	-83.221465	41.491333
7	Portage River	16.5	Mix zone Brush Wellman	496	-83.212347	41.492057
8	Portage River	16.4	Downstream Brush Wellman	496	-83.210509	41.492305
9	Portage River	15.7	Downstream Slemmer-Portage Road	496	-83.198046	41.495192
10	Portage River	14	Adjacent SR 105	497	-83.169747	41.502253
11	Portage River	12.55	SR 19	516	-83.145302	41.505007
12	Portage River	12.3	0.25 mile downstream SR 19	516	-83.141616	41.502593
13	Portage River	11.1	Downstream Oak Harbor WWTP	518	-83.12737	41.504514
14	Portage River	6	0.5 mile Upst L.Portage R.	540	-83.047888	41.507527
15	Portage River	5	Downstream Little Portage	573	-83.029292	41.507543
16	Portage River	3	SR 2	579	-82.991977	41.513099
17	Portage River	0.6	Upstream Port Clinton WWTP	581	-82.946497	41.515442
18	Portage River	0.5	Port Clinton WWTP mix zone	581	-82.944563	41.515398
19	Portage River	0.05	Portage River at mouth	581	-82.936748	41.516363
20	South Branch Portage River	24.77	Co. Road 109	7	-83.5227	41.1228
21	South Branch Portage River	22.58	TR 218	17	-83.5288	41.1401
22	South Branch Portage River	17.77	Stearns Road	32	-83.529459	41.180566
23	South Branch Portage River	14.43	Hall Road	34	-83.513615	41.216754
24	South Branch Portage River	8.35	Portage View Road	54	-83.515888	41.272813
25	South Branch Portage River	4.78	Greensburg Pike	100	-83.50989	41.311313
26	South Branch Portage River	0.5	Kenner Road	110	-83.5028	41.355
27	East Branch Portage River	19.17	TR 214	9.4	-83.4221	41.0937
28	East Branch Portage River	16.1	TR 217	12.3	-83.43792	41.122578
29	East Branch Portage River	12.47	Co. Road 226	15.3	-83.4436	41.1561
30	East Branch Portage River	10.42	WWTP access road bridge	18.4	-83.423985	41.17289
31	East Branch Portage River	9.6	Sterns Road	18.7	-83.432329	41.181501
32	East Branch Portage River	6.18	Eagleville Road	23	-83.460842	41.216902
33	East Branch Portage River	3.1	Cygnet Road	26	-83.493603	41.242804
34	East Branch Portage River	0.8	Bays Road	35.5	-83.5067	41.2681
35	Middle Branch Portage River	15.32	Jerry City Road	64	-83.7327	41.2549
36	Middle Branch Portage River	10.9	Rudolph Road	73	-83.669741	41.295818
37	Middle Branch Portage River	8.64	Solether Road	95	-83.631403	41.307314
38	Middle Branch Portage River	3.45	Bloomdale Road	216	-83.552846	41.338415
39	Middle Branch Portage River	0.55	Caskie Road	224	-83.513514	41.359426
40	Needles Creek	8.3	Hancock-Wood County Road	11	-83.824339	41.168701
41	Needles Creek	5.14	SR 18	17	-83.7926	41.2045
42	Needles Creek	1.25	Cygnet Road	32	-83.7504	41.2412
43	Rader Creek	13.55	Reservoir access road	2.6	-83.780575	41.106702
44	Rader Creek	10.92	Co. Road 203	7.3	-83.7835	41.1382
45	Rader Creek	5.2	Needles Road	18.1	-83.7566	41.1973
46	Rader Creek	0.8	Cygnet Road	32.1	-83.736765	41.240844
47	Trib to Rader Creek at RM 4.03	0.7	Needles Road	2.1	-83.739554	41.197366
48	Trib to Rader Creek at RM 4.37	0.45	Needles Road	6.3	-83.746248	41.19734

Site Number*	RIVER	River Mile	LOCATION	Drainage area	Longitude	Latitude
49	Algire Creek	1.78	Main St (in McComb)	2.3	-83.799806	41.106795
50	Algire Creek	0.1	Adjacent SR 235, farm lane	3	-83.785161	41.126025
51	Rocky Ford Creek	21.12	Co. Road 109	7.6	-83.5553	41.1231
52	Rocky Ford Creek	19.53	Co. Road 18	16.2	-83.5799	41.1309
53	Rocky Ford Creek	15.04	Co. Road 220	23	-83.649492	41.132048
54	Rocky Ford Creek	11.87	TR 114	32	-83.668325	41.160321
55	Rocky Ford Creek	10.74	SR 18, Downstream Fenburg #1	56	-83.675303	41.173509
56	Rocky Ford Creek	9.8	Upstream North Baltimore WWTP	57	-83.663725	41.182312
57	Rocky Ford Creek	5.1	Cygnet Road	66	-83.649527	41.240187
58	Rocky Ford Creek	1.59	Solether Road	72.8	-83.630871	41.285537
59	Trib. to Rocky Ford (RM 10.75)	3.57	TR 112 (Bridge is out)	8.9	-83.7293	41.1459
60	Trib. to Rocky Ford (RM 10.75)	2	Co. Road 139	18.7	-83.7081	41.1603
61	Trib. to Rocky Ford (RM 10.75/1.99)	1.8	Adj. Co. Road 139	7.5	-83.7083	41.1339
62	Bull Creek	8.45	Huffman Road	8.3	-83.593438	41.189803
63	Bull Creek	3.89	Jerry City Road	19	-83.6113	41.2538
64	Bull Creek	0.64	Greensburg Pike	29.8	-83.5858	41.3111
65	North Branch Portage River	25.85	Jerry City Road	8.1	-83.786619	41.255465
66	North Branch Portage River	21.96	Mermill Road	14.3	-83.7418	41.2988
67	North Branch Portage River	17.92	Rudolph Road	24	-83.669468	41.311733
68	North Branch Portage River	13.55	Linwood Road	34	-83.6169	41.3492
69	North Branch Portage River	8.6	Upstream Poe Ditch (SR 105)	40	-83.571517	41.383899
70	North Branch Portage River	8.55	Bowling Green WWTP mix zone	46	-83.570673	41.384869
71	North Branch Portage River	6.55	Silverwood Road	48	-83.542505	41.394014
72	North Branch Portage River	0.08	River Road	59.1	-83.4586	41.4103
73	Sugar Creek	21.31	Greensburg Pike	12	-83.394	41.3124
74	Sugar Creek	18.5	U.S. Rt. 6	17	-83.37	41.3408
75	Sugar Creek	13.38	Anderson Road (CR 32)	35	-83.3582	41.3959
76	Sugar Creek	8.8	Downstream US 20	51	-83.330229	41.437178
77	Sugar Creek	3.65	Elmore-Eastern Road	56	-83.275451	41.472341
78	Sugar Creek	0.8	Hessville Road	58	-83.2411	41.4867
79	Coon Creek	0.34	Anderson Road (CR 32)	7.8	-83.3581	41.4069
80	Wolf Creek	6.51	Yeasting Road	9.2	-83.2559	41.4652
81	Hyde Run	0.02	Portage River South Road	0.5	-83.212977	41.491602
82	Little Portage River	6.2	County Road 169	21.2	-83.125886	41.47783
83	Little Portage River	1.79	Co. Road 17 (lacustuary)	30	-83.0539	41.4864
84	Ninemile Creek	5	Hessville Road (TR 92)	7.9	-83.239159	41.429459
85	Ninemile Creek	2.93	Dunmyer Road (CR 141)	8.7	-83.2121	41.4436
86	Cedar Creek	20.77	Oregon Road	12.1	-83.538433	41.524949
87	Cedar Creek	17.32	E. Broadway Road	18.5	-83.5122	41.5656
88	Cedar Creek	14.5	LeMoyne Road	23.2	-83.473794	41.589472
89	Cedar Creek	9.59	Billman Road	38.6	-83.39613	41.611603
90	Cedar Creek	7.9	Wildacre Road	44	-83.367362	41.618053
91	Cedar Creek	4.27	Yondota Road (lacustuary)	48	-83.312208	41.632836
92	Ditch to Cedar Creek (7.91)	0.01	Adjacent to Railroad	0.1	-83.367707	41.617833
93	Dry Creek	7	East Broadway Road	8.2	-83.5125	41.5869
94	Dry Creek	0.01	at mouth	13.8	-83.3972	41.6119
95	Wolf Creek/Williams Ditch	1.7	Yondota Road (lacustuary)	7.6	-83.3125	41.6677
96	Crane Creek	18.82	Hanley Road	9	-83.463475	41.52928
97	Crane Creek	15.38	Collins Road (Cherry Street)	19.9	-83.427321	41.565949
98	Crane Creek	8.83	Martin-Williston Road	34	-83.338324	41.611978

Site Number*	RIVER	River Mile	LOCATION	Drainage area	Longitude	Latitude
99	Crane Creek	5.2	Elliston Road (Lacustuary)	42	-83.278706	41.623883
100	Ayers Creek	0.6	Billman Road	3.7	-83.396649	41.599718
101	Trib to Crane Creek	0.42	Billman Road	1.4	-83.397152	41.593429
102	Henry Creek	3.73	Cummins Road	5.5	-83.48136	41.531712
103	Henry Creek	0.25	Bradner Road	7.8	-83.434621	41.563239
104	Turtle Creek	11.62	Nissen Road	21.4	-83.2999	41.5784
105	North Branch Turtle Creek	3	Genoa Clay Center Road	3.9	-83.358579	41.581406
106	North Branch Turtle Creek	0.8	Opfer-Lentz Road	7.8	-83.32	41.5792
107	South Branch Turtle Creek	2.65	Moline Road	10.6	-83.3387	41.5587
108	Wolf Creek/Berger Ditch	6.3	Upstream Curtice Road	2.7	-83.451719	41.615824
109	Wolf Creek/Berger Ditch	2.7	Stadium Road	7.8	-83.4096	41.6485
110	Otter Creek	6	Oakdale Avenue	2.8	-83.5	41.6219
111	Otter Creek	3.1	Yarrow Street/Consaul Street	5.8	-83.47588	41.6586
112	Otter Creek	2.2	Millard Road	6.6	-83.47	41.6689
113	Otter Creek	0.5	CSX Road	7.4	-83.4556	41.6906
114	Duck Creek	4.04	Downstream Burger Street	0.3	-83.496527	41.652032
115	Duck Creek	3.1	Consaul Street	0.5	-83.483724	41.658481
116	Duck Creek	2.42	York Road	0.8	-83.480433	41.665901
117	Grassy Creek	3.9	Buck Road	8.4	-83.5767	41.5869
118	Grassy Creek Diversion	0.3	Grand Rapids Road	14.3	-83.682	41.5406
119	Delaware Creek	0.3	Rohr Drive	2.5	-83.59326	41.60944

*The color of the site number corresponds to the biological score (blue is exceptional to very good (meets EWH goals), green is good to marginally good (meets WWH goals), yellow is fair, orange is poor, and red is very poor (fair, poor, and very poor do not meet the goals of WWH). Unshaded sites were not assessed for biology or aquatic life use performance.

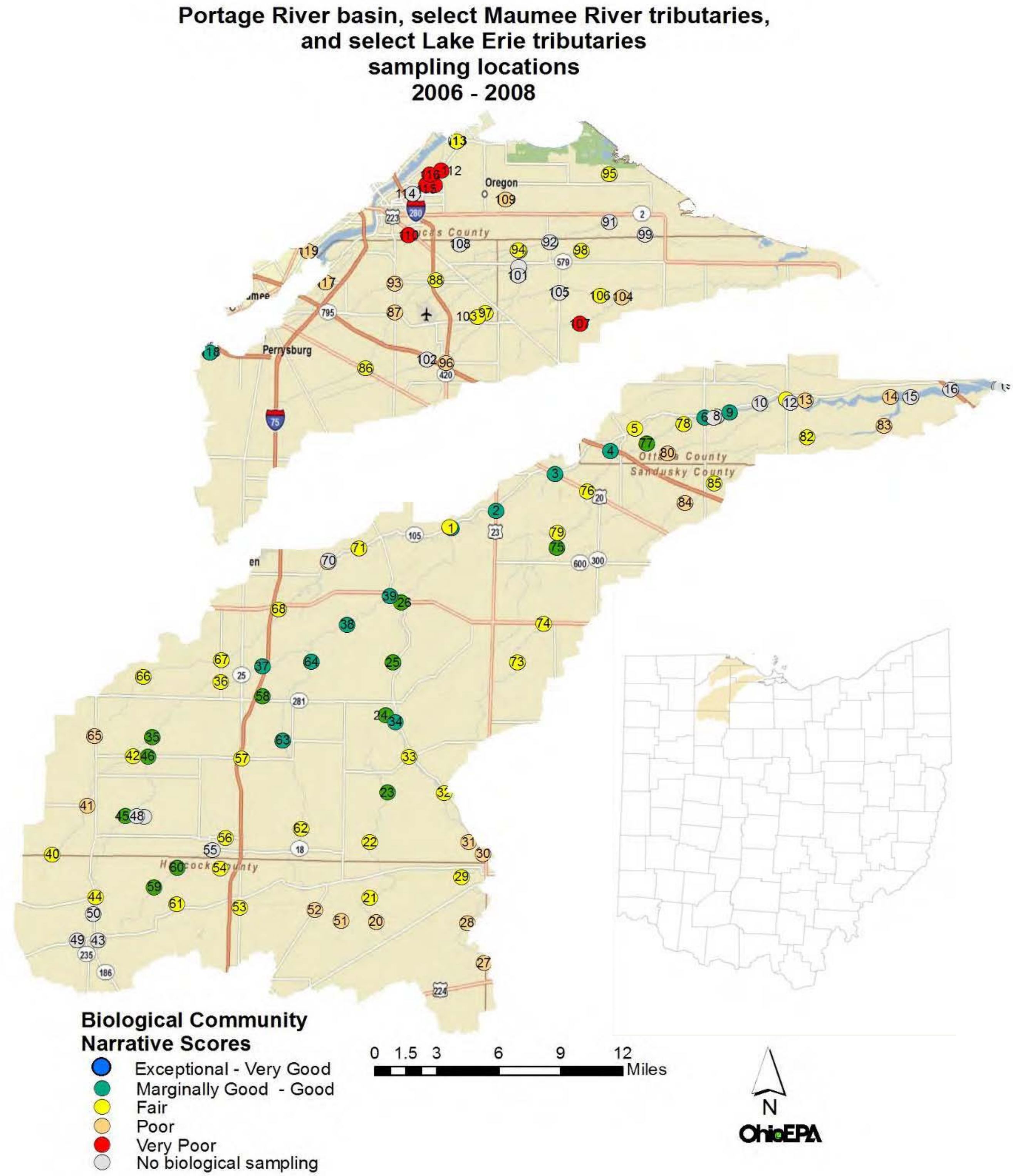

Figure 1. Portage River basin, select Maumee River tributaries and select Lake Erie tributaries sampling locations and biological community performance, 2006 and 2008. Site numbers correspond to Table 1.

Table 2. Aquatic life use attainment status for stations sampled in the Portage River basin and select Lake Erie tributaries based on data collected June-October 2008; and in select Maumee River tributaries from data collected June-October 2006 and 2008. The Index of Biotic Integrity (IBI), Modified Index of well being (MIwb), and Invertebrate Community Index (ICI) are scores based on the performance of the biotic community. The Qualitative Habitat Evaluation Index (QHEI) is a measure of the ability of the physical habitat to support a biotic community. Gray fill indicates sites in the Eastern Corn Belt Plains ecoregion. Yellow fill indicates sites assessed with Lacustuary metrics and breakbpoints; biocriteria are not applicable so attainment status is based on a narrative determination of the designated use using IBI, MIwb, ICI scores adapted to lacustuary and other attributes of the fish and macroinvertebrate community samples. White fill indicates sites in the Huron Erie Lake Plain ecoregion. If biological impairment has occurred, the cause(s) and source(s) of the impairment are noted. NA = not applicable.

Location	STORET (RM)[a]	Drain. (mi²)	IBI	MIwb[b]	ICI[c]	QHEI	Status[d]	Causes	Sources
Portage River (16-001)	**WWH Existing**								
Portage River - Bridge Street	S01S36 (35.28)	353.0[W]	39	7.8	36	53.0	FULL		
Portage River – US 23	S01S12 (32.10)	418.0[W]	43	8.1	46	54.0	FULL		
Portage River – US 20 gauge	500510 (28.08)	429.0[W]	42	7.9	42	42.5	FULL		
Portage River – Upstream Ohio Turnpike	S02S20 (24.20)	430.0[W]	36	9.0	G	68.5	FULL		
Portage River - Downstream Elmore WWTP	300581 (22.10)	432.0[W]	35	6.5*	34	48.5	PARTIAL	Direct habitat alterations	Channelization
Portage River - State Route 590	S02P08 (17.03)	495.0[W]	42	9.0	44	65.5	FULL		
Portage River – Brush Wellman Mix Zone	S02S03 (16.53)	496.0[W]	32	6.5	38	N/A	Mix Zone		
Portage River – Downstream Slemmer-Portage Road	S02S17 (15.70)	496.0[W]	38	8.5	38	47.5	FULL		
Portage River – Downstream State Route 19	S02P06 (12.55)	516.0[B]	32	9.0	26	38.5	**NON**	Nutrient/eutrophication, Siltation, Total PCBs in sediment	Upstream sources, Brush Wellman
Portage River – Downstream Oak Harbor WWTP	S02S14 (11.10)	518.0[B]	36	9.5	20	32.5	**NON**	Nutrient/eutrophication, Siltation, Total PCBs in sediment	Upstream sources, Brush Wellman

Location	STORET (RM)[a]	Drain. (mi²)	IBI	MIwb[b]	ICI[c]	QHEI	Status[d]	Causes	Sources
Portage River – Upstream Little Portage River	S99Q01 (6.00)	540.0[B]	22	6.9	18	26.0	**NON**	Nutrient/eutrophication Siltation	Upstream sources
South Branch Portage River (16-100) Tributary to Portage River at RM 40.84 - WWH Existing									
South Branch Portage River – County Road 109	S01K07 (24.77)	7.0[H]	28	N/A	P*	48.0	**NON**	Direct habitat alterations, Siltation, High TDS	Non-irrigated crop production, Channelization, Source unknown
South Branch Portage River – Township Road 218	S01K06 (22.58)	17.0[H]	38	N/A	LF*	56.0	PARTIAL	Siltation, Organic enrichment (sewage) biological indicators	Non-irrigated crop production, Channelization, On-site treatment systems
South Branch Portage River – Stearns Road	S01K05 (17.77)	32.0[W]	34	7.1[ns]	30[ns]	64.5	FULL		
South Branch Portage River – Hall Road	S01K04 (14.43)	34.0[W]	35	7.6	38	63.5	FULL		
South Branch Portage River – Portage View Road	S01P10 (8.35)	54.0[W]	41	8.2	MG[ns]	60.5	FULL		
South Branch Portage River – Greensburg Pike	S01P14 (4.78)	100.0[W]	37	9.1	36	65.0	FULL		
South Branch Portage River – Kenner Road	S01S19 (0.50)	110.0[W]	42	7.8	46	71.0	FULL		
East Branch Portage River (16-105) Tributary to South Branch Portage River at RM 7.87 – WWH Existing									
East Branch Portage River – Township Road 214	S01K21 (19.17)	9.4[H]	20*	N/A	F*	43.0	**NON**	Low flow alterations, Organic and nutrient enrichment, Siltation	Non-irrigated crop production, Manure runoff
East Branch Portage River – Township Road 217	300373 (16.10)	12.3[H]	26[ns]	N/A	LF*	47.5	PARTIAL	Low flow alterations, Siltation	Non-irrigated crop production, Channelization
East Branch Portage River – County Road 226	S01S30 (12.47)	15.3[H]	28	N/A	MG[ns]	51.0	FULL		
East Branch Portage River – WWTP access road	S01P02 (10.42)	18.4[H]	22*	N/A	LF*	58.5	**NON**	Organic enrichment	Fostoria CSOs
East Branch Portage River – Sterns Road	S01P03 (9.60)	18.7[H]	22*	N/A	P*	47.5	**NON**	Ammonia-N, Nitrate/nitrite as N	Fostoria WWTP and CSOs

Location	STORET (RM)[a]	Drain. (mi²)	IBI	MIwb[b]	ICI[c]	QHEI	Status[d]	Causes	Sources
East Branch Portage River – Eagleville Road	S01P05 (6.18)	23.0^{W}	29	6.9^{ns}	42	78.5	FULL		
East Branch Portage River – Cygnet Road	S01P07 (3.10)	26.0^{W}	32	7.2^{ns}	42	68.0	FULL		
East Branch Portage River – Bays Road	S01P09 (0.80)	35.0^{W}	40	8.0	42	60.0	FULL		
Middle Branch Portage River (16-101) Tributary to Portage River at RM 40.83 – WWH Existing									
Middle Branch Portage River - Jerry City Road	S01K09 (15.32)	64^{W}	36	8.6	MG^{ns}	30.0	FULL		
Middle Branch Portage River - Rudolph Road	201099 (10.90)	73^{W}	29	7.4	G	50.0	FULL	Comment - Though biological indicators were in full attainment of the WWH aquatic life use, organic enrichment (sewage and sewage fungus) was noted downstream from the bridge and is likely attributable to failing on-site treatment systems.	
Middle Branch Portage River - Solether Road	S01S44 (8.64)	95^{W}	42	8.9	G	52.5	FULL	Comment - Failing on-site treatment systems noted in this location.	
Middle Branch Portage River - Bloomdale Road	S01K08 (3.45)	216^{W}	44	9.1	48	37.5	FULL		
Middle Branch Portage River - Caskie Road	S99Q04 (0.55)	224^{W}	42	8.2	44	53.5	FULL		
Needles Creek (16-104) Tributary to Middle Branch Portage River at RM 15.50 – WWH Existing									
Needles Creek – Hancock-Wood County Road	S01S25 (8.35)	11.0^{H}	34	N/A	F*	30.5	PARTIAL	Low flow alterations, Direct habitat alterations	Non-irrigated crop production, Channelization
Needles Creek – State Route 18	S01P30 (5.14)	17.0^{H}	26^{ns}	N/A	MG^{ns}	44.5	FULL		
Needles Creek – Cygnet Road	S01S48 (1.25)	32.0^{W}	38	8.7	F*	45.5	PARTIAL	Low flow alterations, Direct habitat alterations, Siltation	Non-irrigated crop production, Channelization

Rader Creek (16-111) Tributary to Middle Branch Portage River at RM 15.50 – Undesignated/Recommend WWH									
Rader Creek – County Road 203	S01S26 (10.92)	7.3 H	46	N/A	LF*	37.5	PARTIAL	Ammonia-N, Nitrate/nitrite as N, Phosphorus (total), Dissolved oxygen, High pH, Direct habitat alterations, Siltation	McComb WWTP, Non-irrigated crop production, Channelization
Rader Creek – Needles Road	S01S24 (5.20)	18.1 H	38	N/A	MG ns	35.0	FULL		
Rader Creek – Cygnet Road	201109 (0.80)	32 W	39	8.7	MG ns	40.5	FULL		
Rocky Ford Creek (16-103) Tributary to Middle Branch Portage River at RM 8.23 – WWH Existing									
Rocky Ford Creek – County Road 109	S01K12 (21.12)	7.6 H	18*	N/A	LF*	39.5	**NON**	Siltation	Non-irrigated crop production, Channelization
Rocky Ford Creek – County Road 18	S01K11 (19.53)	16.2 H	22*	N/A	F*	58.0	**NON**	Siltation	Non-irrigated crop production
Rocky Ford Creek – County Road 220	S01S06 (15.04)	23 W	36	7.8	LF*	66.0	PARTIAL	Low flow alteration	Van Buren Lake
Rocky Ford Creek – Township Road 114	S01S05 (11.87)	31 W	30	7.0 ns	20*	42.0	PARTIAL	Siltation	Non-irrigated crop production, Channelization
Rocky Ford Creek – Upstream North Baltimore WWTP	S01S04 (9.80)	57 W	44	8.7	F*	70.5	PARTIAL	Low flow alteration	Non-irrigated crop production
Rocky Ford Creek – Cygnet Road	S01P28 (5.10)	66 W	35	7.6	26*	35.0	PARTIAL	Direct habitat alterations, Siltation	Non-irrigated crop production, Channelization
Rocky Ford Creek – Solether Road	300372 (1.59)	72 W	39	9.0	34	46.0	FULL		
Tributary to Rocky Ford Creek at RM 10.75 (16-112) Existing LRW/Recommend WWH									
Tributary to Rocky Ford Creek at RM 10.75 – Township Road 112	S01K13 (3.57)	8.9 H	38	N/A	MG ns	41.5	FULL		
Tributary to Rocky Ford Creek at RM 10.75 – County Road 139	201105 (2.00)	18.7 H	38	N/A	G	39.0	FULL		

Tributary to a tributary of Rocky Ford Creek RM 10.75 at RM 1.99 (16-113) Existing LRW/Recommend WWH									
Tributary to a tributary of Rocky Ford Creek RM 10.75 at RM 1.99 – County Road 139	201106 (1.80)	7.5^{H}	34	N/A	MG^{ns}	50.5	FULL		
Bull Creek (16-102) Tributary to Middle Branch Portage River at 6.1 – WWH Existing									
Bull Creek – Huffman Road	S99Q05 (8.45)	8.3^{H}	34	N/A	F*	43.5	PARTIAL	Direct habitat alterations, Siltation	Non-irrigated crop production, Channelization
Bull Creek – Jerry City Road	S01K10 (3.89)	19.0^{H}	42	N/A	G	56.5	FULL		
Bull Creek – Greensburg Pike	S01S45 (0.64)	29.8^{W}	38	9.1	G	40.5	FULL		
North Branch Portage River (16-007) Tributary to Portage River at RM 35.31 – WWH Existing									
North Branch Portage River - Jerry City Road	S01K03 (25.85)	8.1^{H}	22*	N/A	P*	29.0	**NON**	Dissolved oxygen, Phosphorus (total), Direct habitat alterations, Siltation	Non-irrigated crop production, Channelization
North Branch Portage River - Mermill Road	S01K02 (21.96)	14.3^{H}	34	N/A	LF*	25.5	PARTIAL	Direct habitat alterations, Siltation	Non-irrigated crop production, Channelization
North Branch Portage River – Rudolph Road	S01S40 (17.92)	24.0^{W}	31	7.5	30^{ns}	34.0	FULL		
North Branch Portage River - Linwood Road	S01S11 (13.55)	34.0^{W}	41	6.8^{ns}	26*	43.0	PARTIAL	Siltation	Non-irrigated crop production, Channelization
North Branch Portage River - State Route 105	S01K01 (8.60)	46.0^{W}	35	6.4*	8*	31.5	**NON**	Siltation	Non-irrigated crop production, Channelization
North Branch Portage River – Silverwood Road	S01S10 (6.55)	48.0^{W}	35	7.9	26*	38.0	PARTIAL	Nitrate/nitrite as N, Phosphorus (total), Siltation	Bowling Green WWTP, Non-irrigated crop production, Channelization
North Branch Portage River – River Road	500520 (0.08)	59.0^{W}	38	7.0^{ns}	MG^{ns}	64.5	FULL		
Sugar Creek (16-006) Tributary to Portage River at RM 17.5 – WWH Existing									
Sugar Creek - Greensburg Pike	S02K05 (21.31)	12.0^{H}	30	N/A	MG^{ns}	34.5	FULL		

Sugar Creek – US 6	201092 (18.50)	17.0 H	32	N/A	G	38.5	FULL		
Sugar Creek – Anderson Road	S02S26 (13.38)	35.0 W	35	8.7	52	38.0	FULL		
Sugar Creek – US 20	S02S25 (8.80)	51.0 W	42	7.2ns	42	67.0	FULL		
Sugar Creek – Elmore-Eastern Road	S02P01 (3.65)	56.0 W	49	8.0	MGns	64.5	FULL		
Sugar Creek – Hessville Road	300371 (0.80)	58.0 W	42	7.2ns	38	69.0	FULL		
Coon Creek (16-012) Tributary to Sugar Creek at RM 12.4 – Undesignated /Recommend WWH									
Coon Creek – Anderson Road	S02K06 (0.34)	7.8 H	28	N/A	LF*	30.5	PARTIAL	Nutrient/eutrophication, Direct habitat alterations, Siltation	Non-irrigated crop production, Channelization
Wolf Creek (16-005) Tributary to Portage River at RM 13.82 – WWH Existing									
Wolf Creek – Yeasting Road	S02K04 (6.51)	9.2 H	30	N/A	P*	40.5	**NON**	Phosphorus (total), Siltation	Gibsonburg WWTP, Non-irrigated crop production, Channelization
Little Portage River (16-002) Tributary to Portage River at RM 5.5 – WWH Existing									
Little Portage River – County Road 169	S02P04 (6.20)	21 W	31	7.1ns	20*	33.0	PARTIAL	Siltation	Non-irrigated crop production, Channelization
Little Portage River – County Road 17	S02S23 (1.79)	30 B	23	7.7	14	43.5	**NON**	Siltation, Nutrient/eutrophication	Upstream sources of Non-irrigated crop production
Ninemile Creek (16-003) Tributary to Little Portage River at RM 9.10 – WWH Existing									
Ninemile Creek – Hessville Road	S02K02 (5.00)	7.8 H	24NS	N/A	LF*	26.0	PARTIAL	Low flow alterations, Direct habitat alterations, Siltation, Nutrient/eutrophication	Non-irrigated crop production, Channelization
Ninemile Creek – Dunmyer Road	S02K01 (2.93)	8.7 H	30	N/A	LF*	43.5	PARTIAL	Low flow alterations, Direct habitat alterations, Siltation	Non-irrigated crop production, Channelization

Cedar Creek (16-202) Tributary to Lake Erie – WWH Existing									
Cedar Creek – Oregon Road	S03S34 (20.77)	12.1^{H}	30	N/A	F*	45.0	PARTIAL	Phosphorus (total), Siltation	Non-irrigated crop production, Channelization
Cedar Creek – East Broadway Road	S03S60 (17.32)	18.5^{H}	26^{ns}	N/A	MG^{ns}	33.0	FULL		
Cedar Creek – LeMoyne Road	S03S46 (14.50)	23^{W}	32	6.7*	32^{ns}	38.0	PARTIAL	Siltation	Non-irrigated crop production, Channelization
Cedar Creek – Billman Road	S03S44 (9.59)	38^{W}	28	6.7*	42	51.5	PARTIAL	Siltation	Non-irrigated crop production, Channelization
Dry Creek (16-203) Tributary to Cedar Creek at RM 9.58 – WWH Existing									
Dry Creek – East Broadway Road	S03S68 (7.00)	8.2^{H}	22*	N/A	LF*	26.5	**NON**	Ammonia-N, Dissolved oxygen, Organic enrichment, Siltation, Phosphorus (total)	On-site treatment systems, Non-irrigated crop production, Channelization
Dry Creek – at mouth	S03S48 (0.01)	13.8^{H}	32	N/A	F*	50.0	PARTIAL	Siltation	Non-irrigated crop production, Channelization
Wolf Creek/Williams Ditch (16-223) Tributary to Cedar Creek at RM .01 – LRW Existing/ Recommend WWH									
Wolf Creek/Williams Ditch – Yondota Road	201144 (1.70)	7.6^{B}	40	8.8	-	31.0	(FULL)		
Crane Creek (16-205) Tributary to Lake Erie – WWH Existing									
Crane Creek – Hanley Road	S03P21 (18.82)	9.0^{H}	24^{ns}	N/A	P*	29.5	**NON**	Phosphorus (total), Siltation	Urban runoff, Channelization
Crane Creek – Collins Road	S03K02 (15.38)	19.9^{H}	28	N/A	30^{ns}	55.0	FULL		
Crane Creek – Martin-Willston Road	S03G21 (8.83)	34.0^{W}	28	7.1^{NS}	40	52.5	FULL		
Henry Creek (16-208) Tributary to Crane Creek at RM 15.55 – WWH Existing									
Henry Creek – Bradner Road	201118 (0.25)	7.8^{H}	28	N/A	F*	34.0	PARTIAL	Phosphorus (total), Siltation	Urban runoff, Channelization
Turtle Creek (16-210) Tributary to Lake Erie – WWH Existing									
Turtle Creek – Nissen Road	S03K05 (11.62)	21.0^{W}	24^{ns}	5.6*	24*	30.5	**NON**	Phosphorus (total), Siltation	Non-irrigated crop production, Channelization

North Branch Turtle Creek (16-211) Tributary to Turtle Creek at RM 11.95 – WWH Existing									
North Branch Turtle Creek – Opfer-Lentz Road	201124 (0.80)	7.8[H]	28	N/A	F*	31.5	PARTIAL	Direct habitat alterations, Siltation	Non-irrigated crop production, Channelization
South Branch Turtle Creek (16-212) Tributary to Turtle Creek at RM 11.96 – WWH Existing									
South Branch Turtle Creek – Moline Road	S03K07 (2.65)	10.6[H]	16*	N/A	F*	39.5	**NON**	Ammonia-N, Dissolved oxygen, Phosphorus (total)	On-site treatment systems
Wolf Ditch/Berger Ditch (16-201) Tributary to Lake Erie – Undesignated / Recommend WWH									
Wolf Ditch/Berger Ditch – Stadium Road	201111 (2.70)	7.8[H]	34	N/A	P*	34.5	**NON**	Phosphorus (total), Organic enrichment, Siltation	On-site treatment systems, Channelization
Otter Creek (16-200) Tributary to Lake Erie – MWH Existing									
Otter Creek – Oakdale Avenue	S03P12 (6.0)	2.8[H]	16*	N/A	VP*	23.0	**NON**	Siltation/sedimentation; Cu, Pb, Zn, As, 4,4'-DDD, 4,4'-DDE, Chlordane, and total PAHs in sediments	Industrial runoff, Contaminated sediments, Channelization
Otter Creek – Yarrow Street / Consaul Street	S03P08 (3.1/3.0)	5.8[H]	18*	N/A	VP*	25.5	**NON**	Siltation/sedimentation; Cr, Cu, Pb, Zn, Hg, As, Cd, 4,4'-DDD, Chlordane, and total PAHs in sediments	Industrial landfills, Contaminated sediments, Channelization
Otter Creek – Millard Road	S03P05 (2.2/2.1)	6.6[H]	28	N/A	VP*	30.0	**NON**	Siltation/sedimentation; Cr, Cu, Pb, Zn, Hg, As, 4,4'-DDD, Chlordane, total PCBs, and total PAHs in sediments	Industrial landfills, Contaminated sediments, Channelization
Otter Creek – Adjacent CSX Road near mouth	S03S25 (0.5)	7.4[B]	36	8.0	-	35.0	**(NON)**	Siltation/sedimentation; Cr, Cu, Pb, Zn, Hg, As, Cd, 4,4'-DDD, 4,4'-DDE, Chlordane, and total PAHs in sediments	Industrial landfills, Contaminated sediments, Channelization
Duck Creek (04-002) Tributary to Maumee River at RM 0.7 - WWH Existing									
Duck Creek – Consaul Street	P11K22 (3.10)	0.6[H]	12*	N/A	VP*	30.0	**NON**	Siltation/sedimentation	Urban runoff, Channelization
Duck Creek – York Street	P11S56 (2.52)	0.8[H]	12*	N/A	VP*	22.0	**NON**	Siltation/sedimentation	Urban runoff, Channelization

Grassy Creek (04-012) Tributary to Maumee River at RM 9.6 - WWH Existing									
Grassy Creek – Buck Road	P11Q07 (3.9/3.8)	8.4 H	<u>24</u>ns	N/A	F*	59.5	PARTIAL	Siltation	Urban runoff, Channelization
Grassy Creek Diversion (04-086) Tributary to Maumee River at RM 17.1 - Undesignated / Recommend WWH									
Grassy Creek Diversion – Grand Rapids Road	P11K19 (0.3)	14.3 H	40	N/A	G	66.5	FULL		
Delaware Creek (04-011) Tributary to Maumee River at RM 9.2 - WWH Existing									
Delaware Creek – Rohr Drive	P11A07 (0.3/0.4)	2.5 H	<u>26</u>ns	N/A	<u>P</u>*	45.0	**NON**	Flow regime alterations, Nitrate/nitrite as N, Phosphorus (total)	Urban runoff

a - River Mile (RM) represents the Point of Record (POR) for the station, not the actual sampling RM.

b - MIwb is not applicable to headwater streams with drainage areas ≤ 20 mi^2.

c - A narrative evaluation of the qualitative sample based on attributes such as EPT taxa richness, number of sensitive taxa, and community composition was used when quantitative data was not available or considered unreliable. VP=Very Poor, P=Poor, LF=Low Fair, F=Fair, MG=Marginally Good, G=Good, VG=Very Good, E=Exceptional

d - Attainment is given for the proposed status when a change is recommended.

ns - Nonsignificant departure from biocriteria (≤4 IBI or ICI units, or ≤0.5 MIwb units).

* - Indicates significant departure from applicable biocriteria (>4 IBI or ICI units, or >0.5 MIwb units). Underlined scores are in the Poor or Very Poor range.

B - Boat site.

H - Headwater site.

W - Wading site.

	Biological Criteria							Lacustuary Benchmarks[1]				
	Eastern Corn Belt Plains			Huron Erie Lake Plain								
Index – Site Type	**EWH**	**WWH**	**MWH**	**EWH**	**WWH**	**MWH**	**LRW**	**Exceptional**	**Good**	**Fair**	**Poor**	**Very Poor**
IBI – Headwaters	50	40	24	50	28	20	18	N/A	N/A	N/A	N/A	N/A
IBI – Wading	50	40	24	50	32	22	18	N/A	N/A	N/A	N/A	N/A
IBI – Boat	48	42	24	48	34	20	16	50	42	31	17	<17
MIwb – Wading	9.4	8.3	6.2	9.4	7.3	5.6	4.5	N/A	N/A	N/A	N/A	N/A
MIwb – Boat	9.6	8.5	5.8	9.6	8.6	5.7	5.0	10	8.6	5.6	2.8	<2.8
ICI	46	36	22	46	34	22	8	52	42	25	12	<12

1- Proposed Lacustuary scoring breakpoints. These have not yet been adopted into rule.

INTRODUCTION

The Portage River Watershed, delineated by United States Geological Survey as 8-digit hydrological unit code (HUC) 04100010, is located in portions of Hancock, Ottawa, Sandusky, Seneca, and Wood Counties in northwest Ohio (Figures 1-3). It is a tributary of the western basin of Lake Erie, bordered by the Maumee River on the west and south, the Sandusky River on the east and the Toussaint River on the north. The study area comprises five HUC-10 watersheds nesting sixteen HUC-12 watersheds. The Portage River has a drainage area of 581mi^2, and had been a heavily forested swamp prior to settlement of the area. A portion of the Portage River watershed lies within the historic range of the Great Black Swamp and was historically dominated by shallow lakes, wet prairies and forests of American elm, black ash, red maple, pin oak, and swamp white oak. The incorporation of drainage practices for agricultural activities led to the alteration of the landscape to be dominated by agricultural fields which continues today. Current domination of the landscape for agricultural purposes was evident as the Portage River basin extended through primarily agricultural lands and was negatively influenced by channelization, non-irrigated crop production, and manure runoff. Portions of the Portage River basin which flowed through industrial or urbanized areas were negatively impacted by WWTPs, on-site treatment systems, channelization, and industrial sources.

The Portage River extends approximately 60 miles from its headwater streams in northern Hancock County, north of Findlay, to its mouth at Lake Erie in Port Clinton. There is little topographic relief in the watershed. The overall stream gradient averages less than three feet per mile, although the upper headwater areas exhibit slopes up to 25 feet per mile (Finkbeiner, Pettis, and Srout, 2002).

The Portage River is fed by four major tributaries, the North Branch, the Middle Branch, the South Branch and the East Branch. The lowest 30 miles of river is characterized by a single channel that meanders to Lake Erie with its final reach from Oak Harbor to Port Clinton essentially an estuary controlled by Lake Erie. Water levels in the shallow western basin of the lake are also influenced by storm induced seiches. Other tributaries in the Portage River basin included Bull Creek, Rocky Ford Creek, Needles Creek, Rader Creek, Sugar Creek, Wolf Creek and Little Portage River.

The adjacent Lake Erie tributaries are also contained within HUC 04100010 and are located in portions of Lucas, Wood and Ottawa Counties in northwest Ohio (Figures 1 and 4). The lower Maumee River tributaries watershed is delineated by the 8-digit HUC 04100009 and is located in Lucas County and Wood County (Figures 1 & 5). Both hydrologic units flow directly to the western basin of Lake Erie and Maumee Bay, respectively. There are four HUC-12 watersheds in the Maumee River tributaries and six HUC-12 watersheds in the Lake Erie tributaries.

The Lake Erie tributaries and Maumee tributaries had drainage areas ≤ $21mi^2$ and were located within the Maumee Area of Concern (AOC). Most of the Lake Erie tributaries extend through primarily agricultural lands and were negatively influenced by channelization, non-irrigated crop production, and manure runoff. Otter Creek and the Maumee tributaries flow through heavily urbanized areas and were impaired by industrial runoff, urban runoff, and channelization.

Figure 2. Portage River basin, select Maumee River tributaries, and select Lake Erie tributaries study area.

Between 2006 and 2008, Ohio EPA conducted a water resource assessment of the Portage River basin, select Maumee River tributaries and select Lake Erie tributaries using standard Ohio EPA protocols as described in Appendix Table A. Included in this study are assessments of the biological, surface water, sediment, and recreational (bacterial) condition. A total of 93 biological, 119 water chemistry, and 31 sediment stations were sampled within the study area.

Specific objectives of the evaluation were to:

- establish the present biological conditions in the study area by evaluating fish and macroinvertebrate communities,
- assess physical habitat influences on stream biotic integrity,
- identify the relative levels of organic, inorganic, and nutrient parameters in the sediments and surface water,
- determine recreational water quality,
- compare present results with historical conditions, and
- determine the attainment status of the various aquatic life use designations and recommend changes if appropriate.

The vast majority of the study area is located in the Huron-Erie Lake Plain (HELP) ecoregion and most streams are currently assigned the WWH aquatic life use designation in the Ohio Water Quality Standards (WQS), as well as Primary Contact Recreation (PCR), Agricultural Water Supply (AWS) and Industrial Water Supply (IWS). The most upstream portion of the East Branch Portage River lies within the Eastern Corn Belt Plains (ECBP) ecoregion and has the WWH designation, while Otter Creek has the MWH aquatic life use designation. In addition to WWH and MWH streams, several streams were evaluated as to the appropriateness of the LRW aquatic life use designation.

The findings of this evaluation may factor into regulatory actions taken by the Ohio EPA (e.g. National Pollution Discharge Elimination System (NPDES) permits, Director's Orders, or the Ohio Water Quality Standards [OAC 3745-1]), and may eventually be incorporated into State Water Quality Management Plans, the Ohio Nonpoint Source Assessment, Total Maximum Daily Loads (TMDLs) and the biennial Integrated Water Quality Monitoring and Assessment Report (305[b] and 303[d] report).

STUDY AREA DESCRIPTION

Hydrology

The description of the hydrology of the Portage River basin is largely taken from the 2002 Portage River Hydrologic Study prepared by Finkbeiner, Pettis and Strout Inc., consultants for the Portage River Basin Council (Finkbeiner et al., 2002). The report was intended to inform watershed group stakeholders, especially the county commissioners, on flooding and drainage issues and possible solutions throughout the watershed. Floods that caused significant property damage in 1998 and again in 2007 have led to discussions with USGS and the County Engineer's offices in Wood and Ottawa County.

Many agricultural areas within the watershed have been tiled and/or incised with channels to improve drainage. Drainage alterations and structures were also found where the floodplains were crossed by numerous highways and railroads, as well as urban areas where floodplains have experienced encroachments from development. A recent ODNR survey estimated that over 200 linear miles of rural drainage (i.e., open ditches, subsurface tiles, grassed waterways) are maintained throughout the counties in the watershed (ODNR 2008).

The North Branch is a very flat, fairly straight agricultural drainage channel with few trees along its banks west of I-75. Though historically channelized, it begins to meander somewhat east of I-75 to its confluence with the Portage River in Pemberville. Brush Creek, Yellow Creek and West Creek originally flowed into the North Branch, but were rerouted by the Jackson Cutoff Ditch in the late 1800s and now flow into the Maumee River through Beaver Creek.

The Middle Branch, which forms at the convergence of Needles and Rader Creeks, was is less wooded compared to the Portage River, and is straighter, having been channelized over the years. Stream bank vegetation was removed along much of its length during cleanout projects. Straightening in some areas involved removal of meandering oxbows, and levees formed by past channelization have prevented access to the natural flood plain along the Middle Branch and its main tributary, Bull Creek.

Rocky Ford Creek drains a large portion of Hancock County and runs westerly where a small dam impounds the creek, forming Van Buren Lake. The stream flows through wooded areas and has a well developed riparian corridor. Rocky Ford Creek has been significantly modified over the years to provide agricultural drainage. Much of the stream and oxbows have been straightened and cut off, and the channel has been significantly widened to increase flow capacity.

The South Branch Portage River has experienced little alteration and its appearance is more natural than most streams in the watershed. This includes more downed trees and other vegetative debris with the potential for causing log jams. Like the South Branch Portage River, the East Branch Portage River has a relatively natural character and has reportedly never been channelized or cleaned out. Although the reach through Fostoria is heavily urbanized, there is little development along most of its banks.

In 2007 a drainage petition was filed with the Wood County Engineer's office. A group of landowners requested approximately 32.5 miles of the South and East Branch be cleared of logjams and other flow obstructions and placed under the county's drainage maintenance program. To date the petition process has not proceeded to a formal decision. In the fall of 2009 additional petitions were filed to extend the area of work further up and downstream of the original petition, to a grand total of approximately 46 miles.

Tributaries of the Maumee River included in the study area are Grassy Creek, Grassy Creek Diversion, Delaware Creek and Duck Creek. Grassy Creek runs parallel along the south side of the Maumee River beginning in Perrysburg and flows toward Rossford where it joins the mainstem Maumee River at river mile (RM) 9.6. Grassy Creek combines with the Grassy Creek Diversion to have a drainage area of 38.6 miles. Delaware Creek is a small tributary that flows through the City of Toledo, entering the Maumee River at RM 9.2. Duck Creek is 3.2 miles long and began at Hecklinger Pond in East Toledo. It flows northeasterly through portions of Toledo and Oregon before joining the Maumee River at RM 0.7.

Otter Creek is 7.98 miles long and flows northeast from Northwood through Toledo and Oregon to the Maumee Bay just east of the Maumee River. Wolf Creek with a drainage area of 15.9 miles also begins in Northwood and flows through Oregon before entering the Maumee Bay State Park marina. Cedar Creek (58.3 mi^2), Crane Creek (55.5 mi^2) and Turtle Creek (41.5 mi^2) are each 20-25 miles in length and flow through primarily agricultural lands and the small villages of Walbridge, Millbury, and Clay Center. These streams have very low gradients with an average fall of only one to two feet per mile across the lake plain region.

Geology

The Portage River watershed is almost entirely within the HELP ecoregion and has fairly uniform flat topography. Only the upper most portion of East Branch Portage River exists within the ECBP ecoregion, though the area was still dominated by agricultural land. The lake plain geology of Wood and Ottawa Counties is a result of the

Wisconsinan glaciations. Beach ridges located near headwater streams in southern Wood County and Hancock County mark the shorelines of various stages of Glacial Lake Maumee (NRCS/USDA, 2007).

Soils are poorly to very poorly drained and consist of glacial till and lacustrine deposits from the Late Wisconsinan glacial era. The glacial till is primarily ground moraine overlying limestone bedrock with a thickness ranging from 25m to only a few centimeters. The uppermost bedrock strata consist of Silurian dolomite and dolomitic limestone (dolostone). Soil associations include clay rich Hoytville, Toledo, and Sloan soils (NRCS/USDA, 2007).

The underlying limestone bedrock is closer to the surface or has been exposed in the southeastern parts of the watershed. The Bowling Green fault is a major structural feature that paralleled Interstate 75 south of Bowling Green. East of the fault was the primary location of numerous oil and gas wells in the late 1800s (NRCS/USDA, 2007). The presence of bedrock outcroppings also impeded the early efforts to deepen the streams and construct drainage ditches when the Black Swamp was drained around the same time. The result is that upstream portions of the North Branch and Middle Branch south of US Route 6 has levees composed of the rock spoil from initial drainage projects.

The Maumee River tributaries and Lake Erie tributaries lie entirely within the HELP ecoregion and have fairly uniform flat topography. The lake plain geology of Lucas, Wood and Ottawa counties is a result of the advance and retreat of glaciers and glacial lakes. Soils are poorly to very poorly drained and consist of glacial till and lacustrine deposits from the Late Wisconsinan glacial era. The flat plain in Wood and Ottawa counties is traversed by sand ridges representing former beaches, dunes and offshore bars of Lake Warren and Lake Maumee. Hydric classifications of soils are found throughout these watersheds where wetlands were filled and drained for agriculture and other development. With artificial drainage and water table management, they are very fertile, agriculturally productive soils.

The glacial till is primarily ground moraine overlying limestone bedrock with a thickness ranging from 25m to only a few centimeters. Most of the bedrock in the region is dolomite, a magnesium bearing form of limestone with many different layers. The different ages and chemical compositions of “dolostone” result in varying commercial uses, physical strength and presence, depth and quality of groundwater.

Land Use

Portions of 33 townships, 58 municipal areas and 12 park districts govern land use and other activities in the watershed. Approximately 81.1 percent of land use in the Portage River watershed is agricultural and 0.7 percent pasture, with approximately 9.5 percent developed for urban or residential use. Other land uses include 5 percent forest and 1.2

percent each of wetland, open land and open water (Figure 3). Clearing of swamp forests and the subsequent drainage of the land for agricultural production was responsible for dramatic declines in wetlands. Today, row crop and livestock production remains the dominant land use, though the long term trend indicates the loss of farmland to urban growth and residential sprawl, particularly in Ottawa County where tourism and commercial/residential growth has been occurring for the previous thirty years.

Row crop agriculture has always been practiced in the lake plain areas of the Portage and adjacent Toussaint watersheds, but farm fields must be diked and the water table intensively managed to grow crops. Most of the former wetlands near the mouth of the river were lost to development and farming, but there is a trend toward restoring wetlands for private and public hunting preserves. Some landowners have converted the diked farm fields to wildlife production areas. ODNR currently manages the Portage River Wildlife Access, the Little Portage State Wildlife area and a habitat restoration project near Port Clinton.

Land use within the Lake Erie tributaries is dominated by agricultural land (Figure 4). Agriculture occupies 65 percent of the land use with 0.8 percent pasture and 20 percent developed for urban or residential use. Other land uses include 2.1 percent forest, 2.5 percent open land, 7.9 percent wetland and 1.8 percent open water.

Land use within the Maumee River tributaries is depicted in the following land use maps and information originally contained in the Maumee AOC Phase 2 Watershed Restoration Plan prepared in 2006 for all of the Maumee River partners http://www.partnersforcleanstreams.org/stage2.html. Approximately 37.6 percent land use is agricultural with 0.15 percent pasture and 48.6 developed for urban or residential use. Other land uses include 3.4 percent forest, 1.4 percent open land, 1.9 percent wetland and 7 percent open water (Figure 5). Clearing of swamp forests and the subsequent drainage of land for agricultural production was responsible for dramatic declines in wetlands, but along the lakeshore east of Toledo, there are now several reconstructed wetlands managed by federal and state agencies.

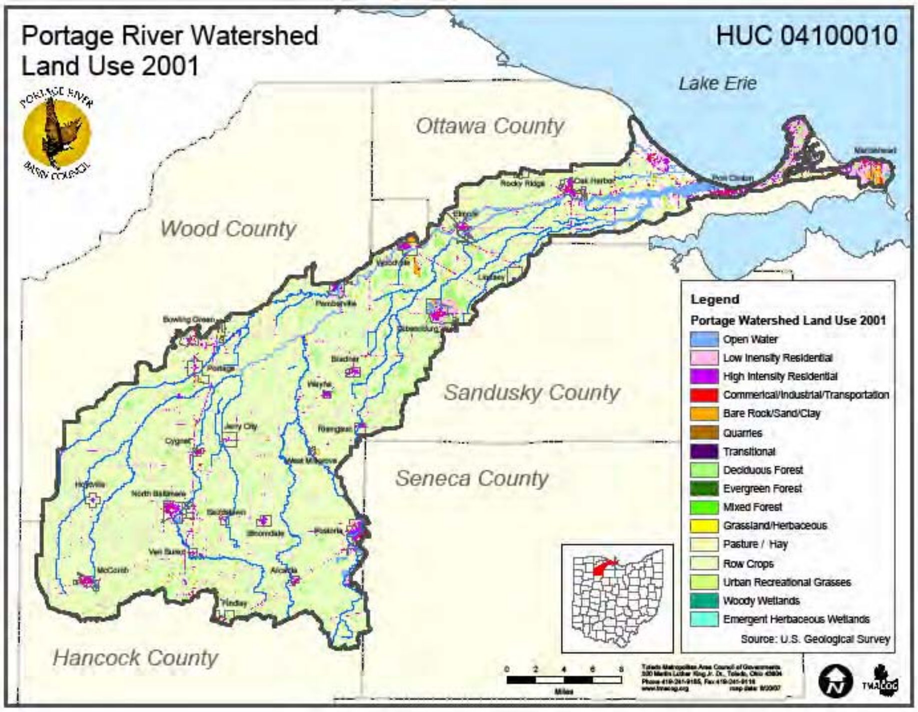

Figure 3. Land use in the Portage River watershed (TMACOG/PRBC, 2009).

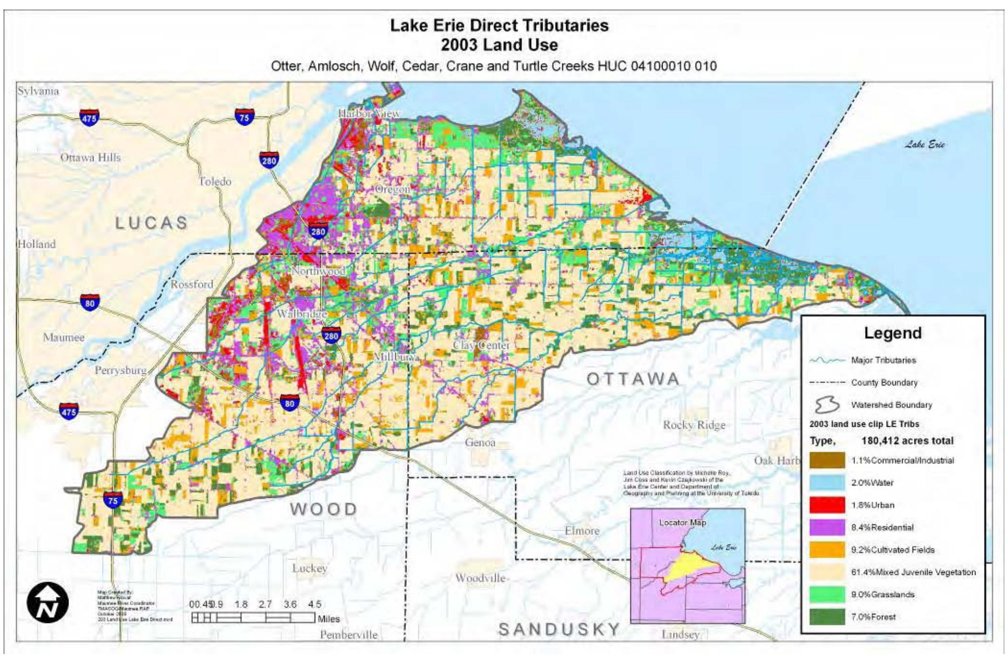

Figure 4. Land use within the Lake Erie tributaries (Maumee AOC, 2006).

Recreational usage such as swimming, boating, fishing and waterfront parks must share the limited shoreline with shipping and port activities, industrial and commercial facilities, agricultural production, wetlands that are managed for waterfowl, historic preservation sites, and private homes. Public and protected lands in the two watersheds include several Toledo Metroparks, Maumee State Forest, Maumee Bay State Park and Crane Creek State Park, all with public access for education and recreation. There are four state and federally owned wildlife refuges along the bay and lake shoreline that are important for migratory birds, fisheries and wildlife. This area of the western basin of Lake Erie lies at the intersection of the Mississippi and Atlantic flyways for migratory birds.

Cedar Point National Wildlife Refuge is a diked marsh with an open bay known as Potter's Pond used for public fishing. The Ottawa National Wildlife Refuge is twice as large as Cedar Point at 5,790 acres. It supports multiple uses for public education, wildlife observation and a wetland managed for migratory waterfowl.

Metzger Marsh State Wildlife Area and Magee Marsh State Wildlife Area are both similarly managed for wetland dependent wildlife and allow controlled waterfowl hunting, fishing and trapping. In addition, the Crane Creek Wildlife Research Station is located on the Magee Marsh site. Wildlife biologists conduct research on all species that inhabit wetland ecosystems, including waterfowl, furbearers, and the bald eagle.

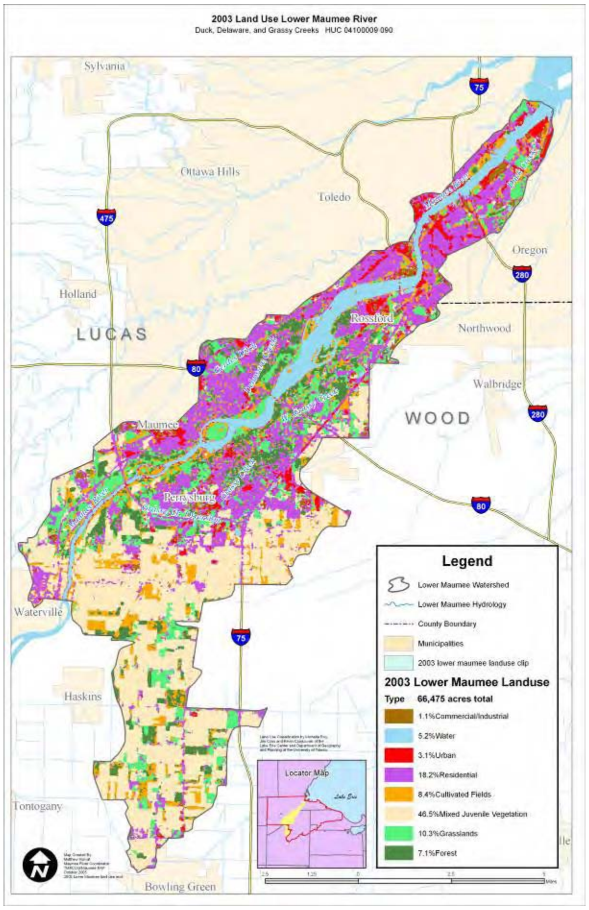

Figure 5. Land use within the Maumee River tributaries (Maumee, 2006).

Ground Water Supply

Outside of the incorporated areas of the Portage River basin, the majority of residents obtain their drinking water via private groundwater wells. In the Portage River watershed, several large communities have municipal drinking water well systems, including Pemberville, Woodville, Elmore and Gibsonburg. Groundwater wells also provide drinking water to numerous smaller towns and non-community systems in the watershed.

Surface Water Supply and Drinking Water Quality Issues

The communities of McComb, North Baltimore and Fostoria collect their drinking water supply directly from tributaries of the Portage River. Port Clinton draws water from Lake Erie and Bowling Green collects water from the Maumee River. All of these communities except Port Clinton utilize reservoirs for storage and management to control nitrate levels, with Fostoria having the largest reservoir system. In addition, the Northwest Water and Sewer District in Wood County purchase water from Bowling Green to supply Portage, Jerry City, Rudolf and Hoytville. While primarily an agricultural watershed, industries such as automotive parts production, quarrying operations, and food processing use water for production and cooling. The single largest water user is Brush-Wellman, which produces automotive parts, and employs approximately 600 workers near Elmore (US ACOE, 2008).

Communities within the Maumee River tributaries and Lake Erie tributaries obtain drinking water from Lake Erie via the municipal public drinking water systems in Toledo and Oregon. The communities of Northwood, Perrysburg and Rossford are supplied with Toledo water through the Northwest Water and Sewer District and Millbury receives Oregon water, also through the Northwest Water and Sewer District. Outside of the incorporated areas, the majority of residents obtain their drinking water via private groundwater wells.

Sampling results from drinking water supplies within the study area are provided within the results section of this report.

Point Source Issues

Bowling Green, Fostoria and the urbanized area in Northeast Wood County and western Ottawa County are designated Phase 2 storm water communities. They are required to prepare and implement storm water pollution prevention plans to address urban runoff issues. The lower part of the Maumee River and Duck Creek are impaired by past industrial activities and contaminated sediment. Most process wastewater is now discharged to the City of Toledo and the industrial facilities have individual NPDES permits for storm water. In the Lake Erie tributaries, including Otter Creek, there are NPDES permits for emergency discharges from two refineries and a landfill. Other permitted facilities in the watershed include seven package plants serving marina/campgrounds, mobile home parks, subdivisions and a school. There are also four quarry operations, several industrial wastewater storage or treatment ponds and numerous facilities with general NPDES permits for storm water.

Almost the entire area of the Maumee River tributaries and the select Lake Erie tributaries are regulated under the Municipal Separate Storm Sewer System permit program. Toledo is a Phase 1 community. Phase 2 communities include Perrysburg, Northwood and Rossford. In addition, all of Lucas County, the north portion of Wood

County and the west part of Ottawa County are designated as Phase 2 urbanizing areas for storm water regulation.

There are five permitted or proposed Confined Animal Feeding Operations (CAFO) located in the Portage River watershed with two more located just beyond the watershed boundaries. Five of these dairy facilities have received operating permits from Ohio Department of Agriculture since 2006, but not all of them are constructed or operational. Manure and milk house wastewater is stored in large on-site lagoons and land applied on farmland in the area. The dairy operations range in size from 1200 to 2200 cows. There have been manure spill/runoff incidents that impacted the North Branch Portage at one of the dairy operations as recently as October 2009. The Wood County Health Department and Bowling Green State University (BGSU) are collaborating in an ongoing sampling project to monitor stream water quality near the manure land application fields (Midden, Pers. Comm., and Espen, Pers. Comm.)

Nonpoint Source Issues

Within all three portions of the study area, most of the water quality impairments could be linked to nonpoint sources such as fertilizer and manure runoff, and sedimentation from agricultural crop production and failing home sewage systems. Agricultural practices such as the habitat alteration, channelization and routine maintenance of streams and ditches and the drainage of farm fields through subsurface tiles cause habitat and flow alteration impairments in the headwater and small tributary streams of the watershed. In Wood County alone, there are approximately 570 miles of the 3,000 miles of ditches, creeks and rivers under the county maintenance plan. Drainage alterations are also found where floodplains and wetlands are crossed by numerous highways and railroads, as well as in urban areas where development has encroached or filled in natural floodplains. All of the counties within the study area have programs for drainage maintenance.

Recreational use impairment from pathogens was found in all of the watershed assessment units in this study area. Sources of bacteria include combined sewer overflows (CSOs) from North Baltimore, Bowling Green, Woodville, Elmore, Gibsonburg, Oak Harbor and Port Clinton in the Portage River basin, while CSOs from Perrysburg and the City of Toledo wastewater collection system which also serve Rossford and Northwood are sources of bacteria in the Maumee River tributaries and Lake Erie tributaries. Another source of bacteria is failing home sewage systems. Individual rural homes and unsewered communities such as West Millgrove and Bairdstown are contributing to unsanitary conditions. On the main stem of the river in Ottawa County, there are several areas needing attention including Lacarne and Nugent's Canal. There ae pockets of beach front housing in Portage and Put-in-Bay townships of Ottawa County and other rural developments throughout the basin that do not have centralized sewage collection and treatment. The four county health departments in this watershed have identified critical areas for replacement of failed systems, but a lack of final statewide sewage rules and adequate funding has delayed progress in abating public health nuisances. In addition, existing small and medium livestock operations that land apply manure are potential sources of pathogens as are the CAFOs mentioned above.

A large oil spill occurred in Rocky Ford in February, 2009 after the stream survey was completed. On February 19, 2009 a pipeline carrying crude oil between Texas and Toledo broke on the tank farm site near Cygnet. Oil migrated through field tiles into a tributary of Rocky Ford Creek and on into the Middle Branch Portage River. Mid-Valley Pipeline and Sunoco Logistics and local state and federal agencies responded and spill containment was attempted along 15.7 miles of the river channel between Cygnet and Pemberville. There was no wildlife damage attributed to the spill, and there were no significant impacts noted during the remainder of the year.

Figure 6. Thermal bank remediation for oil spill on Rocky Ford Creek, 2009.

Remediation efforts initially involved deploying sorbent booms, excavation of contaminated soil and “thermal bank remediation” to destroy oily product on the stream bank vegetation (Figure 6). Initial containment and cleanup were hampered by cold and windy conditions. Rain and snow in the first three days led to bank full flows in the river and steep slippery banks on the Middle Branch after the water receded. Ongoing cleanup includes permanent repair of the 22 inch pipeline, continual monitoring of siphon dams at the tank farm site and “land farm” remediation of the petroleum contaminated soils (U.S.EPA, 2009).

Water quality improvement projects

Two Section 319 grants have been implemented in the Portage River watershed since the last survey in 1994. The three year grant awarded in 1999 paid landowners cost share to install filter strips and concentrated flow filter areas along streams and ditches in the Portage River watershed. This grant in conjunction with other farm bill funding has yielded substantial adoption of multiple agricultural Best Management Practices (BMPs) throughout the watershed, but especially in the tributaries of Bull Creek and Rocky Ford Creek in Wood County.

Another Section 319 grant awarded in 2005 provided cost share funding for home sewage system replacement in critical areas identified by TMACOG and the four local Health Departments. A total of 75 failing systems were replaced with on-site treatment systems. Two alternative demonstration projects in Needles Creek and a tributary to Bull Creek in southern Wood County involved the construction of a two-stage ditch as an alternative to the traditional trapezoid drainage ditch. Early results indicate that this

BMP provided enhanced water storage during peak flows. Further research is needed to fully evaluate watershed wide use of this BMP and associated economic and environmental benefits. (TMACOG/Portage River Basin Council, 2009).

The Wood County Health Department and BGSU have partnered in a bacteria study focusing on the increased dairy development in the area. As early as 2005, the Portage River watershed was attracting interest from a large dairy development company. As of July 2007, two large-scale dairies were already operating and three more were proposed. Local officials and the public are concerned that these CAFOs will result in the degradation of water quality. The Wood County Health Department committed to sampling private water wells near each proposed dairy and began collecting samples to establish baseline stream water quality, since there was not much information on existing bacterial contamination sources within the watershed.

The USGS began a research study of microbial source tracking in 2008, and sampled the Portage River watershed as a test area for characterizing sources of fecal contamination in a watershed. Scientists with the U.S. Geological Survey, Bowling Green State University, and the Wood County Health Department collected and analyzed 17 environmental water samples and 13 source samples for *Bacteroide* based host-specific DNA markers. Although the study validated their method, it has not been used yet in routine stream monitoring or complaint investigations in this watershed (USGS, 2008).

There are multiple ongoing watershed restoration projects in the Maumee AOC being administered by Partners for Clean Streams, Duck and Otter Creeks Partnership, TMACOG and many other local partners. Projects range from stream restoration to wetland mitigation, and sediment remediation studies to “green” storm water infrastructure. Agricultural incentives for nutrient and sediment reduction are led by the Natural Resources Conservation Service (NRCS) and the Soil and Water Conservation districts in the three counties. In addition, numerous projects ae identified in the Maumee AOC report in the Phase 2 Watershed Restoration Plan.

Watershed Group

The Portage River Basin Council, a committee of TMACOG and its many partners, has been active since 1994 in engaging the public in protecting the Portage River. In addition to early emphasis on educating stakeholders on water quality issues, the Basin Council later moved into planning and implementing projects to control non-point source pollution from agricultural and rural home sewage sources. Since 2007, TMACOG has employed a full time coordinator funded through the ODNR watershed coordinator grant program. A watershed action plan is being developed and will be submitted for state endorsement in 2009. It will become the implementation plan for the Portage River TMDL document due to USEPA in 2011 (TMACOG/Portage River Basin Council, 2009).

The *Partners for Clean Streams* and *Duck and Otter Creeks Partnership* and their many collaborators in the AOC are serving as community advocates for the Maumee watershed, and have become an important force to maintain momentum and sponsor improvement efforts. The watershed partners are striving for abundant open space and a high quality natural environment; adequate floodwater storage capacities and flourishing wildlife; stakeholders who take local ownership in their resources; and rivers, streams, and lakes that are clean, clear and safe.

In 2005, the Maumee RAP (now Partners for Clean Streams) undertook an intensive and ambitious effort to create the *Maumee AOC Stage 2 Watershed Restoration Plan* (Stage 2 Restoration Plan). The *Stage 2 Restoration Plan* is a comprehensive regional water quality improvement plan intended to provide a one-stop-shop resource for all jurisdictions, agencies, organizations, and individuals who are working to restore this area's waterways. The *Stage 2 Restoration Plan* has received "Full Endorsement Pending" status from the State of Ohio and will be fully endorsed with the completion of a Coastal Nonpoint Source Pollution Management Measures section. It will become the implementation plan for the TMDL document due to USEPA in 2011(TMACOG/Portage River Basin Council, 2009).

RESULTS

Point Source Pollutant Loadings - NPDES

Facilities within the study areas that are regulated by either an individual or general NPDES permit are listed in Appendices B and C, respectively. Facilities regulated by an individual NPDES permit are required to conduct routine self monitoring of effluent quality and quantity. Results are reported monthly to Ohio EPA as discharge monitoring report (DMR) data. Each permit includes a detailed list of each parameter to be monitored and the specific limits for both concentration and loading rate. They also include monthly average limits and daily or weekly maximum limits, depending on the monitoring requirements. This DMR data can be used to track compliance as well as to evaluate historical trends.

The Ohio EPA conducts 48-hr acute screening bioassays to evaluate toxicity during the permit compliance and renewal process for Major NPDES permitted facilities (discharge >1.0 MGD) and occasionally minor facilities if time permits. Grab and composite samples of the effluents are collected along with samples of the receiving stream upstream and in the near field mixing zone. The fathead minnow *Pimephales promelas* and daphnid *Ceriodaphnia dubia* are used as test organisms.

Normally, only Major NPDES permitted facilities are described in detail here. However, there are so many WWTPs throughout the Portage River basin that are collectively contributing to the overall water quality of the Portage River, more background information will be presented for the municipal facilities in the watershed.

The Rocky Ford-Middle Branch Portage River (HUC 10 – 0410001001)

Village of McComb WWTP (2PB00002) – A minor discharger, originally constructed in 1937, then upgraded in 1970 and again in 1989, the plant had its last major modification in 2002. The McComb WWTP is a secondary treatment facility, which consists of a comminuter, degritting clarigester, a plastic media trickling filter followed by separate stage biological nitrification, secondary clarification, post-aeration and UV disinfection. Final effluent is discharged to Algire Creek, a tributary to Rader Creek. Prior to disposal, digested sludge is discharged to sand beds for drying. The plant has a design flow of 0.388 MGD and a hydraulic capacity of 0.720 MGD. The McComb WWTP serves a population of 1800 and also receives about 25% of its influent from Consolidated Biscuit Co., which manufactures crackers and cookies.

The collection system is 70% separate sewers, and 30% combined sewers, with 1 bypass (Outfall 002) and 3 overflows (Outfalls 003, 004, 005) to Algire Creek. All flow to the plant is by gravity.

During 2008, monthly DMR data submitted by the McComb WWTP documented 23 permit violations: 9 for fecal coliform, 8 for ammonia (NH_3-N), 2 each for total suspended solids (TSS) and dissolved oxygen (D.O.), and 1 each for oil and grease (O&G) and maximum pH.

Village of Hoytville WWTP (2PA00083) - A minor discharger constructed in 1990, the Hoytville WWTP is a secondary treatment facility consisting of a small diameter gravity collection system and a three cell controlled discharge lagoon system operating in series. The plant serves a population of 350 and is designed for an influent flow of 0.036 MGD with lagoon storage for 180 days. Effluent from the third lagoon is only discharged to Needles Creek during high flow periods.

The collection system is 100% separate sewers.

Village of Cygnet WWTP (2PA00000) – A minor discharger constructed in 1996, the Cygnet WWTP is a secondary treatment facility consisting of a gravity collection system and a three cell controlled discharge lagoon system operating in series. The WWTP is operated by the Northwestern Water & Sewer District (NWSD) but owned by the Village of Cygnet. The plant serves a population of about 1600 in the Villages of Cygnet and Jerry City and has an average design flow of 0.18 MGD. Effluent from the third lagoon is discharged to the Rocky Ford Creek several times per year.

The collection system is 100% separated. Cygnet owns its collection system, but Jerry City's collection system is owned by NWSD.

Village of North Baltimore (2PB00033) - A minor discharger, originally constructed in 1959 and then upgraded in 1989, the North Baltimore WWTP is a secondary treatment facility consisting of a comminuter, raw wastewater pumps, grit removal, primary settling, trickling filter solids contact, secondary settling, lift and recirculation pumps, sludge pumps, sludge holding tanks, sludge drying beds, and chlorination/dechlorination. Sludge is digested anaerobically, dewatered with a sludge press and taken to a landfill. The plant has a design flow of 0.8 MGD and a hydraulic flow of 1.3 MGD and serves a population of 3,360. Effluent is discharged to Rocky Ford Creek.

The collection system is 100% combined sewers with 2 overflows (Outfalls 002, 003). The permit currently includes a compliance schedule for addressing CSO problems by 2017.

During 2008, monthly DMR data submitted by the North Baltimore WWTP documented 3 permit violations, all of the minimum pH.

The South Branch-Middle Branch Portage River (HUC 10 – 0410001002)

Village of Bloomdale WWTP (2PA00074) - A minor discharger constructed in 1991, the Bloomdale WWTP is a secondary treatment facility. The plant has a design flow of 0.08 MGD and consists of two aerated lagoons, two clarifiers, chlorination/dechlorination and an aerated sludge holding lagoon. Final effluent is discharged to a tributary of the South Branch Portage River.

During 2008, monthly DMR data submitted by the Bloomdale WWTP documented 3 permit violations, all for TSS.

City of Fostoria WWTP (2PD00031) - A major discharger, the Fostoria WWTP was originally constructed in 1927 with improvements to the plant in 1952 and 1988, and a major modification in 1994. Wet stream processes include screening and grit removal, primary settling, flow equalization, trickling filtration followed by activated sludge aeration, phosphorus removal, secondary clarification and ultraviolet disinfection. Solid stream processes are aerobic digestion, dewatering using a belt filter press, lime stabilization, and wet air oxidation. The design flow is 8.25 MGD and the hydraulic capacity is 12.7 MGD. The plant averages about 5.0 MGD, serving the City of Fostoria (pop. 18,700), the Village of New Riegel (individual sewer taps are being made), the Wood County Northwestern Sewer District, and 3 townships in Seneca and Hancock Counties, including about 15% influent from industry.

The collection system is 65% combined sewers, 35% separate sewers. There are 5 overflows on the combined portion of the system: 4 discharging to the East Branch

Portage River (Outfalls 004, 005, 006 and 007) and 1 discharging to Caples-Flack Ditch (Outfall 008). The plant also has a bypass from its flow equalization basin (Outfall 009).

During 2008, monthly DMR data submitted by the Fostoria WWTP documented 34 permit violations: 32 for TSS, 1 for $cBOD_5$, and 1 for ammonia (NH_3-N).

In the last ten years, Ohio EPA conducted 48-hour acute screening bioassays at the Fostoria WWTP in September and October of 2007, and in May and June of 1999. The results of all four bioassays showed no acute toxicity in the Fostoria WWTP effluent.

Pollutant loadings from the Fostoria WWTP over the last 14 years were evaluated based on monthly DMR data using the Liquid Effluent Analysis Processing System (LEAPS). Annual statistics for TSS, $cBOD_5$ and total phosphorus loadings are displayed in Figures 7-9. For the last 3-5 years loadings of these three parameters have varied commensurate with variations in discharge flow. Annual statistics for loadings of ammonia, and nitrate-nitrite are displayed in Figures 10 & 11. Over the last 3 years, while discharge flows have been increasing, ammonia loadings were also increasing, and nitrate-nitrite loadings were decreasing. This may indicate that inadequate nitrification is occurring in the waste stream prior to discharge, so the more toxic ammonia may be released as opposed to nitrogen in the more preferable form of nitrate-nitrite.

Village of Wayne WWTP (2PA00071) – A minor discharger constructed in 1995, the Wayne WWTP is a secondary treatment facility consisting of a gravity collection system and a three cell controlled discharge lagoon system operating in series. The plant serves a population of about 840 in the Village of Wayne and has an average design flow of 0.120 MGD. Effluent from the third lagoon is discharged several times per year to the South Wayne Road Ditch, a tributary of the South Branch Portage River.

The collection system is 100% separated.

The Upper Portage River (HUC 10 – 0410001003)

City of Bowling Green WWTP (2PD00009) – A major discharger, the existing plant was constructed in 1982 and completely replaced the original treatment plant. The Bowling Green WWTP is a tertiary treatment facility utilizing a pumping station, storm water overflow holding basin, mechanical bar screens, aerated grit removal tank, two primary settling tanks, six aeration chambers, two final settling tanks, activated sludge system, tertiary filters, UV disinfection, aerobic digestion and digested sludge pumps. Sludge digestion is by an ATAD System; sludge is dewatered with a centrifuge and blended with composted material for topsoil. The Bowling Green WWTP has an average design flow of 10 MGD and a hydraulic flow of 20 MGD, serving a population of 29,600 in Bowling Green, 1,500 in Portage and 500 in Rudolph. Effluent is discharged to the North Branch Portage River via Poe Ditch. Average flow through the plant is about 6.2 MGD, including 1-5% from industry.

The collection system is 73% combined and 27% separated with 1 overflow (Outfall 002).

During 2008, monthly DMR data submitted by the Bowling Green WWTP documented 5 permit violations: 2 for TSS, 2 for $cBOD_5$, and 1 for minimum pH.

In the last ten years, Ohio EPA conducted 48-hour acute screening bioassays at the Bowling Green WWTP in March and May of 2009, in September and October of 2003, and in March and April of 1999. The results of all six bioassays showed no acute toxicity in the Bowling Green WWTP effluent.

Pollutant loadings from the Bowling Green WWTP over the last 14 years were evaluated based on monthly DMR data using LEAPS. Annual statistics for TSS, $cBOD_5$, and total phosphorus are displayed in Figures 12-14. For the last 5 years, loadings of these three parameters have generally varied commensurate with variations in discharge flow, particularly during periods of peak flow. However, the maximum loadings of TSS being discharged (95^{th} percentile and greater) in the last 4 years appear to have dramatically increased over past years in proportion to the peak flow periods. Annual statistics for loadings of ammonia, and nitrate-nitrite are displayed in Figures 15 & 16. Loadings of ammonia appear to have greatly decreased with respect to discharge over the last 3 years, particularly at the 95^{th} percentile, while nitrate-nitrite loadings have remained proportional to discharge flows at the 50^{th} percentile, and greatly increased with respect to discharge at the 95^{th} percentile. This reflects a greater degree of nitrification being attained in the waste stream before discharge to the stream.

The Middle Portage River (HUC 10 – 0410001004)

Village of Bradner WWTP (2PA00077) - A minor discharger constructed in 1988, the Bradner WWTP is a secondary treatment facility consisting of a gravity collection system and a three cell controlled discharge lagoon. Solar powered circulation machines (Solar Bees) have been recently added. The plant is designed for an influent flow of 0.121 MGD with lagoon storage for 180 days. Effluent from the lagoon is to be discharged to a tributary of the South Branch Portage River during high flow periods only.

Village of Risingsun WWTP (2PA00094) – A minor discharger constructed in 2007, but not completely operational until late 2008, the Risingsun WWTP is a tertiary treatment facility consisting of a trash trap, flow equalization, activated sludge-extended aeration, sand filter, mixed media filtration, post aeration, and UV disinfection. The plant has a design flow of 0.095 MGD and serves a population of about 825 in the Village of Risingsun and in Scott Twp. Effluent is discharged to Sugar Creek.

The collection system is 100% separate.

Village of Pemberville WWTP (2PB00012) - A minor discharger constructed in 1970, the Pemberville WWTP provides tertiary treatment consisting of oxidation ditches, secondary clarification, chlorination/dechlorination, and sludge drying beds. The plant has a design flow of 0.20 MGD and serves a population of 1,365. The final effluent is to the Portage River. Pemberville has received a PTI and financing to build a 0.400 MGD SBR system with UV disinfection. The NPDES Permit has a compliance schedule for the construction to be completed by June 2011.

The collection system is 65% combined sewers and 35% separate sewers. All overflows/CSOs have been eliminated.

During 2008, monthly DMR data submitted by the Pemberville WWTP documented 4 permit violations, all for TSS.

Village of Woodville WWTP (2PB00052) - A minor discharger constructed in 1971 with a major modification in 2000, the existing Woodville WWTP treatment plant includes pumping stations, two aerated stabilization lagoons (with a baffled third cell area), chlorination and dechlorination. The plant has an average design flow of 0.3 MGD, a hydraulic capacity of 0.8 MGD, and serves a population of about 2000. The final effluent is discharged to the Portage River.

The existing collection system serving the Village of Woodville includes combined sewers, separate gravity sewers and interceptor sewers. There are 17 existing Combined Sewer Overflows (CSOs) located where the trunk sewers connect to the interceptor sewers. Approximately 95% of the collection system is combined and 5% is separated.

In 1994, larger pumps were installed to enable a larger volume of storm water to be routed to the plant during storm events, and flap gates were installed to prevent river water from backing up into the plant during high river flow. However, the CSOs may still be impacting the Portage River. The current NPDES Permit includes monitoring only the 'number of occurrences' and the 'volume of discharge' for the existing 17 CSOs. Sewer Separation, per the Long Term Control Plan (LTCP) is to be completed by August 1, 2017.

During 2008, monthly DMR data submitted by the Woodville WWTP documented 20 permit violations: 11 for TSS, and 9 for $cBOD_5$.

Village of Elmore WWTP (2PB00051) - A minor discharger constructed in 1969 with a major modification in 1992, the Elmore WWTP is a secondary treatment facility consisting of a grit chamber, Imhoff settling tanks, a spiragester, plastic media trickling filters, secondary settling, chlorination/dechlorination, and sludge drying beds. The plant has design flow of 0.180 MGD, a hydraulic capacity of 1.44 MGD, and serves a population of approximately 1,400. The final effluent is discharged to the Portage River.

The collection system is 3% combined sewers and 97% separate sewers, with a raw bypass ahead of the plant. The current NPDES Permit includes a compliance schedule to eliminate the bypass. Phase I of the bypass elimination strategy is a replacement interceptor sewer and is scheduled to be completed prior to the July 2010 milestone. Phase II is the replacement of the aged Imhoff tank/ trickling filter plant with a new 180,000 gpd oxidation ditch type treatment plant by June 2013.

During 2008, monthly DMR data submitted by the Elmore WWTP documented 10 permit violations: 7 for ammonia, 2 for D.O., and 1 for minimum pH.

Village of Gibsonburg WWTP (2PA00005) – A minor discharger, construction on the Gibsonburg WWTP was completed in 1985. The treatment facility includes a pumping station, a storm retention basin, extended aeration oxidation ditch, 2 final clarifiers, chlorination and dechlorination. The plant also has a septic receiving station, 2 aerobic digesters, and sludge drying beds. The treatment plant has a design flow of 0.50 MGD, a hydraulic capacity of 1.23 MGD and serves a population of about 2,500. The combined interceptor sewers are designed to collect all of the dry weather sanitary flow, storm event flow, and extended wet weather flow. Flows that exceed the existing capabilities of the wastewater treatment plant are pumped into the existing storm retention basin for storage and treatment during dry weather flows. If the storage capacity of the retention basin is exceeded, the overflow goes to the CSO structure and/or the retention basin overflows to the WWTP discharge. Future modifications to the retention basin are as specified in the approved LTCP and propose to include improved aeration and baffling. It is also proposed that flows to the storm retention basin that exceed the basin's holding capacity and wastewater treatment plant's capabilities will be disinfected (chlorine and dechlorination) prior to final discharge to Hurlbut Ditch. The plan also includes partial sewer separation and further rerouting of storm water out of the existing combined sewer into Hurlbut Ditch. Final effluent is split, with approximately 50% discharging to Hurlbut Ditch, a tributary to Sugar Creek, and 50% discharging to the SR 300 Ditch, a tributary to Wolf Creek (part of The Lower Portage River – Frontal Lake Erie HUC 10 – 0410001005)**.**

The existing collection system serving the Village includes a mostly combined sewer system. The sewer system includes septic tanks, interceptor sewers, combined sewers and some separate gravity sewers. Approximately 85% of the sanitary sewers are combined. There are 2 CSOs, one to Hurlbut Ditch upstream of the final discharge and one to the SR 300 Ditch.

During 2008, monthly DMR data submitted by the Gibsonburg WWTP documented 47 permit violations: 33 for ammonia, 9 for TSS, 4 for $cBOD_5$, and 1 for fecal coliform.

The Lower Portage River – Frontal Lake Erie (HUC 10 – 0410001005)

Village of Gibsonburg WWTP (2PA00005) – While 50% of Gibsonburg WWTP effluent is discharged to Wolf Creek via the SR 300 ditch, the other 50% is discharge to Hurlburt Ditch. The complete facility description is provided in the above section: The Middle Portage River (HUC 10 – 0410001004).

Village of Oak Harbor WWTP (2PB00032) - A minor discharger, the Oak Harbor WWTP was constructed in 1958 with chlorination facilities added in 1975, and with upgrades in 1990 and again in 2000. The plant is a secondary treatment facility consisting of a grit chamber, preaeration, primary settling, trickling filters, final settling, ultra violet disinfection and sludge digestion tanks. The plant has a design flow of 0.93 MGD and hydraulic capacities of 4.33 MGD for primary facilities and 2.15 MGD for secondary facilities. Final effluent is discharged to the Portage River. The system serves a population of approximately 4,000.

Oak Harbor's collection system has 90% combined sewers, and 10% separate sewers. A new main interceptor trunk sewer and 5 million gallon combined sewage retention basin was completed in May 2009. Seven of nine combined sewer overflows have been eliminated. Only Locust Street (005) and E. Water Street (009) remain, with the goal of four overflows or less per year.

During 2008, monthly DMR data submitted by the Oak Harbor WWTP documented 1 permit violation of the maximum pH.

City of Port Clinton WWTP (2PD00014) - A major discharger, the Port Clinton WWTP was constructed in 1955 and upgraded to secondary treatment with phosphate removal in 1970. Major modifications in 2004 and 2006 completely changed the treatment process, which now consists of a pumping station, fine bar screen, grit removal, Actiflo Ballasted Flocculation, fine bubble aeration tanks, ferric chloride and polymer addition, secondary clarification, chlorination/ dechlorination and a sludge belt filter press with landfill disposal. The plant now has a design flow of 2.0 MGD and wet weather handling capacity of 24 MGD serving a population of 6,400. The final effluent is discharged to the Portage River.

The collection system is 52% combined sewers and 48% separate sewers. There is only one remaining combined sewer overflow at Adams Street (outfall 003).

During 2008, monthly DMR data submitted by the Port Clinton WWTP documented 8 permit violations: 6 for $cBOD_5$, and 2 for TSS.

In the last ten years, Ohio EPA conducted 48-hour acute screening bioassays at the Port Clinton WWTP in September and October of 2009, and in May and June of 2004. The results of all four bioassays showed no acute toxicity in the Port Clinton WWTP effluent.

Pollutant loadings over the last 14 years were evaluated based on monthly DMR data using LEAPS. Annual statistics for TSS, $cBOD_5$, and total phosphorus are displayed in Figures 17-19. The 50^{th} percentile discharge flows have remained fairly stable, with slight increases annually since the major plant modifications in 2004 and 2006, but 95^{th} percentile discharge flows increased dramatically following the plant reconfiguration. Both TSS and $cBOD_5$ loadings have remained in proportion to annual flows, while phosphorus levels at the 50^{th} percentile have decreased somewhat with respect to annual discharge since the change in the treatment process. However, the higher peak phosphorus loadings in 2008 appear more closely linked to peak flows. Annual statistics for loadings of ammonia, and nitrate-nitrite are displayed in Figures 20 & 21. Ammonia loadings at the 50^{th} percentile were steadily decreasing through 2006 despite slightly increasing annual discharge, until it suddenly began to increase in the last 2 years. Ammonia loadings at the 95^{th} percentile have dramatically increased since 2004, commensurate with a spike in peak flows. At the same time, nitrate-nitrite loadings appear to have decreased since the changes in 2004. The incomplete denitrification resulting in the increased ammonia loadings is likely a by-product of plant upgrades under construction at the plant that were just completed. Future monitoring will determine if these issues have since been addressed.

Brush Wellman, Inc. (2IE00000) - Brush Wellman is an industrial facility located along the Portage River downstream from Elmore. Brush Wellman is the only fully integrated supplier of beryllium, beryllium and copper alloys, and beryllium ceramics in the U.S. The raw materials used include scrap copper and other metallic sources. Processes include: pickling, plating, melting, casting, forming, extruding, annealing, and heat treating. All process wastewater, sanitary wastewater, and some storm water is discharged to Hyde Run (aka Brush Creek), which is a tributary to the Portage River at RM 16.54. Hyde Run originates at the Brush Wellman facility and is essentially 100% effluent, except during heavy rainfall events when flow in Hyde Run may include some runoff from Brush Wellman's property upstream of the outfalls. A description of the Brush Wellman facility outfalls is below:

Outfall 001 – This outfall no longer exists. When in service, treated industrial wastewater was pumped to a holding basin then to the #6 lagoon prior to discharge to

Hyde Run. Brush Wellman completed a Resources Conservation and Recovery Act (RCRA) approved closure of the #6 lagoon.

Outfall 002 – This is a discharge to Hyde Run from the #5 lagoon. Process wastewater from the Beryllium Metal Plant is sent to #5 lagoon following ammonia removal by aeration. Calcium chloride and chlorine may be added for the removal of fluoride and cyanide, respectively, if levels warrant. Wastewater from #5 lagoon is pumped into a holding tank until needed to be reused in the plant, so it is infrequently discharged to Hyde Run. Brush Wellman has not reported a discharge from Outfall 002 since 1994, though wastewater from the holding tank may also be discharged to Hyde Run if necessary (see Outfall 014). Brush Wellman's NPDES permit prohibits any discharge from this outfall when the Portage River flow is below 15 cubic feet per second (cfs) (see Station/Outfall 802).

Outfall 003 – This outfall is an internal outfall which discharges treated sanitary sewage to the Industrial WWTP (IWWTP). Sanitary wastewater is treated in a 23,000 gpd extended aeration plant, including final rapid sand filtration before being discharged to the IWWTP.

Outfalls 004, 006, 007, 008 - These storm water outfalls have been eliminated. Flows have been directed either to process wastewater lagoons or to new storm water outfalls.

Outfall 005 – This is the North storm sewer outfall from the beryllium metal plant area of the Brush Wellman facility. Discharge is collected in the lagoons and normally pumped to the IWWTP.

Outfall 009 – This storm water outfall drains an area west of State Route 590, fields around the facility on the west side, and one storm water tile on the copper alloy side of the Brush Wellman facility. Most of the runoff from these areas is pumped to Brush Wellman's makeup pond, which is used for process water, so flow from Outfall 009 should be low and should not discharge at all during the summer. Runoff that is not diverted to the makeup pond is discharged directly to the Portage River upstream of Outfall 006.

Outfall 010 – This outfall no longer exists. When in service, it was a discharge to Hyde Run from the nickel plating line. The nickel plating line was taken out of service, the process and discharge were eliminated and all equipment and tanks have been removed.

Outfall 011 – The IWWTP discharges effluent to Hyde Run (aka Brush Creek) through this outfall. Wastewater from the beryllium alloy and beryllium oxide processes is treated by chemical precipitation, flocculation, mixing and neutralization. Lime is added to raise the pH of the wastewater to 9-10 S.U., causing metal hydroxides to settle out.

Calcium chloride is used for fluoride removal and a Nalco flocculent is added before the waste is sent to the parallel plate clarifier. Sludge from the clarifier is sent to a thickener, and then disposed of off-site. Effluent from the clarifier is neutralized and sent to a holding tank before release to Hyde Run. The IWWTP is a continuous discharge, but can be held back if necessary for up to approximately 2 months. Brush Wellman's NPDES permit prohibits any discharge from this outfall when the Portage River flow is below 15 cfs (see Station/Outfall 802).

Outfall 013 – This outfall has been eliminated.

Outfall 014 – The outfall discharges to Hyde Run from a holding tank. Following treatment in #5 lagoon (see Outfall 002), process wastewater is pumped to this holding tank for reuse in the plant. Wastewater may be discharged to Hyde Run if necessary, but Brush Wellman has never reported a discharge from Outfall 014. Brush Wellman's NPDES Permit prohibits any discharge from this outfall when the Portage River flow is below 15 cfs (see Station/Outfall 801).

Outfalls 015, 016 and 018-023 – These are storm water outfalls from various areas of the plant. Most are not treated, but outfall 016 is routed to a storage pond from where it is usually sent to IWWTP.

Outfall/Station 802 – This is the USGS gaging station on the Portage River at SR 590, which replaced the use of the gaging station at Woodville Road. Brush Wellman obtains instantaneous gage height/river flow information from this station in order to determine discharge limitations for Hyde Run that have been calculated to maintain the water quality criteria at various river flows.

Brush Wellman currently operates under an NPDES permit which contains specific loading limits for each of the three process discharges (Outfalls 002, 011, and 014). Additionally, the NPDES permit designates tiered load limits for Hyde Run using a series of fictitious outfalls. The applicable tier/fictitious outfall (dependent on daily river flow measured at station 802) may represent Outfall 002, Outfall 011, or Outfall 014 on any given day, but is measured in the same location in Hyde Run, just upstream of the confluence with the Portage River. The tiers apply as follows:

No discharge is permitted when the Portage River flow is <15 cfs.

Tier 0 limits (Fictitious Outfall/Station 040) apply when Portage River flow is 15.0-17 cfs.
Tier 1 limits (Fictitious Outfall/Station 041) apply when Portage River flow is 17.01-35 cfs.
Tier 2 limits (Fictitious Outfall/Station 042) apply when Portage River flow is 35.01-52 cfs.
Tier 3 limits (Fictitious Outfall/Station 043) apply when Portage River flow is 52.01-69 cfs.
Tier 4 limits (Fictitious Outfall/Station 044) apply when Portage River flow is 69.01-145 cfs.
Tier 5 limits (Fictitious Outfall/Station 045) apply when Portage River flow is 145.01-254 cfs.
Tier 6 limits (Fictitious Outfall/Station 046) apply when Portage River flow is >254 cfs.

During 2008, monthly DMR data submitted by Brush Wellman documented 6 permit violations: 4 for acute whole effluent toxicity (2 for *C. dubia* and 2 for *P. promelas*) and 2 for copper. In the last 10 years, Ohio EPA conducted only one 48-hour acute screening bioassay at the Brush Wellman facility in March of 1999. The composite sample and 2 grab samples were collected at Outfall 011, and additional grab samples were collected in Hyde Run at Portage River South Road (the location of the fictitious outfalls). The results of this bioassay showed the Brush Wellman 011 effluent was acutely toxic to both *P. promelas* (1.4 TUa) and *C. dubia* (2.5 TUa), and the Hyde Run grab samples were acutely toxic to *C. dubia* (TUa >1).

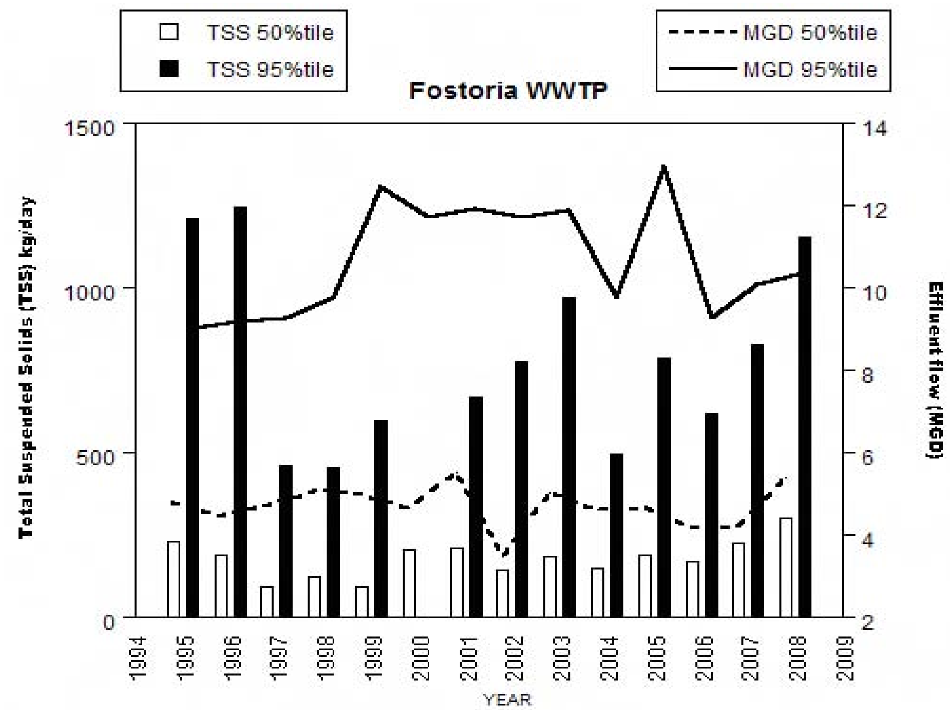

Figure 7. TSS loadings from Fostoria WWTP over time.

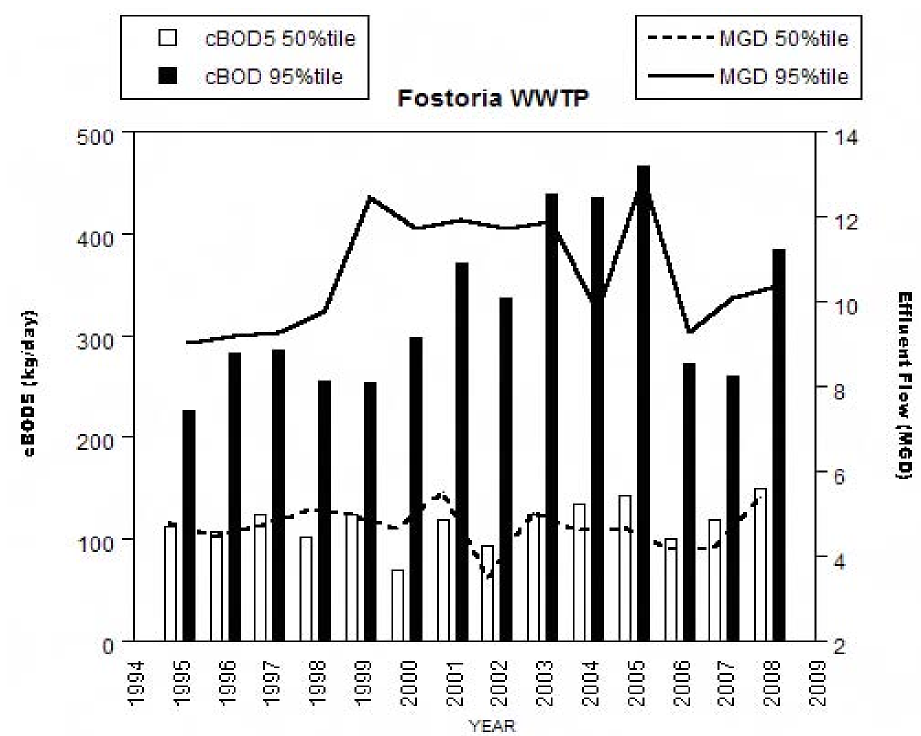

Figure 8. Loadings of cBOD5 for Fostoria WWTP over time.

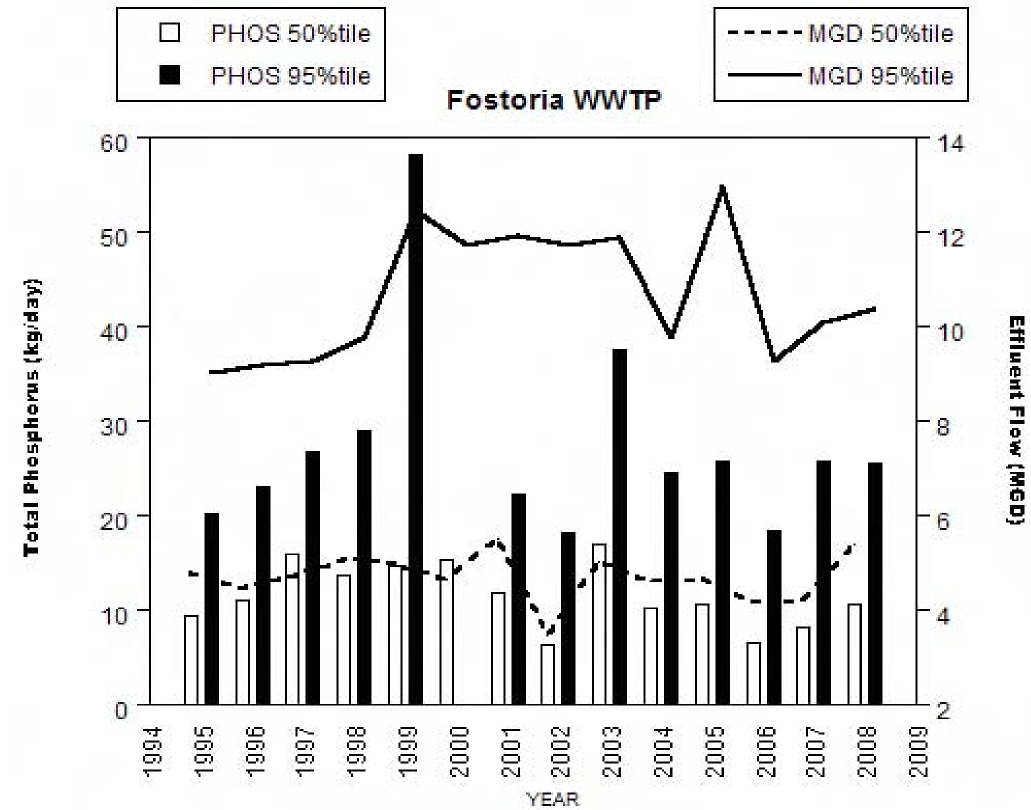

Figure 9. Total phosphorus loadings for Fostoria WWTP over time.

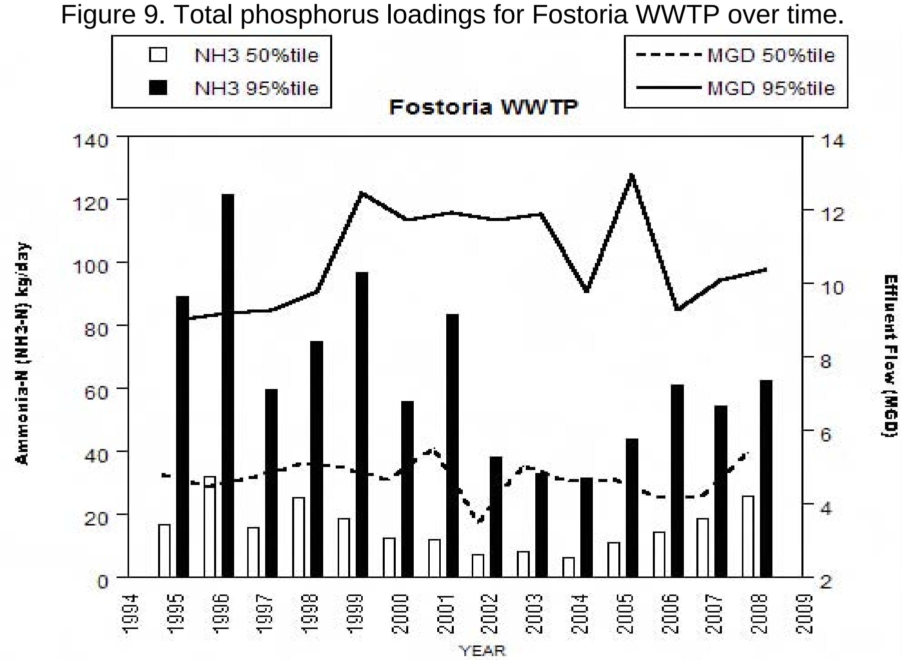

Figure 10. Ammonia loadings for Fostoria WWTP over time.

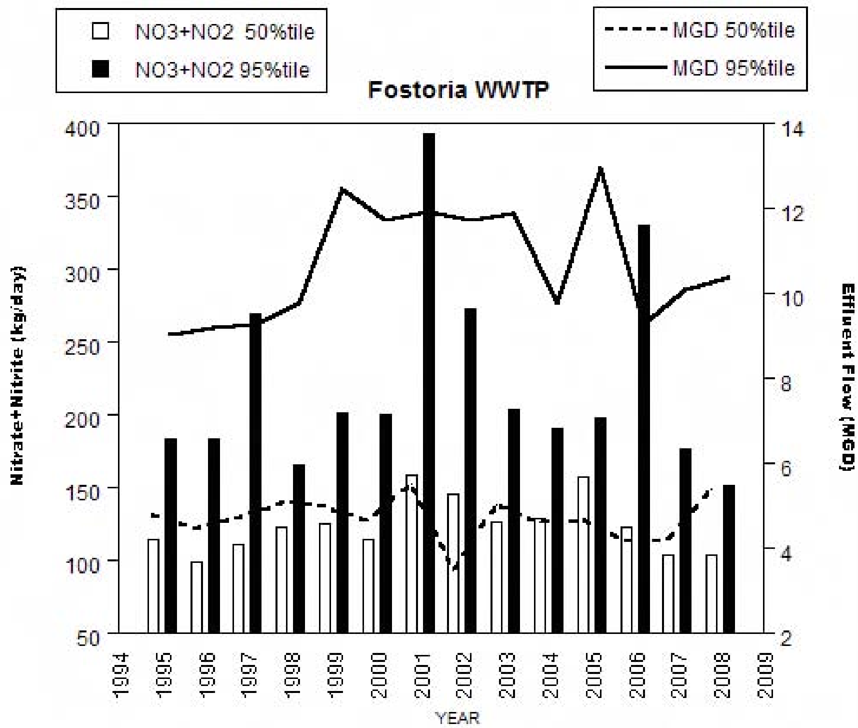

Figure 11. Nitrate-nitrite loadings for Fostoria WWTP over time.

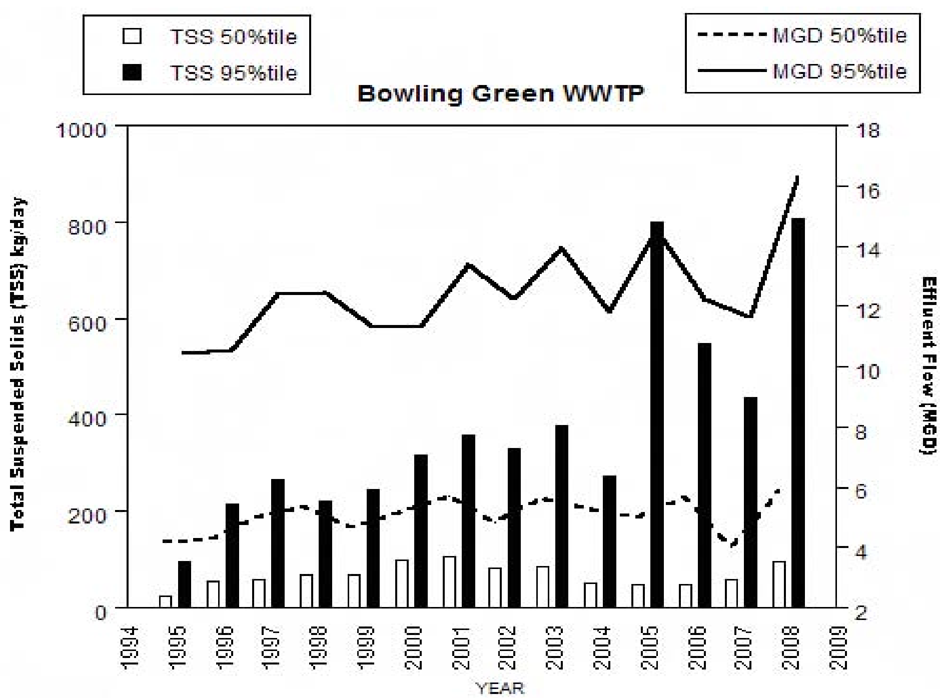

Figure 12. Loadings of TSS for Bowling Green WWTP over time.

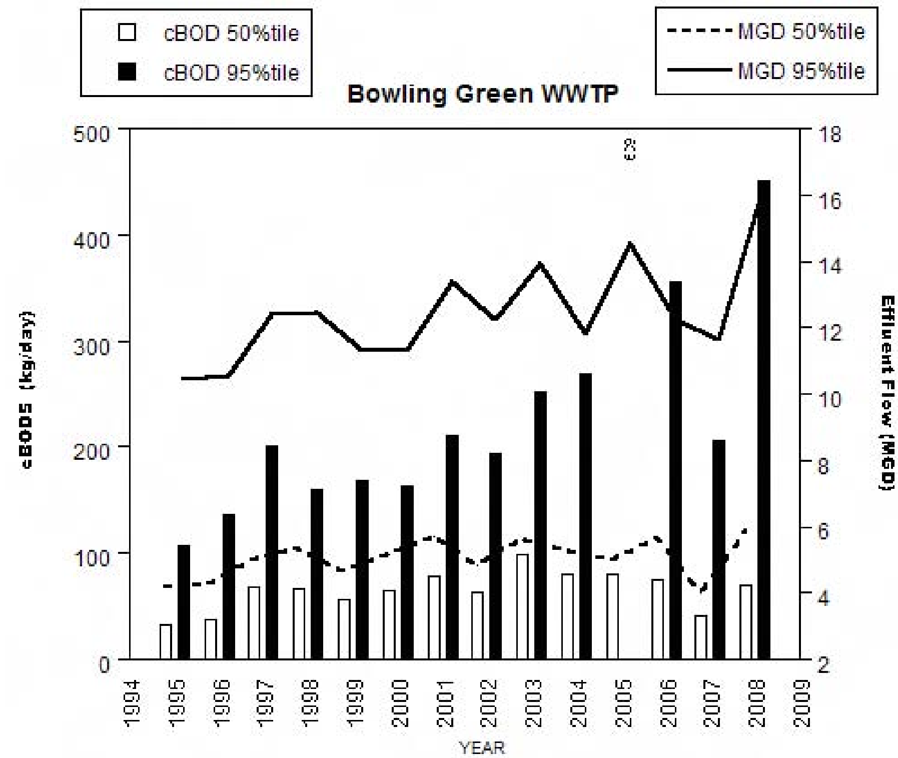

Figure 13. Loadings of TSS for Bowling Green WWTP over time.

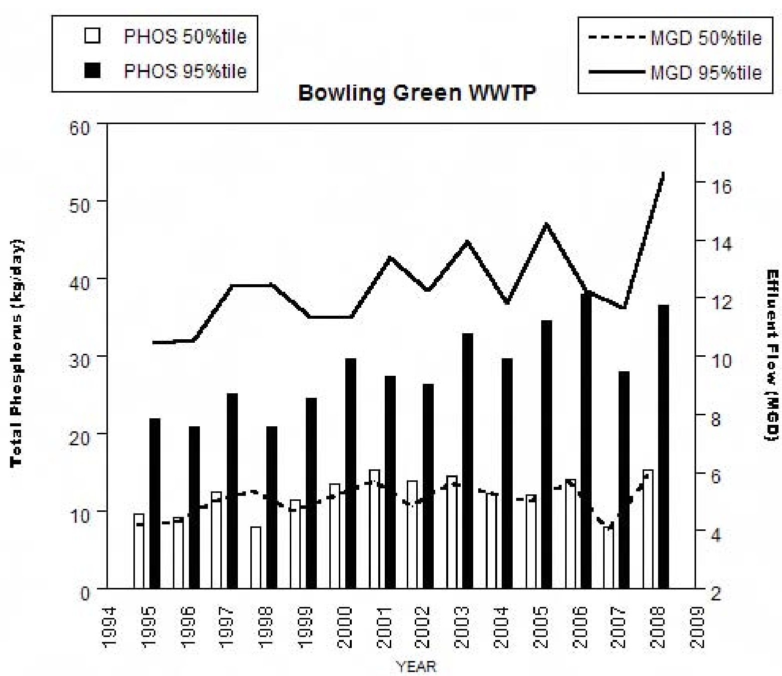

Figure 14. Total phosphorus loadings for Bowling Green WWTP over time.

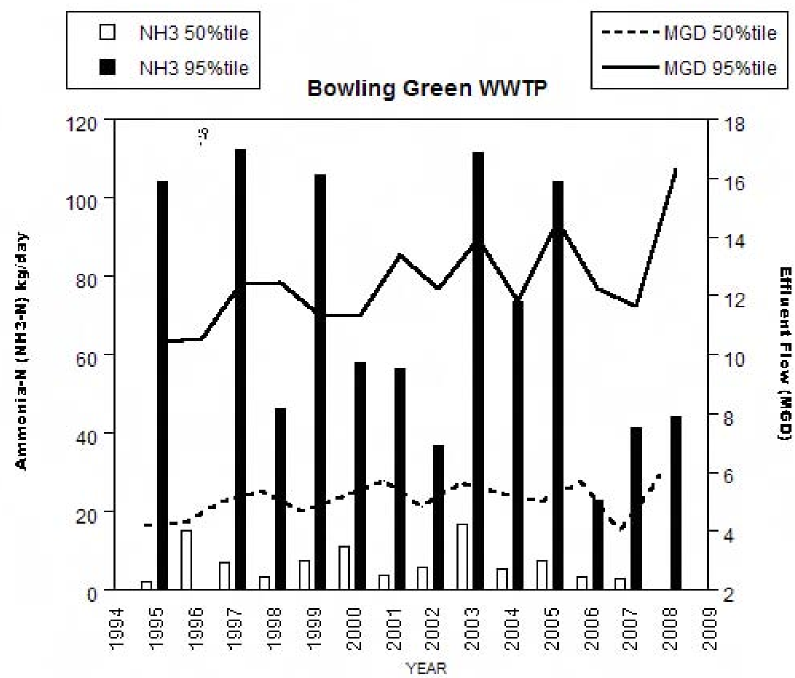

Figure 15. Ammonia loadings for Bowling Green WWTP over time.

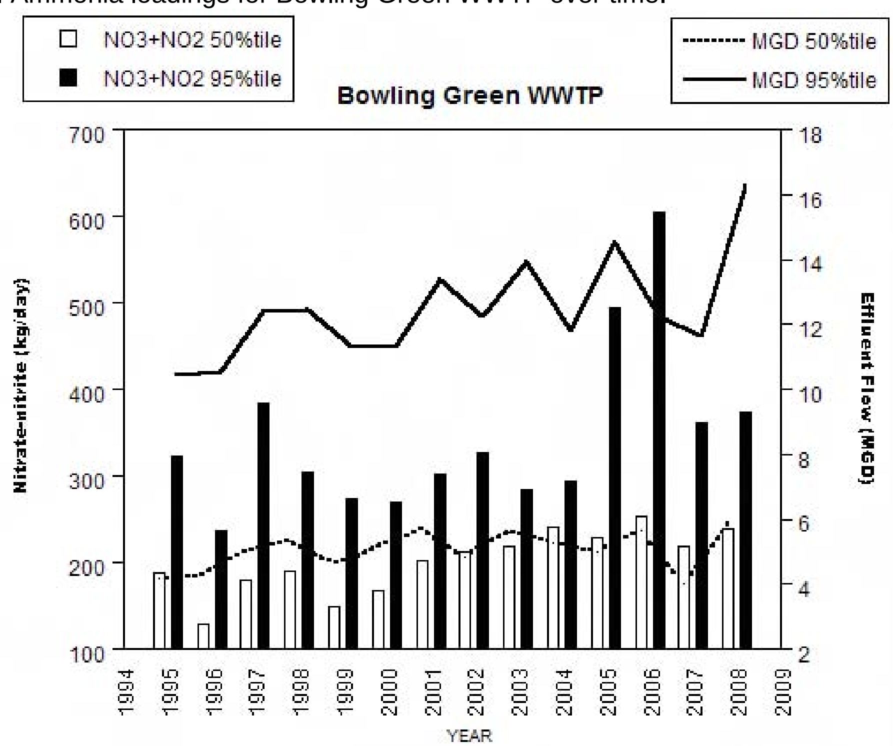

Figure 16. Loadings of nitrate-nitrite for Bowling Green WWTP over time.

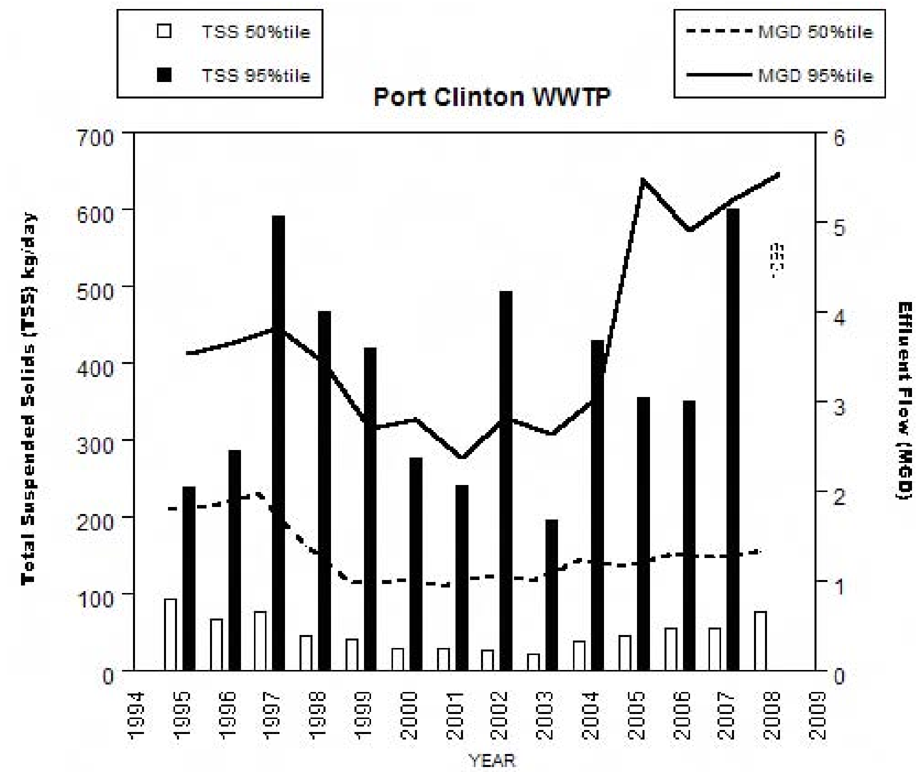

Figure 17. Loadings of TSS for Port Clinton WWTP over time.

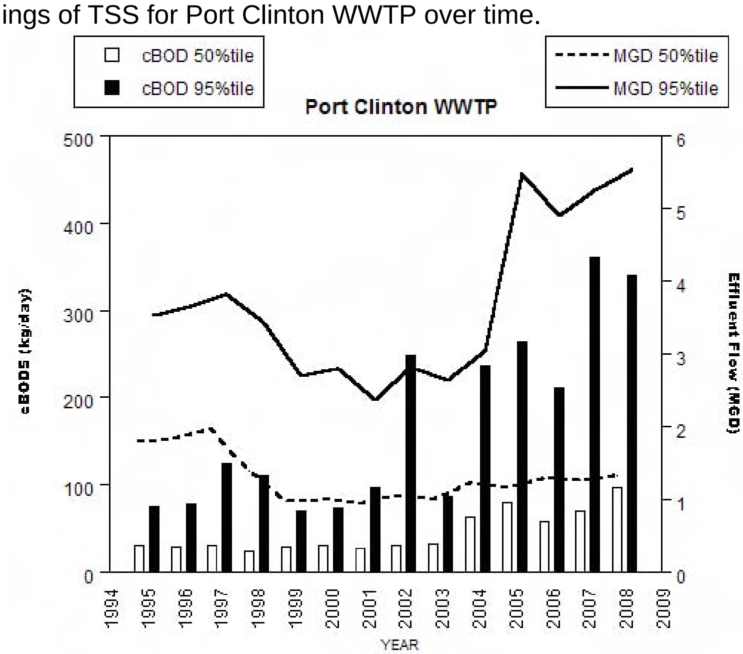

Figure 18. Loadings of cBOD5 for Port Clinton WWTP over time.

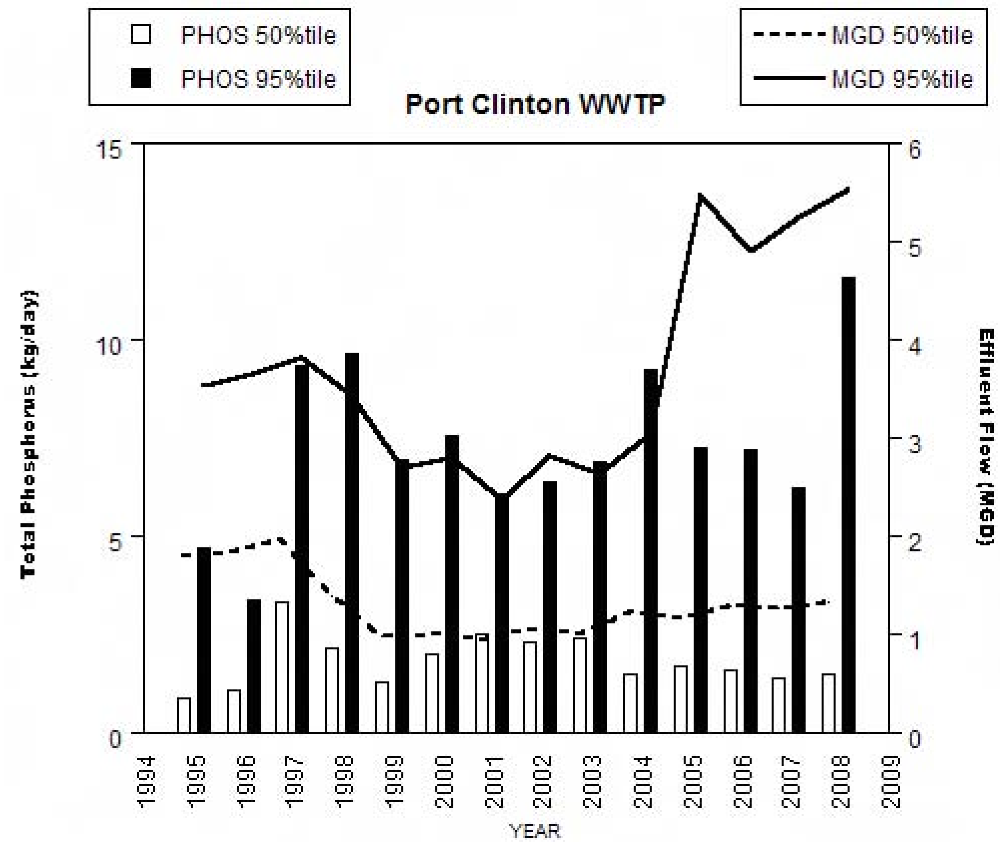

Figure 19. Total phosphorus loadings for Port Clinton WWTP over time.

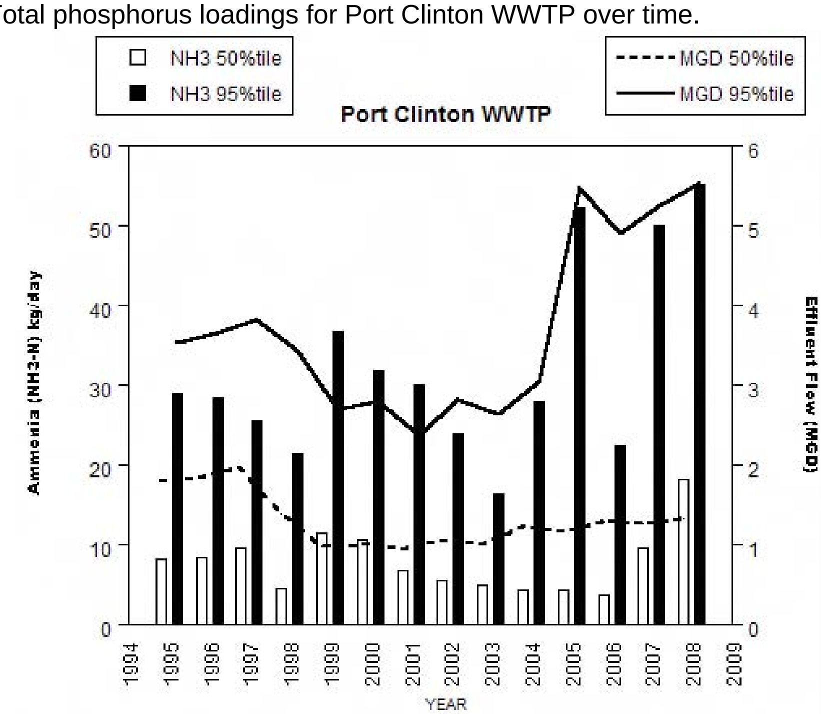

Figure 20. Ammonia loadings for Port Clinton WWTP over time.

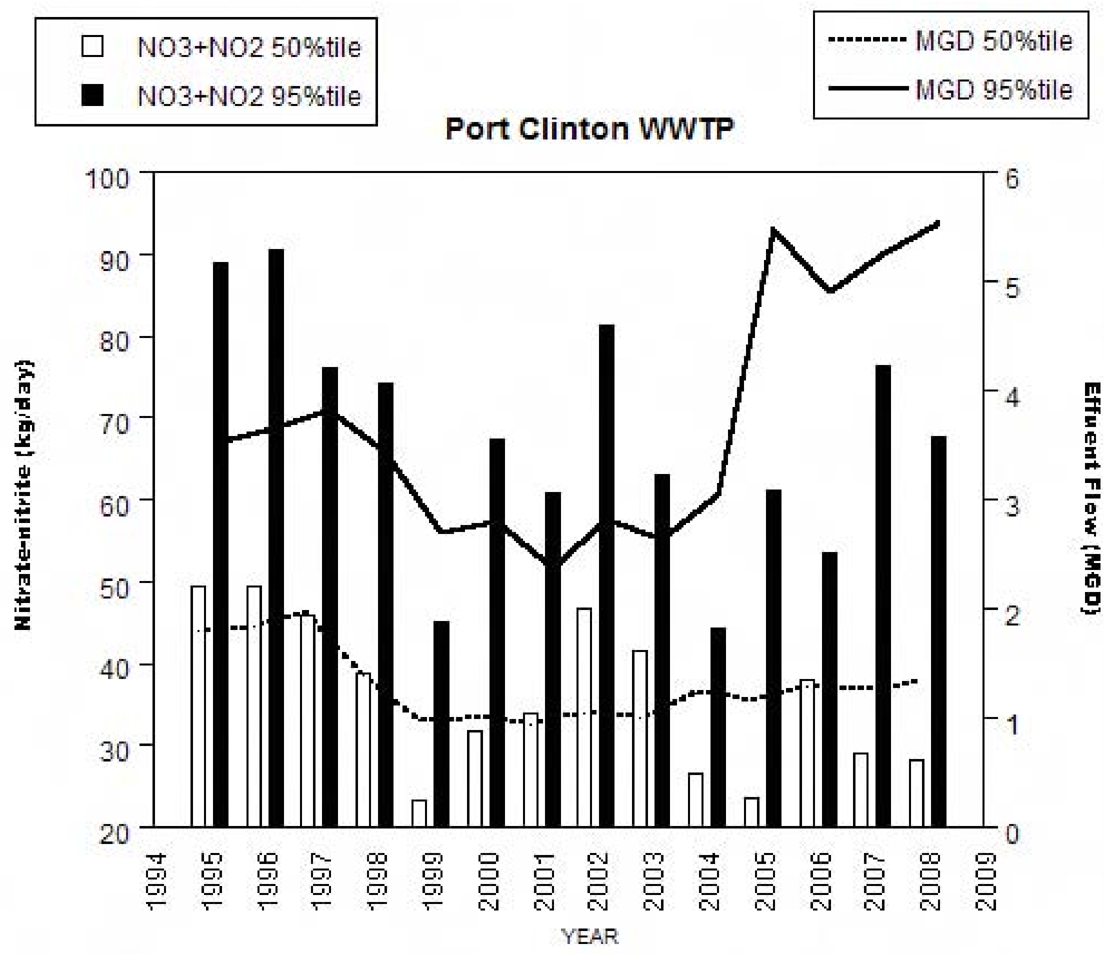

Figure 21. Nitrate-nitrite loadings for Port Clinton WWTP over time.

Chemical Water Quality

Results for select water quality constituents from the Portage River basin are summarized in Table 3, from the select Lake Erie tributaries in Table 4, and from the Maumee River tributaries in Table 5. For ease of comparison, streams contained within the same Watershed Assessment Unit (WAU) are discussed collectively in the text below and displayed collectively in the associated tables. The standard (minimum/maximum, average) or target used to evaluate each constituent is included in the table. Results above these levels are considered degraded and are highlighted in bold. In some cases, the geometric mean of sample results is computed and presented for comparison to the standard or target.

The Rader Creek WAU was impacted by high nutrient levels (Table 3). Nutrient levels were assessed by comparing the geometric mean of the samples collected at each site to the statewide target values for headwaters (i.e., 0.08 mg/l for phosphorus and 1.0 mg/l for nitrate). The McComb WWTP discharge to Algire Creek appeared to be responsible for the high nutrient loading in Rader Creek as illustrated in Figures 22 & 23. Single sample exceedences of a few metals parameters were attributable to very high flows following rain events.

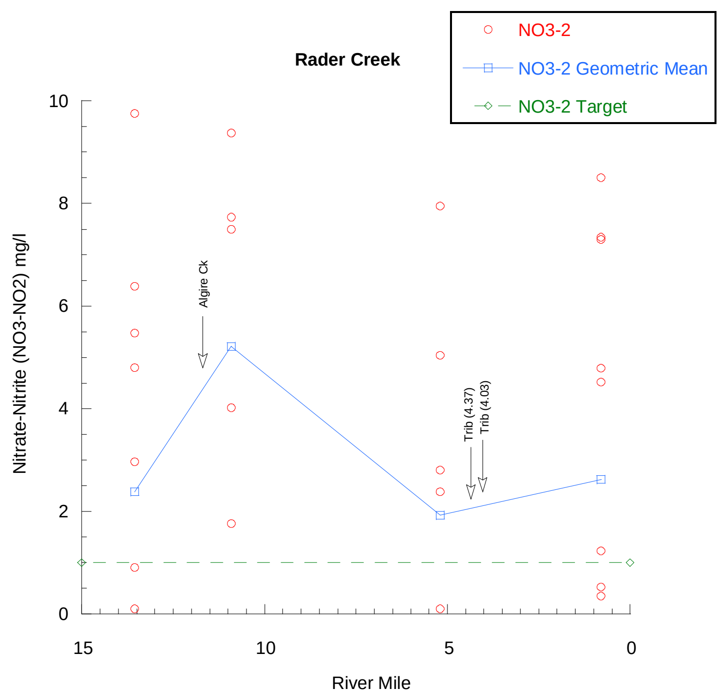

Figure 22. Nitrate-nitrite data for Rader Creek showing influence of McComb WWTP via Algire Creek.

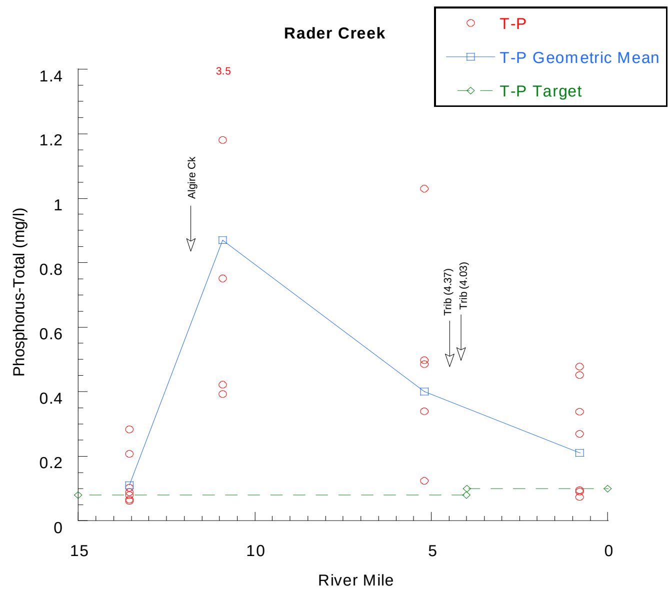

Figure 23. Total phosphorus for Rader Creek showing influence of McComb WWTP via Algire Creek.

The Needles Creek WAU also had nutrient enrichment, particularly nitrate, though the numbers were not as high as in Rader Creek (Table 3). A non-permitted discharge from a holding pond at the Reyskens Dairy (CAFO) on Cygnet Road was discovered to be impacting Needles Creek at RM1.25. It was causing exceedences of the recreation use, and was contributing to the nutrient load of the stream.

The Rocky Ford Creek WAU was somewhat nutrient enriched by nitrate, particularly downstream of the North Baltimore WWTP discharge (Figure 24), but phosphorus geometric means were all below the target value. There are 2 PWS intakes on Rocky Ford Creek and there were exceedences of the PWS use for aluminum, manganese and iron in all the samples collected (see also the section on Public Water Supplies).

The Middle Branch Portage River (upstream of Rocky Ford Creek) HUC12 was in fairly good shape, except for higher levels of phosphorus and nitrate that were residual from Rader and Needles Creek (Figures 25 & 26). The state wide target values of 0.10 mg/l for phosphorus and 1.0 mg/l for nitrate in wadeable streams applied to this section. There may be some additional input of nitrate from agricultural runoff and/or from the Rudolph area where there was an unidentified septic discharge.

The Bull Creek HUC12 did not have any notable water quality issues in the headwaters, except for some lower dissolved oxygen levels during the late summer low flow conditions (Table 3). Nitrate exceeded the state wide nutrient target for wadeable streams at the most downstream site, likely due to agricultural runoff from upstream.

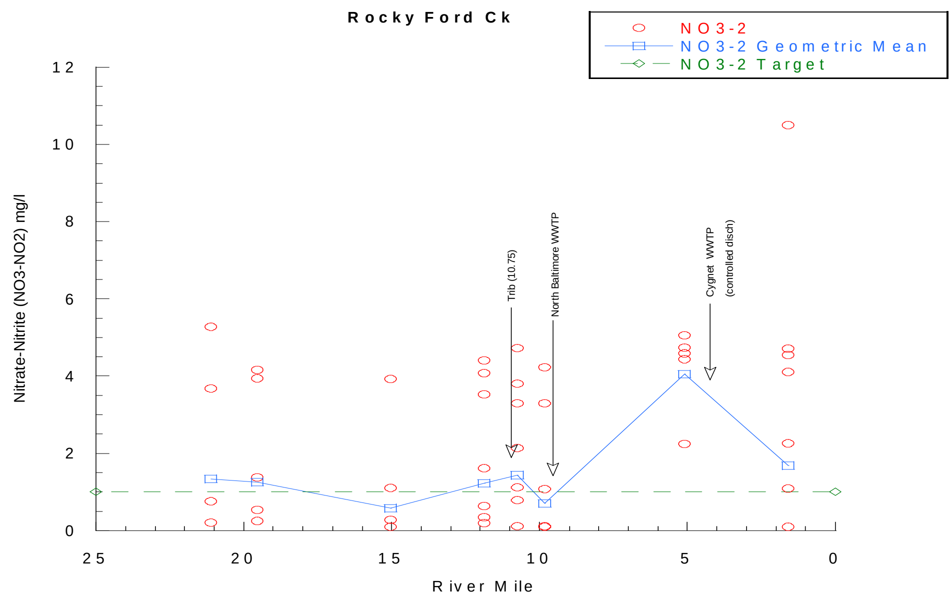

Figure 24. Nitrate-nitrite data for Rocky Ford Creek.

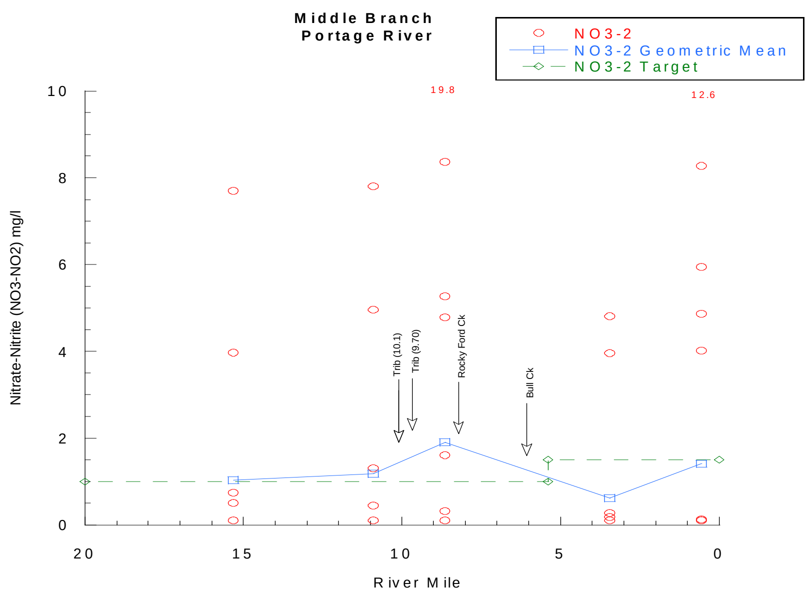

Figure 25. Nitrate-nitrite data for Middle Branch Portage River depicting slight elevations associated with waters from Rader Creek and Needles Creek, and possibly an unsewered area near Rudolph.

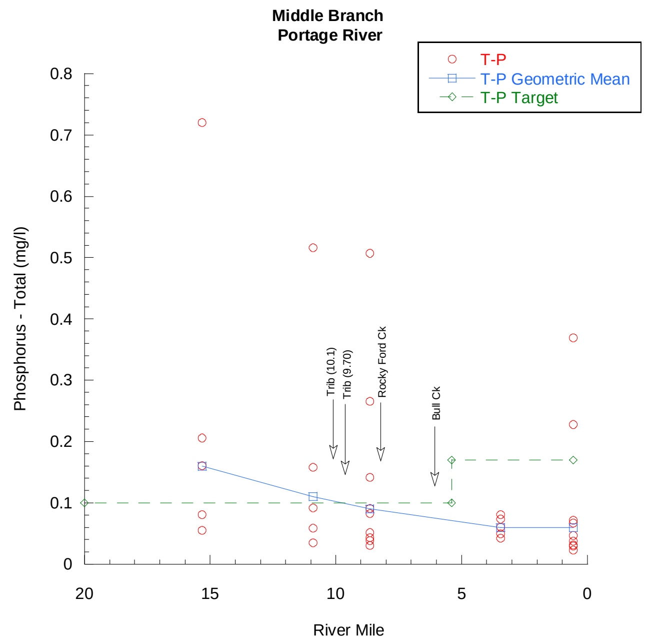

Figure 26. Total phosphorus for Middle Branch Portage River showing occasional spikes from Rader Creek and Needles Creek, and possibly an unsewered area near Rudolph.

The East Branch Portage River WAU was highly nutrient enriched. The geometric mean for nitrate increased to >7 mg/l downstream of Fostoria (Figure 27), and the geometric mean of phosphorus results was generally 1.5-3 times the statewide target (Figure 28), with the highest levels at TR 226 (RM 12.47) and downstream of the unsewered Village of West Milgrove (RM 0.80). The spike of nitrate near TR 226 (RM 12.47) is possibly attributed to the upstream golf course. The East Branch Portage River was also not meeting the PWS use for aluminum or iron at the site where water is withdrawn into the drinking water reservoirs, and there were also occasional exceedences of the drinking water criteria for nitrate and manganese here (see also the section on Public Water Supply Use Status and Table 3).

The water quality in the South Branch Portage River (upstream of the East Branch) WAU had phosphorus levels that were slightly above the statewide target level until RM 17.77, where the geometric mean phosphorus increased to 3 times the statewide target of 0.10 mg/l. Although not as dramatic, nitrate levels also increased at this point downstream of the Bloomdale tributary (Bloomdale WWTP discharge). Nutrient levels returned to at or below target levels by RM 14.43. There was also a strange occurrence of very high conductivity and TDS concentrations in the headwaters during late summer low flow conditions, likely attributable to groundwater contributing a higher percentage of the base flow of the stream (Table 3).

The South Branch Portage River (downstream of the East Branch) WAU was impacted by the high nutrient load of the East Branch Portage River. Both phosphorus and nitrate increased to above the statewide target levels for wadeable streams (Figures 29 & 30).

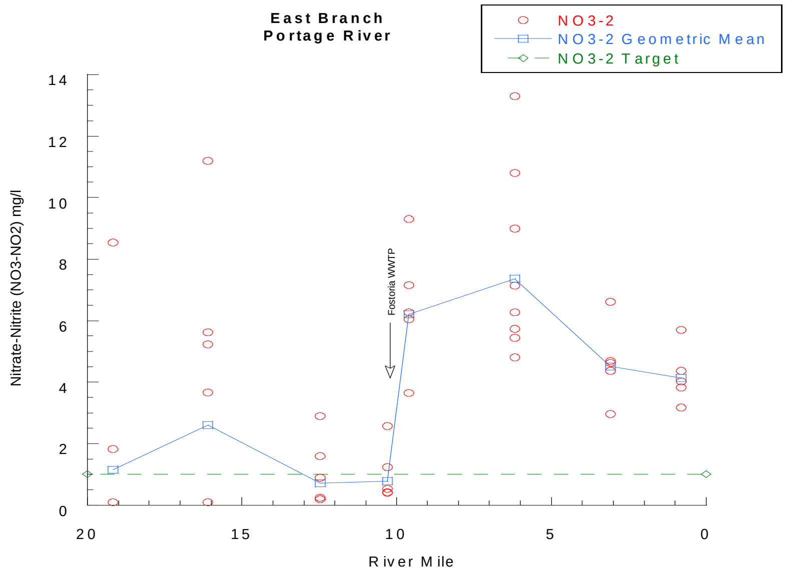

Figure 27. Nitrate-nitrite levels within East Branch Portage River. Note increase downstream of Fostoria.

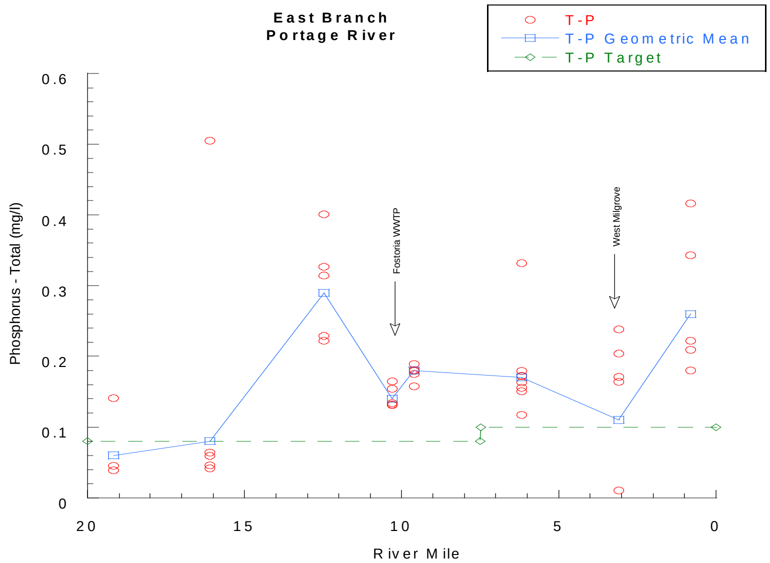

Figure 28. Total phosphorus levels within East Branch Portage River. Note increases downstream of both Fostoria and the unsewered community of West Milgrove.

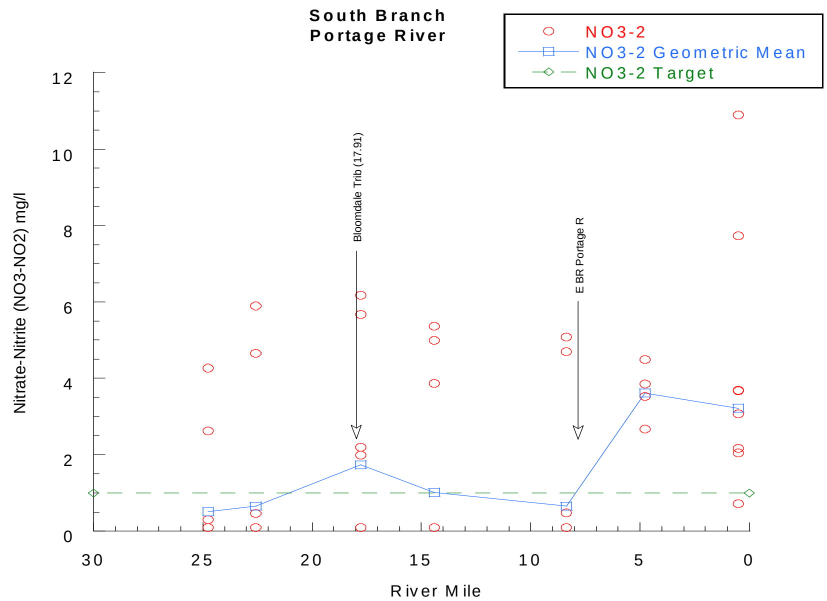

Figure 29. Nitrate-nitrite levels collected in South Branch Portage River showing influence of nutrient enriched waters of East Branch Portage River.

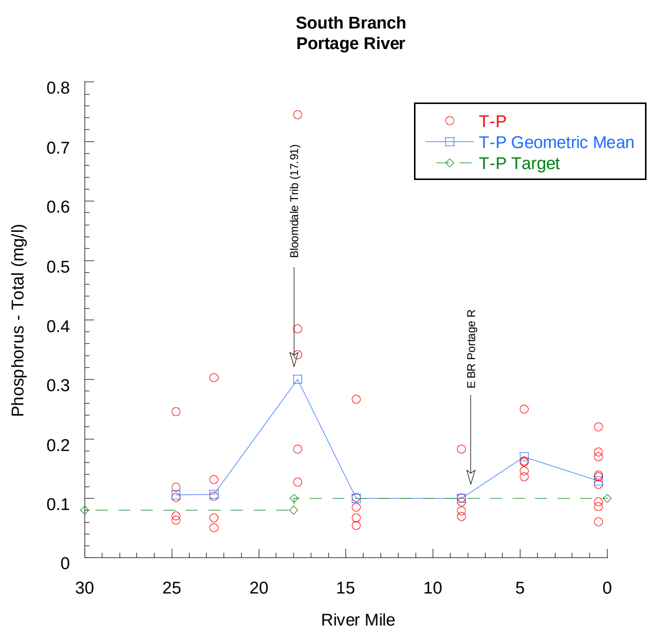

Figure 30. Phosphorus levels collected in South Branch Portage River showing influence of nutrient enriched waters of East Branch Portage River.

At the most upstream site in the North Branch Portage River WAU, the geometric mean of phosphorus results was >3 times the statewide target for headwater streams. The proximity of the Reyskens Dairy (CAFO) suggested that runoff from this facility may be contributing to the elevated phosphorus. Phosphorus levels returned to below target levels until RM 9.64, which was downstream from the Cuckle Creek tributary known to receive septic inputs from an unsewered residential area. Exceedences of the WWH criteria for strontium at this site may also have been from the use of well water by the same residential area. The Bowling Green WWTP was a major contributor of both nitrate and phosphorus to the North Branch Portage River (Figures 31 & 32, Table 3). The geometric mean of phosphorus downstream of the Bowling Green WWTP was >4 times the statewide target (0.10 mg/l for wadeable streams) and nitrate was >8 times the target (1.0 mg/l for wadeable streams).

The most upstream site in the Sugar Creek WAU (RM 21.31) had a geometric mean for phosphorus that was >3 times the statewide target of 0.08 mg/l for headwater streams (Figure 33). The Village of Rising Sun, further upstream, may have contributed to phosphorus loads (and *E. coli* counts) at the site, since sampling was conducted in 2008, before the new Rising Sun WWTP had become fully operational. From RM 18.50 to RM 13.38 there were no exceedences of any water quality criteria (except *E. coli* – see Recreation Use Status), nor were there any exceedences in Coon Creek. At RM 8.90 there was a sudden increase in phosphorus levels (Figure NW10), with the geometric mean >10 times the statewide target of 0.10 mg/l for wadeable streams. The likely source of phosphorus was the Village of Gibsonburg. The effluent from the Gibsonburg WWTP is split with 50% going to Sugar Creek via Hurlbut Ditch, and 50% going to Wolf Creek via the SR 300 Ditch. A similar impact was noted in Wolf Creek.

There were no water quality exceedences in Ninemile Creek (tributary to the Little Portage River), nor at the upstream site in the Little Portage River (again with the exception of *E. coli* – see Recreation Use Status). The geometric mean phosphorus level at RM 1.79 on the Little Portage River was slightly above the statewide target of 0.10 mg/l for wadeable streams (Table 3).

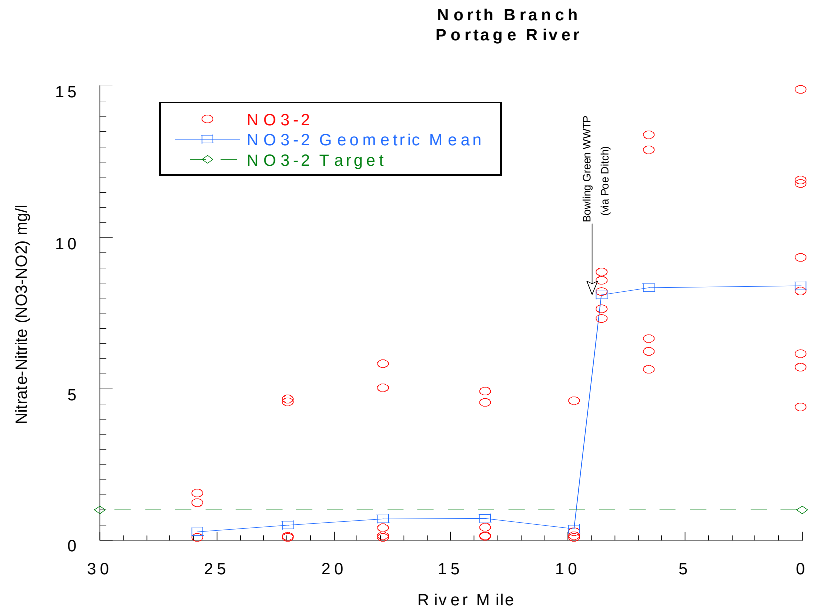

Figure 31. Nitrate-nitrite levels from North Branch Portage River depicting increases associated with an unsewered community along Cuckle Creek.

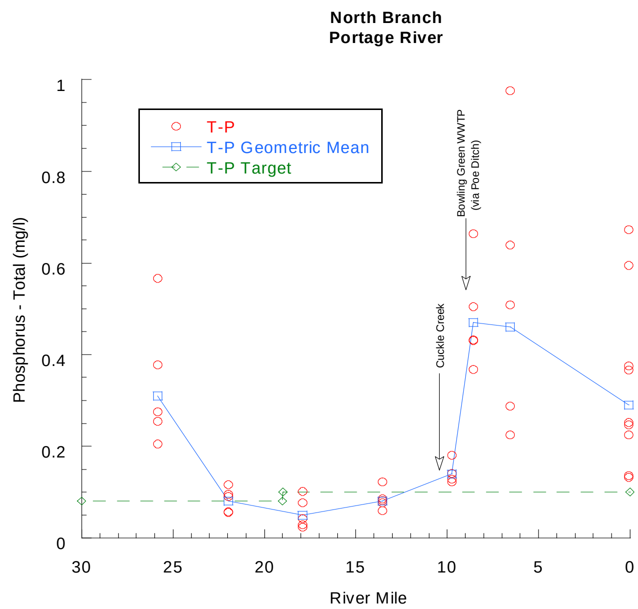

Figure 32. Total phosphorus levels within North Branch Portage River depicting spike associated with Reyskens Dairy in the headwaters and an unsewered community along Cuckle Creek near RM 9.64.

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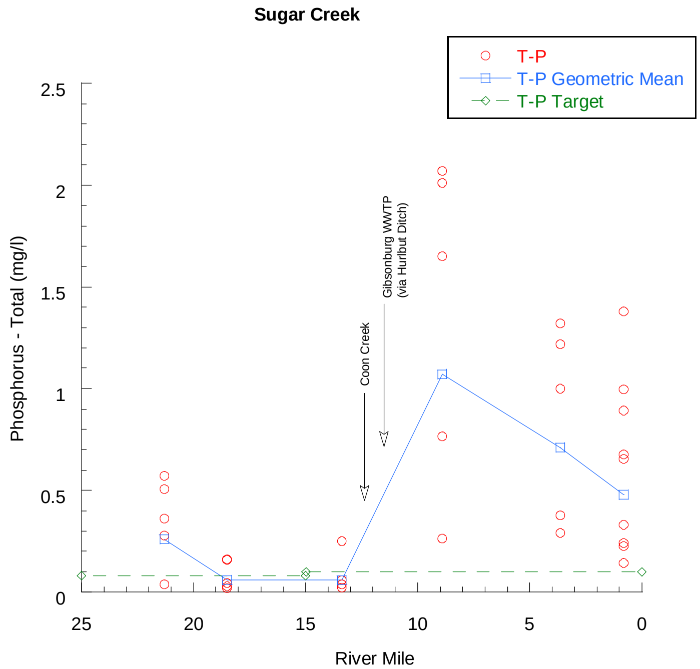

Figure 33. Total phosphorus levels within Sugar Creek showing elevated levels downstream of the village of Rising Sun.

In the upper mainstem Portage River, the high nitrate levels were residual from upstream sources on the North Branch Portage River, East Branch Portage River, and South Branch Portage River (Figure 34). These levels recovered to below the statewide target of 1.5 mg/l for small rivers from RM 24.10 to just upstream of the Brush Wellman discharge (via Hyde Run). Brush Wellman typically had a very high nitrogen input from their IWWTP when they are discharging. It showed up in their DMR self-monitoring as ammonia, but by the time it reached Hyde Run (the fictitious outfalls – see explanation in Pollutant Loadings Section), it was mostly nitrified and was seen as nitrate in levels that sometimes reached several hundred parts per million (300-500 mg/l). The geometric mean for nitrate in Hyde Run during 2008 was 97 mg/l with a high of 411 mg/l. The geometric mean of nitrate in the Portage River within the "mix zone" from Hyde Run was 7.19 mg/l with a high of 346 mg/l. On three of the five sample dates, Portage River daily average flows at SR 590 (as reported by USGS) were 43, 22, and 14 cfs respectively. Brush Wellman's NPDES permit specifies that Tier 2 and Tier 1 limits for the fictitious outfall at Hyde Run should have been applied on July 24 and August 7, 2008 respectively (the 3rd and 4th sample dates), and no discharge would have been allowed on August 21, 2008 when the Portage River flow was <15 cfs.

Nitrate in the July 24 Hyde Run sample was 381 mg/l and 6.16 mg/l in the Portage River immediately downstream of Hyde Run. On August 7, no sample was collected from Hyde Run, but nitrate in the Portage River downstream of Hyde Run was 3.00 mg/l (compared to 0.11 mg/l just upstream at SR 590). On August 21, the nitrate level in Hyde Run was 9.71 mg/l, but may have been residual from an earlier discharge, since little to no flow from Hyde Run appeared to be reaching the Portage River. There are no limits in the Brush Wellman NPDES permit for nitrate. Since there was evidence that most of the ammonia from the IWWTP discharge (outfall 011) was nitrified by the time it reached the location of the fictitious outfall(s) in Hyde Run, it may be beneficial to add limits for nitrate to the NPDES permit at the Hyde Run location. The impact of nitrate on the Portage River from Brush Wellman appeared to be localized however, as the geometric mean for nitrate fell below the statewide target of 1.5 mg/l about a mile downstream of Hyde Run and remained below the target in the remainder of the Portage River mainstem.

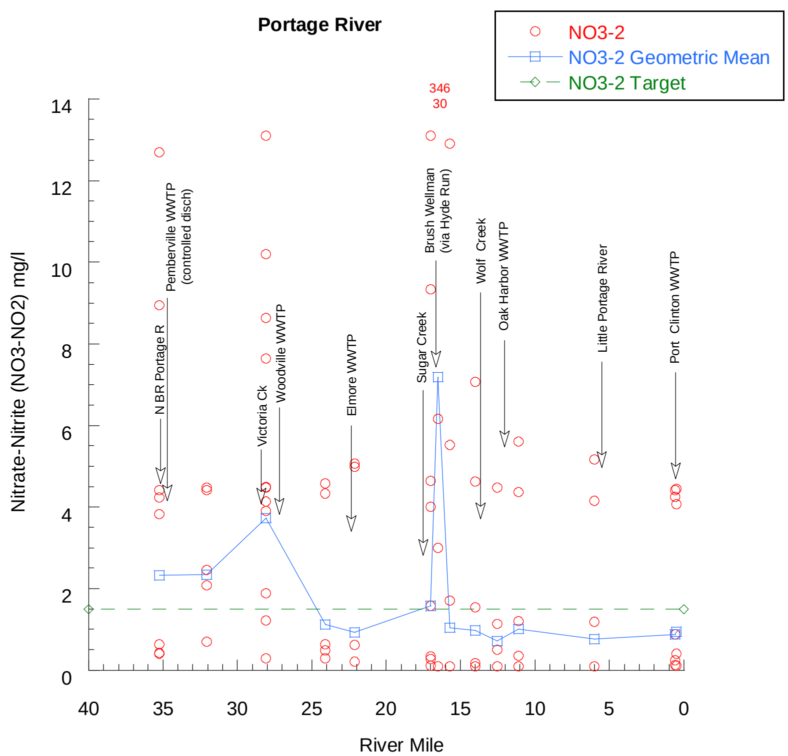

Figure 34. Nitrate-nitrite levels in Portage River mainstem from 2008 sampling.

Geometric mean phosphorus levels in the Portage River mostly remained below the statewide target of 0.17 mg/l for small rivers until near RM 15.70 (downstream of Sugar Creek) where values rose until peaking at RM 11.10 (downstream of the Oak Harbor WWTP discharge). The increase may be linked to the high levels of phosphorus from the Gibsonburg WWTP that was reaching both Sugar Creek and Wolf Creek as illustrated in Figure 35. The Oak Harbor WWTP likely added to the phosphorus load, though downstream of RM 11.10 the phosphorus levels dropped back below the target.

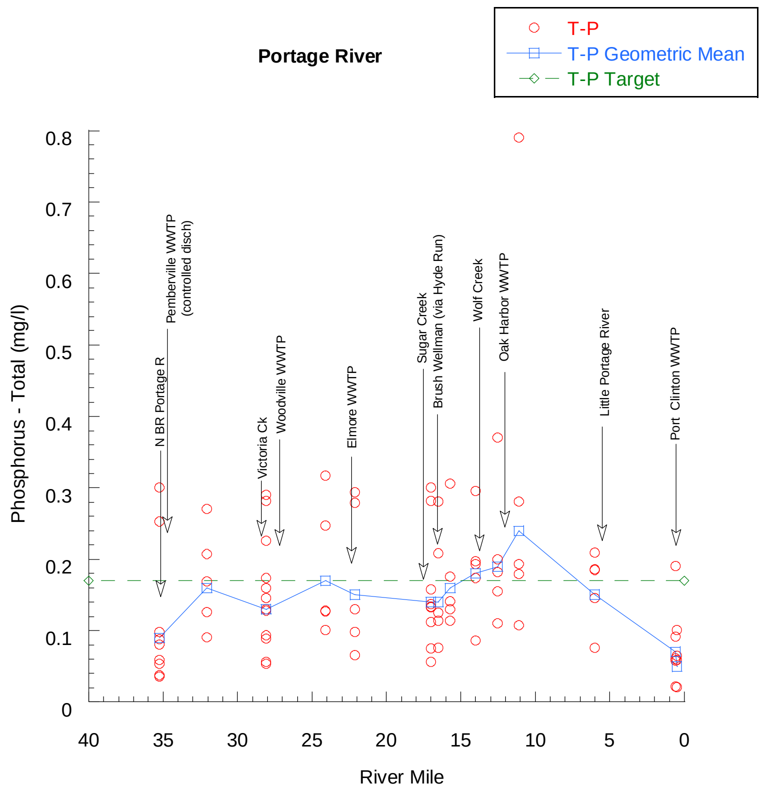

Figure 35 Total phosphorus levels for the Portage River in 2008.

There were also a few single sample exceedences of copper, aluminum and iron in the Portage River that were associated with high flow conditions (rain event runoff). However, the copper exceedence was just downstream of the confluence with Hyde Run, and Brush Wellman is known to discharge high levels of copper. In 2008, 3 of 4 samples in Hyde Run also exceeded the WWH outside mixing zone average (OMZA) criteria for copper (Table 3).

Additional water samples collected from the Portage River basin and analyzed for pesticides, herbicides, volatile and semi-volatile organic compounds resulted in undetectable levels of most parameters (Appendix E). Only contaminants that were detected at least once in any sample are shown in Table 6.

While most contaminants were not detected, several compounds were found including, with trade name in parenthesis: Acetochlor (Harness), Atrazine (AAtrex), Metolachlor (Dual), and Simazine (Princep). These chemicals are used for selective weed control in corn and soybeans and are sometimes used in mixtures. For example, atrazine and metolachlor are commonly mixed and marketed under the trade name Bicep. Some of these chemicals are also used for turf management, such as residential lawns and golf courses. The fact that they are detected in surface water indicates that non-point runoff is a source and that they persist in the environment. The levels of most concentrations of the detected compounds were fairly low, however, Atrazine levels often exceeded the MCL of 3.0 mg/l for drinking water, but only 3 of the exceedences were at sites that have the PWS use.

Of particular note was the detection of PCB-1242 (0.36 ųg/l) in a water sample collected in Hyde Run (Brush Wellman discharge) at a level slightly higher than the concentration of PCB-1248 (0.316 ųg/l) that was detected in water collected at the same site during Ohio EPA sampling in 1994. This is the suspected source of PCBs that have been persistent in the Portage River sediments from this location to as far downstream as Oak Harbor (See Sediment Quality Status).

Water quality in the select Lake Erie tributaries was generally influenced by agricultural activities and sewage from small villages and rural residential areas that were unsewered. There were no major dischargers in the HUC10, but there were a half dozen package plants, and there were more industrial treatment ponds and industrial storm water discharges closer to the outlying areas of Toledo, (Appendix B). In the Turtle Creek HUC12, there were no exceedences of water quality criteria in North Branch Turtle Creek near the mouth (except *E. coli* - see Recreational Use Status). However, the South Branch Turtle Creek site was highly impacted by the unsewered community of Martin. There were 2 exceedences of the WWH OMZA criteria for ammonia; the geometric mean phosphorus was 6 times the statewide target of 0.08 mg/l for headwater streams, and there were 3 exceedences of the minimum criterion for dissolved oxygen as the stream became more stagnant under late summer low flow conditions (Table 4). Exceedingly high *E. coli* counts were also an indication of the impacts of septic discharges to the stream. Turtle Creek downstream of the confluence of the North and South Branches reflected the conditions of the two source tributaries with geometric mean phosphorus slightly higher than the statewide target of 0.10 mg/l for wadeable streams and high *E. coli* counts (Table 4).

The Crane Creek HUC12 had geometric phosphorus means ranging from 1.5 to nearly 4 times the target levels at all sites. Only at the most downstream site (RM 5.90) did the nitrate geometric mean exceed the target. There were also 2 exceedences of the WWH OMZA for ammonia, so there may be septic discharges influencing this site (Table 4).

In the Cedar Creek HUC12, the upstream site in Dry Creek at East Broadway Road was highly impacted by a septic discharge. Ammonia levels were elevated, with one exceedence of the WWH OMZA criteria for ammonia and *E. coli* counts were exceedingly high (Table 4). The geometric mean phosphorus was 2 times the target and there was one exceedence of the minimum dissolved oxygen criterion. Strontium also exceeded the WWH OMZA criterion in all 5 samples, indicating that well water may be the source of water for the users contributing to the septic discharge. The water quality of Cedar Creek was fairly good, with geometric mean phosphorus levels only slightly higher than target at the 2 most upstream sites. There were only two water quality parameters with exceedences. Strontium exceeded the WWH OMZA criterion in 3 samples at RM 9.59. The other parameter, of course, was *E. coli* at all sites (see Recreation Use Status). *E. coli* counts were especially high at 2 sites sampled in the unsewered Village of Curtice. No other parameters were sampled at these sites.

Wolf Ditch and Wolf Creek have geometric mean phosphorus levels that exceed the target at all sites. However, Wolf Ditch at RM 6.30 (Curtice Road) appeared to be particularly impacted by a nearby septic discharge(s). Ammonia was elevated with one exceedence of the WWH OMZA criteria for ammonia and *E. coli* counts were exceedingly high. The geometric mean phosphorus and nitrate levels were 0.35 mg/l and 5.28 mg/l compared to targets of 0.08 mg/l and 1.0 mg/l, respectively.

Additional water samples were collected at several Lake Erie tributary sites and tested for volatile and semi-volatile organic compounds. Sites tested were Crane Creek at Hanley Rd (RM 18.82), Cedar Creek at East Broadway and Billman Roads (RM 17.32 and RM 9.59), and Dry Creek at E. Broadway (RM 7.00). All contaminants tested were below the method detection limits (Appendix E). Samples were also analyzed for PCBs at the Crane Creek and Dry Creek sites, though no PCBs were detected in these samples.

Otter Creek, which is designated MWH, was impaired by industrial activity. Sampling in Otter Creek was conducted in 2006. At the two most upstream sites (RM 5.92 and RM 2.95) arsenic levels were elevated in all samples, although concentrations never exceeded the OMZA of 150 ɥg/l. At RM 5.92, benzo(a)pyrene (a PAH compound) was detected in one sample at 3.38 ɥg/l. The human health Tier II non-drinking water criterion for this contaminant is 0.00002 ɥg/l. The IMZM (end of pipe maximum) criterion is 1.1 ɥg/l. At the downstream sites (RM 2.13 and RM 0.40) the maximum pH criterion of 9.0 SU was frequently exceeded (Table 4).

Additional water samples collected from Otter Creek sites in 2006 and analyzed for pesticide, herbicide, volatile and semi-volatile organic compounds resulted in undetectable levels of most parameters (Appendix E). Only contaminants that were detected at least once in any sample are shown in Table 7.

Water quality in the select Maumee River tributaries was also evaluated using data collected in 2006, with the exception of Duck Creek which was sampled in 2008. Both Grassy Creek and Grassy Creek Diversion, which flowed through Perrysburg and into Rossford, had geometric mean phosphorus levels only slightly above the target of 0.08

mg/l for headwater streams. Both the phosphorus and the nitrate targets were exceeded in Delaware Creek. The pesticide compound a-BHC was detected at 0.0080 ųg/l in Delaware Creek, above the Human Health Tier I non-drinking water criterion of 0.0053 ųg/l. There were also elevated levels of chloride, TDS and conductivity at this site (Table 5).

Duck Creek, which originated at the outlet from Hecklinger Pond in Oregon, became intermittent with no flow evident at the two downstream sites in late summer 2008. Four samples were collected just downstream of the Hecklinger Pond outlet, where the minimum D.O. criterion was exceeded once and the maximum pH criterion was exceeded twice. Only 2 samples could be collected at each of the 2 downstream sites before they went dry. Both sites had elevated phosphorus in the second sample (collected July 15, 2008). At RM 3.10, the second sample exceeded the minimum D.O. criterion and the agricultural water supply criterion for iron. Levels of arsenic and conductivity were elevated at both sites, in both samples, but particularly in the second sample (Table 5).

Additional water samples collected from select Maumee River tributary sites in 2006 and 2008 were analyzed for pesticides, herbicides, volatile and semi-volatile organic compounds and resulted in undetectable levels of most parameters (Appendix E). Only contaminants that were detected at least once in any sample are shown in Table 7.

Results of all inorganic and organic water quality samples collected in the survey areas during 2006 and 2008 are presented in Appendices D and E.

Table 3 Results for select water quality constituents tested in grab samples from the Portage River basin organized by WAU. The standard or target used to evaluate each constituent is included. Concentrations that exceeded these levels may indicate degradation of water quality and are highlighted in bold. Although the applicable recreational use designation is listed for each stream (PCR), *E. coli* results for each site are presented separately in Table8.

Stream Use Designations	**River Mile (Drainage Area)**	**Use**	**Constituent**	**Values**
Rader Creek WAU (HUC 12 – 041000100101)				
Algire Creek Undesignated	1.78 (2.3 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.479, 0.120, 0.087, 0.308, 0.164 (Geo. mean = 0.19)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**8.87 ,4.81**, 0.97, **2.27**, 0.12 **(Geo. mean = 1.62)**
			D.O. (mg/L) Min=4.0	8.07, 7.59, 6.81, 4.90, **2.34**
McComb WWTP 2PB00002 RM 1.05	0.10 (3.0 mi^2) Headwaters	WWH	Ammonia (mg/L) 30 day OMZA (temp & pH dependent)	0.843, 0.114, 0.111, **1.21, 9.00**
			t-P (mg/L) target=0.08 (as geo. mean)	**0.460, 0.719, 1.22, 2.08, 3.63 (Geo. mean = 1.25)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**8.21, 8.59, 4.19, 3.46, 3.34 (Geo. mean = 5.09)**
Rader Creek Undesignated (WWH, PCR, AWS, IWS Recommended) PWS (RM 13.55 only)	13.55 (2.6 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.088**, 0.080, **0.284**, 0.066, **0.102**, 0.061, **0.207 (Geo. mean = 0.11)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**4.80, 6.39, 9.75, 5.48, 2.97**, 0.90, <0.10 **(Geo. mean = 2.38)**
			Temperature (°C) Daily Max by date	13.54, **25.01**, 19.08, 21.47, 23.37, 22.68, 22.39
		PWS	Aluminum (ug/L) **Secondary MCL=200** Human Health Tier II Drinking=970	**1300, 517, 9120, 291, 428, 624, 566**
			Manganese (ug/L) **Secondary MCL=50** Human Health Tier II Drinking=50	25, 40, **140**, 44, **86, 168, 650**

Stream Use Designations	**River Mile (Drainage Area)**	**Use**	**Constituent**	**Values**
Algire Ck Confluence RM 11.70			Iron, TR (ug/L) **Secondary MCL=300** Human Health Tier II Drinking=300* *HH criteria is for **soluble** Iron	**1520, 580, 11900, 407, 624, 897, 1880**
		AWS	Iron, TR (ug/L) OMZA=5000	1520, 580, **11900,** 407, 624, 897, 1880
	10.92 (7.03 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.392, 0.421, 0.751, 1.18, 3.50 (Geo. mean = 0.87)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**9.37, 7.73, 4.02, 1.76, 7.50 (Geo. mean = 5.21)**
	5.20 (18.1 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.498, 0.123, 0.340, 0.485, 1.03 (Geo. mean = 0.40)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**7.95, 5.04**, **2.38**, <0.10, **2.81 (Geo. mean = 1.93)**
			Copper (ug/L) OMZA= Hardness Dependent	**13.9,** 3.1, 4.2, 4.0, 6.7
			Lead (ug/L) OMZA= Hardness Dependent	**12.2,** <2.0, <2.0, <2.0, <2.0
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	**13400**, 509, 376, 693, 1710
		AWS	Iron, TR (ug/L) OMZA=5000	**17500,** 679, 568, 882, 2600
	0.80 (32.1 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	0.095, **0.452**, 0.090, 0.073, **0.269, 0.269, 0.477, 0.338 (Geo. mean = 0.21)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	0.479, 0.730, 0.452, **1.23,** 0.53, 0.35, **7.34, 8.50 (Geo. mean = 2.62)**
			Copper (ug/L) OMZA= Hardness Dependent	3.9, **15.8,** 3.4, 3.7, 5.0, 8.2, 4.8, 3.1

Stream Use Designations	River Mile (Drainage Area)	Use	Constituent	Values
			Lead (ug/L) OMZA= Hardness Dependent	<2.0, **14.7,** <2.0, <2.0, <2.0, 2.4, <2.0, <2.0
			Temperature (°C) Daily Max by date	**29.95,** 19.42, 22.31, 24.33, 22.16, 19.17, 3.91, 0.68
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	867, **14600,** 796, 393, 1300, 2370, 537
		AWS	Iron, TR (ug/L) OMZA=5000	1130, **19200,** 1120, 449, 1660, 3760, 894, 692
Rader Ck Trib (4.03) Undesignated	0.70 (2.10 mi^2) Headwaters	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**27.4, 4.71**, 0.10 **(Geo. mean = 2.35)**
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	**5500**, 775, 281
Rader Ck Trib (4.37) Undesignated	0.45 (6.30 mi^2) Headwaters	WWH	Copper (ug/L) OMZA= Hardness Dependent	**12.9**, 3.2, 2.3, 2.2, 2.3
			Lead (ug/L) OMZA= Hardness Dependent	**8.9**, <2.0, <2.0, <2.0, <2.0
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	**10200**, 278, 589, 1360, 980
		AWS	Iron, TR (ug/L) OMZA=5000	**12900,** 369, 841, 1820, 1430
Needles Creek WAU (HUC 12 – 041000100102)				
Needles Creek WWH, PCR, AWS, IWS	8.35 (11.0 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.495,** 0.077, 0.063, 0.080 **(Geo. mean = 0.12)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**4.62, 4.58, 1.02,** 0.85 **(Geo. mean = 2.07)**
Hoytville WWTP (controlled discharge) 2PA00083 RM 6.00	5.14 (17.0 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.609,** 0.060, 0.033, **0.096** **(Geo. mean = 0.103)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**5.00, 3.55,** 0.52, 0.63 **(Geo. mean = 1.55)**

Stream Use Designations	**River Mile (Drainage Area)**	**Use**	**Constituent**	**Values**
	1.25 (32.0 mi^2) Wadeable Stream	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**5.30, 3.46, 6.50, 3.24,** 0.37, 0.10, 0.14, **17.8** **(Geo. mean = 1.56)**
		WWH	Copper (ug/L) OMZA= Hardness Dependent	3.9, 3.3, **20.5,** 3.1, 2.6, 5.3, 3.1, 3.8
		WWH	Lead (ug/L) OMZA= Hardness Dependent	<2.0, <2.0, **19.3,** <2.0, <2.0, <2.0, <2.0, <2.0
		WWH	Temperature (°C) Daily Max by date	15.17, **29.19**, 19.56, 21.31, 23.47, 22.61, 5.52, 5.89
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	1210, 664, **21700,** 683, 546, 1620, 329, 1350
		AWS	Iron, TR (ug/L) OMZA=5000	1700, 877, **29200,** 931, 743, 2270, 490, 1900
Rocky Ford Creek WAU (HUC 12 – 041000100103)				
Rocky Ford Trib (10.75) LRW, SCR, AWS, IWS (WWH, PCR recommended)	3.57 (8.90 mi^2) Headwaters	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**7.59, 6.83, 2.87,** 0.60, <0.10 **(Geo. mean = 1.55)**
	2.00 (18.70 mi^2) Headwaters	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**4.80, 4.93, 1.79,** 0.90, 0.70 **(Geo. mean = 1.93)**
Trib to Rocky Ford Trib (10.75/1.99) LRW, SCR, AWS, IWS (WWH, PCR recommended)	1.80 (7.50 mi^2) Headwaters	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**2.21, 2.86, 1.96, 1.31,** 0.57 **(Geo. mean = 1.56)**
Rocky Ford Creek WWH, PCR, AWS, IWS PWS (RM 11.87 & RM 10.74 only)	21.12 (7.00 mi^2) Headwaters	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**5.27, 3.68,** 0.21, 0.76 **(Geo. mean = 1.33)**
	19.53 (16.20 mi^2) Headwaters	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**4.16, 3.94,** 0.54, 0.25, **1.38** **(Geo. mean = 1.25)**
	15.04 (23.0 mi^2) Wading	WWH	D.O. (mg/L) Min=4.0	9.73, 8.27, **3.22,** 5.34
	11.87 (32.0 mi^2)	WWH	NO_3-NO_2 (mg/L) Target=1.0	**3.53, 4.41, 1.61, 4.07,** 0.63, 0.19, 0.34 **(Geo. mean = 1.23)**

Stream Use Designations	**River Mile (Drainage Area)**	**Use**	**Constituent**	**Values**
	Wading		(as geo. mean)	
			Temperature (°C) Daily Max by date	13.83, **25.70,** 18.75, 21.63, 22.79, 20.89, 19.30
		PWS	Aluminum (ug/L) **Secondary MCL=200** Human Health Tier II Drinking=970	**2240, 977, 1900, 1600, 1360,** 922, 715
			Manganese (ug/L) **Secondary MCL=50** Human Health Tier II Drinking=50	**84, 68, 109, 68, 176, 411, 232**
			Iron, TR (ug/L) **Secondary MCL=300** Human Health Tier II Drinking=300* *HH criteria is for **soluble** Iron	**3260, 1400, 2670, 2170, 1960, 1260, 928**
	10.74 (56.0 mi^2) Wading	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**3.29, 4.72, 2.13, 3.80, 1.12,** 0.79, 0.11 **(Geo. mean = 1.43)**
			Temperature (°C) Daily Max by date	14.31, **25.46,** 18.26, 21.51, 25.25, 23.15, 21.30
		PWS	Aluminum (ug/L) **Secondary MCL=200** Human Health Tier II Drinking=970	**2170, 995, 1550, 1640, 380, 1160, 541**
			Manganese (ug/L) **Secondary MCL=50** Human Health Tier II Drinking=50	**71, 58, 86, 58, 57, 144, 391**
			Iron, TR (ug/L) **Secondary MCL=300** Human Health Tier II Drinking=300* *HH criteria is for **soluble** Iron	**3010, 1450, 2070, 2170, 576, 1730, 984**
	9.82 (57.0 mi^2) Wading		NO EXCEEDENCES	
N. Baltimore WWTP 2PB00033 RM 9.70	5.10 (66.0 mi^2) Wading	WWH	NO3-NO2 (mg/L) Target=1.0 (as geo. mean)	**5.05, 4.58, 2.25, 4.74, 4.43 (Geo. mean = 4.05)**

Stream Use Designations	River Mile (Drainage Area)	Use	Constituent	Values
Cygnet WWTP (controlled discharge) 2PA0000 RM 4.22	1.59 (72.8 mi^2) Wading	WWH	NO3-NO2 (mg/L) Target=1.0 (as geo. mean)	**4.10, 4.71, 4.71, 4.54, 1.09,** <0.10, <0.10, **2.26, 10.5** **(Geo. mean = 1.68)**
			Temperature (°C) Daily Max by date	14.76, **28.79,** 17.94, 21.20, 23.56, 22.77, 19.63, 5.32, 5.57
Middle Branch Portage River – Town of Rudolph, above Rocky Ford Creek WAU (HUC 12 – 041000100104)				
Middle Branch Portage River WWH, PCR, AWS, IWS	15.32 (64.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.720,** 0.081, 0.055, **0.206, 0.161** **(Geo. mean = 0.16)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**7.70, 3.97,** 0.75, 0.50, <0.10 **(Geo. mean = 1.03)**
	10.90 (73.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.516,** 0.092, 0.035, **0.158,** 0.059 **(Geo. mean = 0.11)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**7.80, 4.96,** 0.45, **1.31,** <0.10 **(Geo. mean = 1.18)**
	8.64 (95.0 mi^2) Wading	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**5.27, 14.8, 8.37, 4.79,** 0.32, <0.10, <0.10, **1.61, 19.8** **(Geo. mean = 1.90)**
			Copper (ug/L) OMZA= Hardness Dependent	3.8, 8.9, **18.0,** 5.0, 3.2, 4.2, 3.0, 4.0, 4.3
			Lead (ug/L) OMZA= Hardness Dependent	<2.0, 3.9, **17.9,** <2.0, <2.0, <2.0, <2.0, <2.0, <2.0
			Strontium (ug/L) OMZA=5300	932, 462, 314, 1240, 2240, 3270, **7560,** 4020, 744
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	851, **5010, 19400,** 819, 483, 822, 553, 286, 1990
		AWS	Iron, TR (ug/L) OMZA=5000	1200, 6600, **26300,** 1180, 314, 1080, 803, 405, 2700
Bull Creek WAU (HUC 12 - 041000100201)				
Bull Creek WWH, PCR, AWS, IWS	8.45 (8.3 mi^2)	WWH	D.O. (mg/L) Min=4.0	8.20, 10.95, 6.98, 4.93, **3.87**

Stream Use Designations	River Mile (Drainage Area)	Use	Constituent	Values
	Headwaters			
	3.89 (19.0 mi^2) Headwaters		NO EXCEEDENCES	
	0.64 (29.8 mi^2) Wading	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**11.4, 4.36, 3.19,** 0.26, <0.10, <0.10, **3.51, 15.7** **(Geo. mean = 1.48)**
			Strontium (ug/L) OMZA=5300	1340, 712, 1410, 1670, 2380, 3070, **5830,** 3200, 1330
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	268, **9280,** 343, 518, 430, 1730, 1010, 532, 1970
		AWS	Iron, TR (ug/L) OMZA=5000	386, **12600,** 383, 712, 613, 2390, 1480, 895, 2790
East Branch Portage River WAU (HUC 12 – 041000100202)				
East Branch Portage River WWH, PCR, AWS, IWS PWS (RM 16.10 only)	19.17 (9.40 mi^2) Headwaters	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**8.54, 1.83,** <0.10 **(Geo. mean = 1.16)**
	16.1 (12.3 mi^2) Headwaters	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**5.62, 11.2, 5.23, 3.66,** <0.10 **(Geo. mean = 2.61)**
		PWS	NO_3-NO_2 (mg/L) MCL=10.0	5.62, **11.2,** 5.23, 3.66, <0.10
			Aluminum (ug/L) **Secondary MCL=200** Human Health Tier II Drinking=970	**386, 21500, 520, 446, 241**
			Manganese (ug/L) **Secondary MCL=50** Human Health Tier II Drinking=50	25, **495,** 20, 35, **549**
			Iron, TR (ug/L) **Secondary MCL=300** Human Health Tier II Drinking=300* *HH criteria is for **soluble** Iron	**488, 28400, 614, 588, 534**
		AWS	Iron, TR (ug/L)	488, **28400,** 614, 588, 534

Stream Use Designations	**River Mile (Drainage Area)**	**Use**	**Constituent**	**Values**
Fostoria WWTP 2PD00031 RM 10.20			OMZA=5000	
	12.47 ($15.3\ mi^2$) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.314, 0.229, 0.401, 0.327, 0.222 (Geo. mean = 0.29)**
	10.30 ($18.4\ mi^2$) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.131, 0.132, 0.165, 0.134, 0.154 (Geo. mean = 0.14)**
	9.60 ($18.7\ mi^2$) Headwaters	WWH	Ammonia (mg/L) 30 day OMZA (temp & pH dependent)	0.115, 0.389, **2.62,** 0.537, 0.131
			t-P (mg/L) target=0.08 (as geo. mean)	**0.189, 0.179, 0.158, 0.181, 0.175 (Geo. mean = 0.18)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**6.04, 6.28, 3.65, 7.16, 9.31 (Geo. mean = 6.21)**
	6.18 ($23.0\ mi^2$) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.156, 0.332, 0.163, 0.179, 0.172, 0.151, 0.172, 0.117 (Geo. mean = 0.17)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**6.27, 4.81, 5.44, 5.74, 7.13, 8.99, 10.8, 13.3 (Geo. mean = 7.37)**
	3.10 ($26.0\ mi^2$) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.171,** <0.010, **0.204, 0.164, 0.238 (Geo. mean = 0.11)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**2.97, 4.37, 4.62, 6.61, 4.70 (Geo. mean = 4.51)**
			Strontium (ug/L) OMZA=5300	1390, 1960, 2080, 1190, **8740**
	0.80 ($35.5\ mi^2$) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.209, 0.343, 0.222, 0.180, 0.416 (Geo. mean = 0.26)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**3.17, 4.02, 3.83, 5.70, 4.36 (Geo. mean = 4.14)**
South Branch Portage River – Town of South Bloomdale, above East Branch Portage River WAU (HUC 12 – 041000100203)				

Stream Use Designations	River Mile (Drainage Area)	Use	Constituent	Values
South Branch Portage River WWH, PCR, AWS, IWS	24.77 (7.00 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	0.063, **0.246, 0.102,** 0.071, **0.119** **(Geo. mean = 0.106)**
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	670, 287, 829, 1266, 1414
			Noteworthy Levels TDS (mg/L)	414, 248, 580, 960, 1100
	22.58 (17.0 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.132, 0.303, 0.104,** 0.067, 0.051 **(Geo. mean = 0.107)**
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	715, 328, 836, 1006, 1271
	17.77 (32.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.128, 0.385, 0.183, 0.342, 0.745** **(Geo. mean = 0.30)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**6.18, 5.67, 1.99, 2.20,** <0.10 **(Geo. mean = 1.73)**
			TDS (mg/L) (Total Dissolved Solids) OMZA=1500	488, 272, 648, 1120, **1560**
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	746, 321, 914, 1713, 2390
	14.43 (34.0 mi^2) Wading	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**4.99, 3.86, 5.36,** <0.10, <0.10 **(Geo. mean = 1.01)**
	8.35 (54.0 mi^2) Wading		NO EXCEEDENCES	
South Branch Portage River – Rhodes Ditch, below East Branch Portage River WAU (HUC 12 – 041000100204)				
South Branch Portage River WWH, PCR, AWS, IWS	4.78 (100.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.146, 0.250, 0.163, 0.161, 0.137** **(Geo. mean = 0.17)**
			NO_3-NO_2 (mg/L) Target=1.0	**3.52, 4.49, 2.67, 3.85, 3.85** **(Geo. mean = 3.62)**

Stream Use Designations	River Mile (Drainage Area)	Use	Constituent	Values
			(as geo. mean)	
	0.50 (110.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	0.086, **0.22, 0.124, 0.178, 0.139, 0.137,** 0.094, **0.17,** 0.061 **(Geo. mean = 0.13)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**10.9, 3.67, 3.69, 2.05, 3.07, 2.17,** 0.72, **7.73** **(Geo. mean = 3.21)**
Middle Branch Portage River – Cessna Ditch, below Rocky Ford Creek WAU (HUC 12 – 041000100205)				
Middle Branch Portage River WWH, PCR, AWS, IWS	3.45 (216.0 mi^2) Small River		NO EXCEEDENCES	
	0.55 (224.0 mi^2) Small River	HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	529, **4690,** 739, **8100,** 276, 352, 306, 269, 242
		AWS	Iron, TR (ug/L) OMZA=5000	715, **5990,** 941, **10800,** 342, 473, 413, 360, 339
North Branch Portage River WAU (HUC 12 – 041000100301)				
North Branch Portage River WWH, PCR, AWS, IWS	25.85 (8.10 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.275, 0.205, 0.566, 0.255, 0.378 (Geo. mean = 0.31)**
			D.O. (mg/L) Min=4.0	**3.80,** 5.09, **2.36, 2.57,** 4.48
	21.96 (14.3 mi^2) Headwaters		**NO EXCEEDENCES**	
	17.92 (24.0 mi^2) Wading		**NO EXCEEDENCES**	
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	630, 591, 627, 729, 1251
	13.55 (34.0 mi^2) Wading		**NO EXCEEDENCES**	
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	726, 647, 759, 1333, 1427
			Noteworthy Levels TDS (mg/L)	482, 400, 568, 942, 1110

Stream Use Designations	River Mile (Drainage Area)	Use	Constituent	Values
Bowling Green WWTP 2PD00009 via Poe Ditch RM 8.56	9.64 (40.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.123, 0.141, 0.181, 0.129 (Geo. mean = 0.14)**
			Strontium (ug/L) OMZA=5300	2380, **7300, 13300, 17100**
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	652, 899, 1293, 1396
			Noteworthy Levels TDS (mg/L)	414, 668, 894, 962
	8.55 (46.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.368, 0.432, 0.431, 0.664, 0.505 (Geo. mean = 0.47)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**7.64, 8.86, 7.34, 8.22, 8.58 (Geo. mean = 8.11)**
	6.55 (48.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.288, 0.225, 0.509, 0.976, 0.639 (Geo. mean = 0.46)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**6.24, 5.65, 6.67, 12.9, 13.4 (Geo. mean = 8.35)**
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	820, 760, 938, 1210, 1524
			Noteworthy Levels TDS (mg/L)	536, 494, 606, 768, 916
	0.08 (59.1 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.136, 0.247, 0.225, 0.252, 0.366, 0.672, 0.376, 0.595, 0.132 (Geo. mean = 0.29)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**11.9, 5.72, 6.17, 4.42, 9.34, 8.23, 14.9, 11.8 (Geo. mean = 8.41)**
			Strontium (ug/L) OMZA=5300	4180, 1610, 3470, 2710, 4880, **7460, 6960,** 4910, **6820**
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	836, 515, 755, 647, 898, 1226, 1477, 1028, 945

Stream Use Designations	River Mile (Drainage Area)	Use	Constituent	Values
Portage River – Town of Pemberville, above North Branch Portage River WAU (HUC 12 – 041000100302)				
Portage River WWH, PCR, AWS, IWS	35.28 (353 mi^2) Small River	WWH	NO_3-NO_2 (mg/L) Target=1.5 (as geo. mean)	**12.7, 4.42, 4.23**, 0.42, 0.40, 0.64, **3.82, 8.94** **(Geo. mean = 2.33)**
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	345, **5100,** 650, **6720,** <200, 213, 268, <200, 206
		AWS	Iron, TR (ug/L) OMZA=5000	427, **6990,** 782, **8990,** 159, 227, 331, 267, 301
Sugar Creek WAU (HUC 12 – 041000100401)				
Coon Creek Undesignated (WWH, PCR, AWS, IWS recommended)	0.34 (7.80 mi^2) Headwaters		NO EXCEEDENCES	
Sugar Creek WWH, PCR, AWS, IWS	21.31 (12.0 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	0.039, **0.361, 0.573, 0.506, 0.279** **(Geo. mean = 0.26)**
	18.50 (17.0 mi^2) Headwaters	WWH	NO EXCEEDENCES	
	13.38 (35.0 mi^2) Wading	WWH	NO EXCEEDENCES	
Gibsonburg WWTP 2PA00005 ½ discharge routed to Sugar Ck (RM 11.48) via Hurlbut Ditch	8.90 (51.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.765, 0.264, 1.65, 2.01, 2.07** **(Geo. mean = 1.07)**
	3.65 (56.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.378, 0.292, 1.22, 1.32, 1.00** **(Geo. mean = 0.71)**
	0.80 (58.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.226, 0.242, 0.332, 0.142, 1.38, 0.891, 0.997, 0.654, 0.676** **(Geo. mean = 0.48)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**2.17, 12.8, 2.06, 3.94,** 0.53, <0.10, <0.10, 0.19, **8.92** **(Geo. mean = 1.08)**
Portage River – Larcarpe Creek Outlet #4, below North Branch Portage R to above Sugar Creek WAU (HUC 12 – 041000100402)				

Stream Use Designations	**River Mile (Drainage Area)**	**Use**	**Constituent**	**Values**
Portage River WWH, PCR, AWS, IWS	32.10 (418.0 mi^2) Small River	WWH	NO_3-NO_2 (mg/L) Target=1.5 (as geo. mean)	**4.47, 4.42,** 0.70, **2.08, 2.46** **(Geo. mean = 2.34)**
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	485, **6690,** <200, 303, 325
		AWS	Iron, TR (ug/L) OMZA=5000	666, **9190,** 130, 345, 377
	28.08 (429.0 mi^2) Small River	WWH	NO_3-NO_2 (mg/L) Target=1.5 (as geo. mean)	**13.1, 8.64, 4.47, 3.91,** 0.29, 1.22, **1.88, 4.13, 4.49, 10.2** **(Geo. mean = 3.46)**
		WWH	Selenium (ug/L) OMZA=5.0	<2.0,<2.0,<2.0,<2.0,<2.0, 3.5, **10.8,**<2.0,<2.0,<4.0,<2.0
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	378, **5310,** 4490, 667, 2120,<200, 602, 588, 712, 320, 240
Woodville WWTP 2PB00052 RM 27.22		AWS	Iron, TR (ug/L) OMZA=5000	1120, **12200,** 454, **7100, 5660,** 905, 2810, 140, 639, 730, 687, 360, 332, 138
	24.10 (430.0 mi^2) Small River	WWH	Selenium (ug/L) OMZA=5.0	<2.0, <2.0, 2.8, **10.1,** <2.0
		WWH	Strontium (ug/L) OMZA=5300	2460, 648, 2760, 4390, **6090**
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	522, **5440,** <200, 246, 229
Elmore WWTP 2PB00051 RM 22.15		AWS	Iron, TR (ug/L) OMZA=5000	637, **7150,** 110, 290, 293
	22.13 (432.0 mi^2) Small River ***Note:** samples could be considered to be within the Mix Zone	WWH	Selenium (ug/L) *OMZA=5.0	<2.0, <2.0, 4.7, **9.4,** <2.0
		WWH	Strontium (ug/L) *OMZA=5300	2850, 661, 2880, 4770, **5990**
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	891, **5480,** <200, <200, <200
		AWS	Iron, TR (ug/L) *OMZA=5000	1240, **7360,** 213, 265, 152

Stream Use Designations	**River Mile (Drainage Area)**	**Use**	**Constituent**	**Values**
Little Portage River WAU (HUC 12 – 041000100501)				
Little Portage River WWH, PCR, AWS, IWS	6.20 (21.2 mi^2) Wadeable Stream		NO EXCEEDENCES	
	1.79 (30.0 mi^2) Wadeable Stream	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.101, 0.133, 0.148, 0.153** **(Geo. mean = 0.124)**
		AWS	Iron, TR (ug/L) OMZA=5000	3220, **5130,** 2580, 2990
Ninemile Creek WWH, PCR, AWS, IWS	5.00 (7.90 mi^2) Headwaters		NO EXCEEDENCES	
	2.93 (8.70 mi^2) Headwaters		NO EXCEEDENCES	
Portage River – Below Sugar Creek WAU (HUC 12 – 041000100502)				
Portage River WWH, PCR, AWS, IWS	17.03 (495 mi^2) Small River	WWH	NO_3-NO_2 (mg/L) Target=1.5 (as geo. mean)	**13.1, 4.00, 4.64,** 0.28, 0.11, 0.33, **1.57, 9.33** **(Geo. mean =1.57)**
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	419, **5370,** 590, **5420,** 407, 276, <200, <200, 299
		AWS	Iron, TR (ug/L) OMZA=5000	505, **7360,** 757, **7280,** 516, 305, 189, 82, 396
Brush Wellman 2IE00000 Discharge to Portage R (RM 16.54) via Hyde Run	16.53 (496 mi^2) Small River	WWH	NO_3-NO_2 (mg/L) Target=1.5 (as geo. mean)	**346, 30.0, 6.16, 3.00,** <0.10 **(Geo. mean = 7.19)**
			Copper (ug/L) OMZA= Hardness Dependent	**45.1,** 12.3, 4.2, 5.5, 5.6
			TDS (mg/L) (Total Dissolved Solids) OMZA=1500	**5500,** 584, 490, 632, 656
			pH (SU) OMZA: min=6.5, max=9.0	8.34, 7.64, 8.24, 8.60, **9.30**

Stream Use Designations	River Mile (Drainage Area)	Use	Constituent	Values
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	<200, **4850,** 284, 283, 261
		AWS	Iron, TR (ug/L) OMZA=5000	105, **6450,** 363, 318, 386
	15.70 (496 mi^2) Small River	WWH	NO_3-NO_2 (mg/L) Target=1.5 (as geo. mean)	**12.9, 5.52, 1.71,** <0.10, <0.10 (Geo. mean = 1.04)
			pH (SU) OMZA: min=6.5, max=9.0	7.27, 7.64, 8.25, 8.33, **9.21**
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	550, **5290,** 385, 272, <200
		AWS	Iron, TR (ug/L) OMZA=5000	723, **6930,** 493, 264, 192
	14.02 (497 mi^2) Small River	WWH	t-P (mg/L) target=0.17 (as geo. mean)	**0.197, 0.296,** 0.086, **0.193, 0.174 (Geo. mean = 0.18)**
			NO_3-NO_2 (mg/L) Target=1.5 (as geo. mean)	**7.07, 4.62, 1.55,** 0.17, <0.10 (Geo. mean = 0.97)
			pH (SU) OMZA: min=6.5, max=9.0	7.89, 7.64, **9.06,** 8.22, 8.28
		HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	1920, **4990,** 772, 1380, 1420
		AWS	Iron, TR (ug/L) OMZA=5000	2380, **6520,** 995, 1760, 1670
	12.55 (516 mi^2) Small River	WWH	t-P (mg/L) target=0.17 (as geo. mean)	**0.200, 0.370,** 0.110, 0.155, **0.182 (Geo. mean = 0.19)**
		AWS	Iron, TR (ug/L) OMZA=5000	2200, **5730,** 1260, 1210, 1220
Oak Harbor WWTP 2PB00032 RM 12.03	11.10 (518 mi^2)	WWH	t-P (mg/L) target=0.17 (as geo. mean)	0.108, **0.281, 0.790, 0.179, 0.193 (Geo. mean = 0.24)**

Stream Use Designations	**River Mile (Drainage Area)**	**Use**	**Constituent**	**Values**
	Small River	HH Tier II	Aluminum (ug/L) Human Health Tier II Non-Drinking=4500	904, **4950,** 2070, 1430, 1440
		AWS	Iron, TR (ug/L) OMZA=5000	1200, **6390,** 2730, 1860, 1970
	6.00 (540 mi^2) Small River		NO EXCEEDENCES	
Port Clinton WWTP 2PD00014 RM 0.55	0.58 (581 mi^2) Small River	WWH	pH (SU) OMZA: min=6.5, max=9.0	8.07, 8.10, 8.30, 8.34, **9.34**
	0.50 (581 mi^2) Small River	WWH	pH (SU) OMZA: min=6.5, max=9.0	7.93, 8.03, 8.28, **9.37**
Hyde Run (Brush Wellman Trib 16.54) Undesignated	0.02 (0.5 mi^2) Headwaters ***Note:** samples could be considered to be within the Mix Zone	WWH	Copper (ug/L) *OMZA= Hardness Dependent	**43.9,** 18.9, **46.0, 38.6**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**411, 59.0, 381, 9.71 (Geo. mean = 97.32)**
			TDS (mg/L) (Total Dissolved Solids) *OMZA=1500	**5670, 3410, 5600, 1710**
			Strontium (ug/L) *OMZA=5300	4180, 3370, **5920, 10800**
Wolf Creek WWH, PCR, AWS, IWS Gibsonburg WWTP 2PA00005 ½ discharge routed to Wolf Ck (RM 14.38)	6.51 (9.20 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**1.13, 0.282, 1.91, 1.53, 1.03 (Geo. mean = 0.99)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**4.20, 4.05,** 0.51, 0.74, **1.14 (Geo. mean = 1.49)**

Table 4. Results for select water quality constituents tested in grab samples from the Lake Erie Tributaries included in this survey. The standard or target used to evaluate each constituent is included. Concentrations that exceeded these levels may indicate degradation of water quality and are highlighted in bold. Although the applicable recreational use designation is listed for each stream (PCR), *E. coli* results for each site are presented separately in Table 9.

Stream Use Designations	**River Mile/ (Drainage Area)**	**Use**	**Constituent**	**Values**
HUC 12 041000100701 - Turtle Creek plus Lk. Erie drainage between Crane Ck. and Toussaint Ck.				
North Branch Turtle Creek WWH, PCR, AWS, IWS	0.80 (7.80 mi^2) Headwaters		NO EXCEEDENCES	
South Branch Turtle Creek WWH, PCR, AWS, IWS	2.65 (10.6 mi^2) Headwaters	WWH	Ammonia (mg/L) 30 day OMZA (temp & pH dependent)	0.111, 0.074, 0.968, **2.50, 10.5**
			t-P (mg/L) target=0.08 (as geo. mean)	**0.229, 0.204, 0.394, 0.655, 2.05 (Geo. mean = 0.48)**
			D.O. (mg/L) Min=4.0	7.62, 7.04, **3.08, 3.70, 1.95**
Turtle Creek WWH, PCR, AWS, IWS	11.62 (21.4 mi^2) Wadeable Stream	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.216, 0.191, 0.215,** 0.069, 0.053 **(Geo. mean = 0.13)**
HUC 12 041000100702 - Crane Creek (includes Henry Ck.)				
Henry Creek WWH, PCR, AWS, IWS	3.73 (5.50 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.181, 0.188, 0.425, 0.289, 0.466 (Geo. mean = 0.29)**
	0.25 (7.80 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.155, 0.158, 0.272, 0.134, 0.142 (Geo. mean = 0.17)**
Crane Creek WWH, PCR, AWS, IWS	18.82 (9.0 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.195, 0.122, 0.128, 0.203, 0.144 (Geo. mean = 0.15)**
			Strontium (ug/L) OMZA=5300	1290, 2070, 3100, **9350,** 4670
	15.38 (19.9 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.202, 0.134, 0.124,** 0.080, **0.142 (Geo. mean = 0.13)**

Stream Use Designations	River Mile/ (Drainage Area)	Use	Constituent	Values
HUC 12 041000100702 - Crane Creek (includes Henry Ck.) Continued.				
Crane Creek WWH, PCR, AWS, IWS (Contined)	8.83 (34.0 mi^2) Wading	WWH	t-P (mg/L) target=0.10 (as geo. mean)	**0.199, 0.161, 0.865, 0.764** **(Geo. mean = 0.38)**
	5.20 (42.0 mi^2) Wading	WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**5.07, 1.22, 1.56,** 0.80 **(Geo. mean = 1.67)**
			Ammonia (mg/L) 30 day OMZA (temp & pH dependent)	0.193, 0.098, **2.14, 1.72**
			t-P (mg/L) target=0.10 (as geo. mean)	**0.196, 0.182, 0.172, 0.152, 0.175** **(Geo. mean = 0.17)**
HUC 12 041000100703 - Cedar Creek including Reno Side Cut and Wards Canal plus Lk. Erie drainage between Reno Side Cut and Crane Ck.				
Dry Creek WWH, PCR, AWS, IWS	7.00 (8.20 mi^2) Headwaters	WWH	Ammonia (mg/L) 30 day OMZA (temp & pH dependent)	0.203, 0.187, **1.98,** 1.34, 0.229
			t-P (mg/L) target=0.08 (as geo. mean)	**0.117, 0.155, 0.376, 0.180, 0.089** **(Geo. mean = 0.16)**
			Strontium (ug/L) OMZA=5300	**5510, 9260, 11400, 24500, 11300**
			D.O. (mg/L) Min=4.0	7.02, 7.07, **3.65,** 6.95, 6.03
	0.01 (13.8 mi^2) Headwaters		NO EXCEEDENCES	
Cedar Creek WWH, PCR, AWS, IWS	20.77 (12.1 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.153,** 0.073, 0.064, **0.116, 0.100** **(Geo. mean = 0.096)**
	17.32 (18.5 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.145, 0.106, 0.081, 0.131, 0.081** **(Geo. mean = 0.105)**

Stream Use Designations	River Mile/ (Drainage Area)	Use	Constituent	Values
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	560, 801, 1128, 1615, 1453
			Noteworthy Levels TDS (mg/L)	364, 464, 666, 904, 906
	14.50 (23.2 mi^2) Wadeable Stream		NO EXCEEDENCES	
	9.59 (38.6 mi^2) Wadeable Stream	WWH	Strontium (ug/L) OMZA=5300	1420, 4610, **12600, 12600, 7660**
	4.27 (48.0 mi^2) Wadeable Stream		NO EXCEEDENCES	
HUC 12 041000100704 - Lake Erie Drainage between Berger Ditch and Reno Side Cut				
Wolf Creek LWR, SCR, AWS, IWS (WWH, PCR recommended)	1.70 (7.60 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.235, 0.297, 0.196, 0.205 (Geo. mean = 0.23)**
			D.O. (mg/L) Min=4.0	4.17, **3.60,** 8.92, 6.13
HUC 12 041000100705 - Wolf Ditch and Berger Ditch				
Wolf Ditch Undesignated (WWH, PCR, AWS, IWS recommended)	6.30 (2.70 mi^2) Headwaters	WWH	Ammonia (mg/L) 30 day OMZA (temp & pH dependent)	0.232, 0.219, 0.335, 0.222, **0.868**
			t-P (mg/L) target=0.08 (as geo. mean)	**0.235, 0.582, 0.462, 0.782, 0.105 (Geo. mean = 0.35)**
			NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**4.50, 2.73, 5.32, 4.28, 14.7 (Geo. mean = 5.28)**
	2.70 (7.80 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.153, 0.165, 0.255, 0.188, 0.203 (Geo. mean = 0.19)**

Stream Use Designations	River Mile/ (Drainage Area)	Use	Constituent	Values
HUC 12 041000100706 – Otter Creek				
Otter Creek MWH, PCR, AWS, IWS	5.92 ($2.80\ mi^2$) Headwaters	MWH HH Tier II	Benzo[a]pyrene (ug/L) IMZM (SV) = 1.1 OMZM (SV) = 0.54 OMZA (SV) = 0.060 HH Tier II Non drinking=0.00002	**3.38,** <0.51
			Noteworthy Levels Arsenic (ug/L) OMZA = 150	41.0, 19.1, 10.3, 53.5, 55.5, 50.0
	2.95 ($5.90\ mi^2$) Headwaters		**NO EXCEEDENCES**	
			Noteworthy Levels Arsenic (ug/L) OMZA = 150	20.7, 14.5, 7.8, 19.3, 18.9, 8.8
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	1366, 981, 653, 1168, 1242, 447
	2.13 ($6.60\ mi^2$) Headwaters	MWH	pH (SU) OMZA: min=6.5, max=9.0	**9.49,** 8.63, 8.16, **9.35, 9.59, 9.42**
	0.40 ($7.40\ mi^2$) Headwaters	MWH	pH (SU) OMZA: min=6.5, max=9.0	**9.07, 9.34**

Table 5. Results for select water quality constituents tested in grab samples from the Maumee River Tributaries sampled as part of this survey. The standard or target used to evaluate each constituent is included. Concentrations that exceeded these levels may indicate degradation of water quality and are highlighted in bold. Although the applicable recreational use designation is listed for each stream (PCR), *E. coli* results for each site are presented separately in the Table 10.

Stream Use Designations	**River Mile/ (Drainage Area)**	**Use**	**Constituent**	**Values**
HUC 12 041000090901 -. Grassy Creek Diversion				
Grassy Creek Diversion WWH, PCR, AWS, IWS	0.28 Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	0.046, **0.113,** 0.059, 0.071, **0.339** **(Geo. mean = 0.094)**
HUC 12 041000090902 - Grassy Creek				
Grassy Creek WWH, PCR, AWS, IWS	4.85 (7.90 mi^2) Headwaters	WWH	Strontium (ug/L) OMZA=5300	**5310,** 4250, 2800, 4870, 4650
	0.98 (11.80 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	0.075, 0.038, **0.105, 0.088, 0.307, 0.112** **(Geo. mean = 0.098)**
HUC 12 041000090904 - Maumee River below Grassy Cr. to Lake Erie [except Swan Cr.]				
Delaware Creek WWH, PCR, AWS, IWS	0.38 (2.50 mi^2) Headwaters	WWH	Copper (ug/L) OMZA= Hardness Dependent	<10, <10, <10, <10, <10, **30**
		WWH	t-P (mg/L) target=0.08 (as geo. mean)	**0.089, 0.086, 0.166, 0.088, 0.131, 0.122** **(Geo. mean = 0.110)**
		WWH	NO_3-NO_2 (mg/L) Target=1.0 (as geo. mean)	**2.28, 2.71, 1.21, 1.68, 1.23, 1.20** **(Geo. mean = 1.63)**
		HH Tier I	a-BHC (ug/L) Human Health Tier I non-drinking=0.0053	**0.0080**
			Noteworthy Levels Chloride (mg/L)	468, 457, 125, 431, 503, 116
			Noteworthy Levels TDS (mg/L)	1230, 1170, 534, 1150, 1230, 442
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	2142, 2038, 925, 2040, 2201, 714

	4.00 (0.3 mi^2) Headwaters	WWH	D.O. (mg/L) Min=4.0	9.75, 8.68, **3.18,** 5.83
			pH (SU) OMZA: min=6.5, max=9.0	**9.71, 9.73,** 7.77, 8.13
	3.10 (0.6 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	0.068, **0.140** **(Geo. mean = 0.097)**
			D.O. (mg/L) Min=4.0	5.86, **3.72**
		AWS	Iron, TR (ug/L) OMZA=5000	1110, **5270**
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	1257, 1079
			Noteworthy Levels Arsenic (ug/L) OMZA = 150	18.8, 52.8
			Noteworthy Levels Manganese (ug/L)	685, 1150
	2.52 (0.8 mi^2) Headwaters	WWH	t-P (mg/L) target=0.08 (as geo. mean)	0.076, **0.177** **(Geo. mean = 0.116)**
			Noteworthy Levels Conductivity, Field corrected (umhos/cm)	1213, 1106
			Noteworthy Levels Arsenic (ug/L) OMZA = 150	10.1, 20.5

Table 6. Organic compounds detected (in **Bold**) in water samples from the Portage River basin, collected during the 2008 survey. Results highlighted in **gray** exceed the MCL for drinking water and/or the WQ criteria.

HUC12	0410001001-01			0410001001-02	
Location	Rader Ck at McComb Reserv Access Rd	Rader Ck at McComb Reserv Access Rd	Rader Ck at Cygnet Rd	Needles Ck at Cygnet Rd	Needles Ck at Cygnet Rd
Use*	PWS	PWS			
River Mile STORET ID Date Sampled	**RM 13.55** 300374 5/15/2008	**RM 13.55** 300374 6/9/2008	**RM 0.80** 201109 6/9/2008	**RM 1.25** S01S48 5/15/2008	**RM 1.25** S01S48 6/9/2008
Method 525.2 – Herbicides & other organic compounds (ug/l)*					
Acetochlor	<0.20	<0.21 PT	**0.75 PT**	<0.21	**0.72 PT**
Atrazine	<0.20	**1.29 PT**	**3.31 PT**	**0.31**	**4.29 PT**
bis(2-Ethylhexyl)phthalate	**1.11 B**	**1.27 PT B**	**0.56 PT B**	**0.88 B**	**1.13 PT B**
Metolachlor	<0.20	**0.98 PT**	**1.87 PT**	**0.34**	**1.24 PT**
Simazine	<0.20	<0.21 PT	**0.51 PT**	<0.21	**0.73 PT**

HUC12	0410001001-03					
Location	Rocky Ford at TR 114	Rocky Ford at TR 114	Rocky Ford at SR 18	Rocky Ford at SR 18	Rocky Ford at Solether Rd	Rocky Ford at Solether Rd
Use*	PWS	PWS	PWS	PWS		
River Mile STORET ID Date Sampled	**RM 11.87** S01S05 5/15/2008	**RM 11.87** S01S05 6/9/2008	**RM 10.74** S01P26 5/15/2008	**RM 10.74** S01P26 6/9/2008	**RM 1.59** 300372 5/15/2008	**RM 1.59** 300372 6/9/2008
Method 525.2 – Herbicides & other organic compounds (ug/l)*						
Acetochlor	<0.20	**1.55 PT**	<0.20	**1.42 PT J**	**0.23**	**0.96 PT**
Atrazine	<0.20	**6.19 PT**	**0.34**	**5.60 PT J**	**0.31**	**4.18 PT**
bis(2-Ethylhexyl)phthalate	**0.66 B**	**0.78 PT B**	**1.00 B**	**1.57 PT B J**	**1.08 B**	**1.24 PT B**
Metolachlor	**0.91**	**3.47 PT**	**0.33**	**3.00 PT J**	**0.51**	**2.26 PT**
Metribuzin	**0.32**	**0.41 PT**	<0.20	**0.59 PT J**	**0.21**	**0.42 PT**
Simazine	<0.20	**1.05 PT**	<0.20	**1.18 PT J**	<0.21	**0.77 PT**

HUC12	0410001001-04		0410001002-01	
Location	M BR Portage R at Solether Rd	M BR Portage R at Solether Rd	Bull Ck at Greensburg Pike	Bull Ck at Greensburg Pike
River Mile STORET ID Date Sampled	**RM 8.64** S01S44 5/15/2008	**RM 8.64** S01S44 6/11/2008	**RM 0.64** S01S45 5/21/2008	**RM 0.64** S01S45 6/10/2008
Method 525.2 – Herbicides & other organic compounds (ųg/l)*				
Acetochlor	<0.21	**4.25**	<0.21	**3.07 J**
Atrazine	**0.25**	**10.20**	**0.25**	**10.40 J**
bis(2-Ethylhexyl)phthalate	**1.41 B**	**0.60 J**	**0.98 B**	**1.10 B J**
Metolachlor	**0.27**	**5.61**	**0.25**	**7.92 J**
Metribuzin	<0.21	**0.59**	<0.21	**0.81 UJ**
Simazine	<0.21	**1.25**	<0.21	**1.14 J**

HUC12	0410001002-02					
Location	E BR Portage R at TR 217	E BR Portage R at TR 217	E BR Portage R at TR 217	E BR Portage R at Stearns Rd	E BR Portage R at Eagleville Rd	E BR Portage R at Eagleville Rd
Use*	PWS	PWS	PWS			
River Mile STORET ID Date Sampled	**RM 16.10** 300373 5/21/2008	**RM 16.10** 300373 6/10/2008	**RM 16.10** 300373 7/8/2008	**RM 9.60** S01P03 7/8/2008	**RM 6.18** S01P05 5/21/2008	**RM 6.18** S01P05 6/10/2008
Method 525.2 – Herbicides & other organic compounds (ųg/l)*						
Acetochlor	<0.21	**2.00 J**			<0.21	**1.36**
Atrazine	<0.21	**11.40 J**			<0.21	**2.66**
bis(2-Ethylhexyl)phthalate	**1.05 B**	**1.95 B J**			**0.78 B**	**0.98 B**
Metolachlor	**0.24**	**7.65 J**			<0.21	**0.78**
Simazine	<0.21	**4.37 J**			<0.21	<0.21
Method 624 - Volatile Organic Compounds (ųg/l)						
cis-1,2-Dichloroethene			<0.50	**0.72**		
Trichloroethene			<0.50	**2.13**		

HUC12	**0410001002-04**		**0410001002-05**	
Location	**S BR Portage R at Kemner Rd**	**S BR Portage R at Kemner Rd**	**M BR Portage R at Caskie Rd**	**M BR Portage R at Caskie Rd**
River Mile STORET ID Date Sampled	**RM 0.50** S01S19 5/21/2008	**RM 0.50** S01S19 6/10/2008	**RM 0.55** S99Q04 5/21/2008	**RM 0.55** S99Q04 6/10/2008
Method 525.2 – Herbicides & other organic compounds (ųg/l)*				
Acetochlor	<0.21 UJ	**1.84**	<0.21	**2.50 J**
Atrazine	**0.28**	**4.93**	**0.33**	**6.63 J**
bis(2-Ethylhexyl)phthalate	**1.18 B**	**0.67 B**	**0.71 B**	**1.10 B J**
Metolachlor	**0.27**	**4.14**	**0.35**	**2.86 J**

HUC12	**0410001003-02**				**0410001004-01**	
Location	**N BR Portage R at River Rd**	**N BR Portage R at River Rd**	**Portage R at Bridge St**	**Portage R at Bridge St**	**Sugar Ck at Hessville Rd**	**Sugar Ck at Hessville Rd**
River Mile STORET ID Date Sampled	**RM 0.08** 500520 5/22/2008	**RM 0.08** 500520 6/11/2008	**RM 35.28** S01S36 5/22/2008	**RM 35.28** S01S36 6/11/2008	**RM 0.80** 300371 5/22/2008	**RM 0.80** 300371 6/11/2008
Method 525.2 – Herbicides & other organic compounds (ųg/l)*						
Acetochlor	<0.21	**2.39 J**	<0.20	**2.74 R**	<0.21	**4.49**
Atrazine	**0.65**	**4.11 J**	**0.33**	**9.54 R**	<0.21	**6.79**
bis(2-Ethylhexyl)adipate	<0.52	<0.51 UJ	<0.51	**2.66 R**		
bis(2-Ethylhexyl)phthalate	**1.04 B**	<0.51 UJ	**0.97 B**	**4.04 R**	**0.78 B**	**0.71 J**
Metolachlor	**0.37**	**1.74 J**	**0.3**	**4.34 R**	**0.23**	**0.89**
Simazine	<0.21	<0.20 UJ	<0.20	**1.12 R**		

HUC	**0410001005-02**					
Location	**Portage R at SR 590**	**Portage R at SR 590**	**Portage R at SR 590**	**Hyde Run (Brush Wellman Trib 16.54) at Mouth**	**Portage R at Hyde Run (Brush Wellman Mix Zone)**	**Portage R at Slemmer-Portage Rd**
River Mile STORET ID Date Sampled	**RM 17.03** S02P08 5/22/2008	**RM 17.03** S02P08 6/11/2008	**RM 17.03** S02P08 8/21/2008	**RM 0.02** S02S03 8/21/2008	**RM 16.53** S02S03 8/21/2008	**RM 15.70** S02S17 8/21/2008
Method 525.2 – Herbicides & other organic compounds (ųg/l)*						
Acetochlor	**0.35**	**3.16 J**				
Atrazine	**0.4**	**6.39 J**				
bis(2-Ethylhexyl)phthalate	**0.83 B**	**0.69 J**				
Metolachlor	**0.31**	**3.94 J**				
Metribuzin	<0.21	**0.41 J**				
Simazine	<0.21	**0.59 J**				
Method 608 - PCBs (ųg/l)						
PCB-1242			<0.11	**0.36**	<0.10	<0.10

B – the result is estimated. Analyte was detected in the associated blank as well as in the sample.
J – the analyte was positively identified, the associated value is estimated.
PT – result is estimated because the sample was not analyzed within the required holding time.
R – the result is unusable because the QC criteria was not met.
UJ – the analyte was not detected above the quantitation limit (QL), however the QL is estimated.

*Note: USEPA Method 525.2 is an approved method for the determination of organic compounds in drinking water (including source water), but is not approved for surface water unless it is a drinking water source (PWS use). Although Ohio EPA-DSW utilizes Method 525.2 mostly for the detection of herbicides that are not found using approved surface water methods, not all compounds detected (e.g. bis(2-Ethylhexyl)phthalate) are herbicides, but all analytes reported are reliably recovered using Method 525.2. At any site not designated as a drinking water source (PWS), the results of any compounds detected using Method 525.2 are a good indication of the presence and concentration of the compound, and are used for informational purposes only.

Table 7. Organic compounds detected (in **Bold**) in water samples from Otter Creek (2006), and from select Maumee River tributaries (2006 and 2008). Results highlighted in **gray** exceed the MCL for drinking water and/or the WQ criteria.

HUC12	**0410001007-06**					
Location	**Otter Ck at Oakdale Ave**	**Otter Ck at Oakdale Ave**	**Otter Ck at Oakdale Ave**	**Otter Ck at Millard Ave**	**Otter Ck at Millard Ave**	**Otter Ck adj CSX Rd**
River Mile	**RM 5.92**	**RM 5.92**	**RM 5.92**	**RM 2.13**	**RM 2.13**	**RM 0.40**
STORET ID	S03P12	S03P12	S03P12	S03P05	S03P05	S03S25
Date Sampled	6/29/2006	8/10/2006	8/24/2006	6/29/2006	8/10/2006	8/10/2006
Method 608 - Pesticides (ug/l)						
d-BHC	<0.0021	**0.0037**		<0.0022	<0.0023	<0.0022
Heptachlor epoxide	<0.0021	**0.0041**		<0.0022	<0.0023	<0.0022
Method 624 - Volatile Organic Compounds (ug/l)						
Chloroform	<0.50	<0.50		**1.31**	**1.43**	**0.88**
Method 525.2 – Herbicides & other organic compounds (ug/l)*						
Atrazine	**0.25**		<0.26			
Benzo[a]pyrene	<0.51		**3.38**			
bis(2-Ethylhexyl)phthalate	<0.51		**0.9**			
Metolachlor	**0.21**		<0.26			

HUC12	**0410000909-02**		**0410000909-04**
Location	**Grassy Ck at Glenwood Rd**	**Grassy Ck at Glenwood Rd**	**Delaware Ck at Rohr Dr**
River Mile	**RM 0.98**	**RM 0.98**	**RM 0.38**
STORET ID	P11K18	P11K18	P11A07
Date Sampled	6/28/2006	8/23/2006	6/29/2006
Method 608 - Pesticides (ug/l)			
Aldrin			**0.0036**
a-BHC			**0.0080**
Method 525.2 – Herbicides & other organic compounds (ug/l)*			
Alachlor	**0.24**	<0.22	
Atrazine	**0.22**	<0.22	
Metolachlor	**0.31**	<0.22	

*Note: USEPA Method 525.2 is an approved method for the determination of organic compounds in drinking water (including source water), but is not approved for surface water unless it is a drinking water source (PWS use). Although Ohio EPA-DSW utilizes Method 525.2 mostly for the detection of herbicides that are not found using approved surface water methods, not all compounds detected (e.g. benzo(a)pyrene) are herbicides, but all analytes reported are reliably recovered using Method 525.2. Otter Creek is not a drinking water source, therefore, the results of any compounds detected using Method 525.2 are a good indication of the presence and concentration of the compound, and are used for informational purposes only.

Datasonde Results

Deployments of multi-parameter water quality probes, Datasondes© or sondes, took place in 2009 to better understand the nature of in-stream dissolved oxygen (D.O.) of five impaired streams in the Portage River watershed. These streams are Rader Creek, Rocky Ford Creek, East Branch Portage River, North Branch Portage River and the Portage River mainstem. These streams are impacted by a variety of aquatic life use impairment causes. The D.O. data measured in these deployments are intended to aid in the understanding of the severity and nature by which the causes of impairment are impacting aquatic life.

The D.O. data in this section are examined for three metrics. The WWH 24-hour average (5 mg/l) and minimum (4 mg/l) D.O. criteria are examined for each site's data. On each D.O. plot shown below these criteria are noted and any observed deviations are identified with the numeric value of the violations displayed. Many of the streams in the Portage River watershed exhibit poor habitat, nutrient enrichment and excessive fine sediment loads. Each of these factors, and combinations of them, can cause reduced D.O. through a number of in-stream processes. One of these processes, eutrophication due to nutrient enrichment, will generally cause a stream's D.O. concentration swing or range (maximum minus minimum) to increase. When this happens, corresponding minimum D.O. concentrations can fall below critical levels needed to support aquatic life. A swing in D.O. greater than 7.0 mg/l has been identified by Ohio EPA to be good indicator of enrichment (Miltner, in press). The D.O. swing metrics are not indicated on the plots below, but are discussed.

Rader Creek

A total of six sites were examined for D.O. in the Rader Creek watershed, and a violation of the minimum criterion was observed at each site. Four of the sondes were deployed on Rader Creek and two on its tributary, Algire Creek. Algire Creek receives the effluent from the McComb WWTP. Algire Creek and Rader Creek upstream of Algire Creek were not assessed for aquatic life use attainment. The Algire Creek D.O. data (Figure 36) show generally low D.O. data upstream of McComb WWTP. The site assessed downstream of McComb indicates a great deal of nutrient enrichment with a D.O. range of 16.08 mg/l and a very low minimum of 0.49 mg/l. Rader Creek's data (Figure 37) show similar enriched conditions downstream of Algire Creek; a D.O. range of 21.85mg/l. Very poor channelized habitat exacerbated the effects of nutrient enrichment from the McComb WWTP.

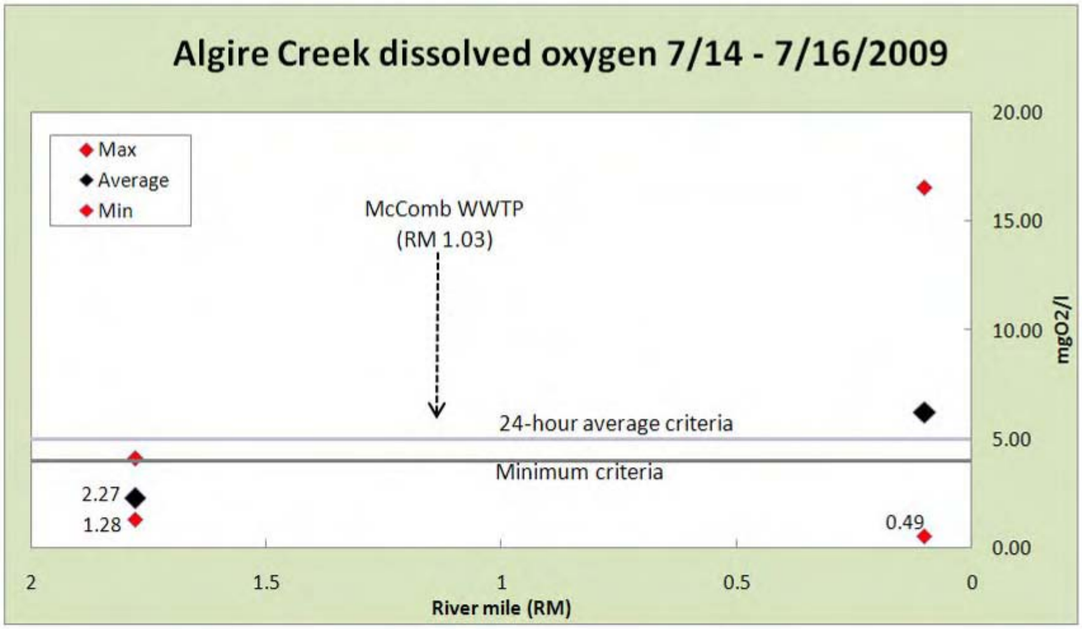

Figure 36. Algire Creek dissolved oxygen data from 2009 sonde sampling.

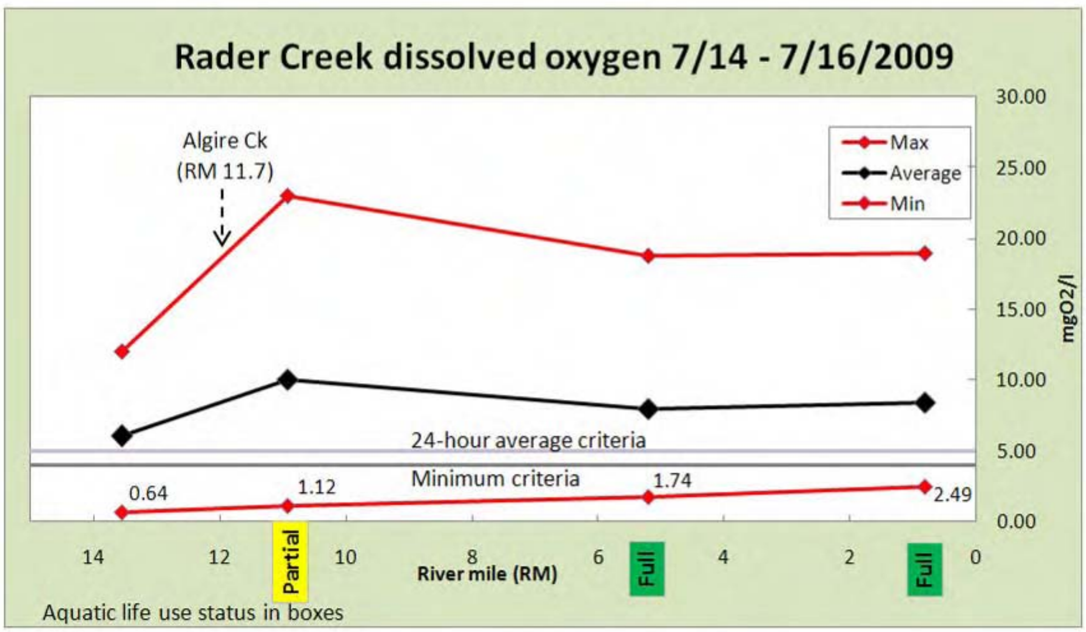

Figure 37. Rader Creek dissolved oxygen data from 2009 sonde sampling.

Rocky Ford Creek

Six sites on Rocky Ford Creek were included in this stream's D.O. survey. All but one of the sites on this stream failed to meet the D.O. minimum criteria. Excessive siltation was the cause of impairment at RMs 19.53 and 11.87. The observed D.O. at site RM 19.53 confirms heavy siltation as there was very low D.O. without a large swing.

Sediment oxygen demand compounded by low stream velocity at this site is very likely the reason for the consistently low D.O. The stream became more enriched downstream of the Village of North Baltimore (RM 9.82) and enriched to an even greater degree downstream of the North Baltimore WWTP discharge, as all three sites assessed downstream of the Village of North Baltimore were found to have D.O. swings greater than 8 mg/l. The Cygnet WWTP discharge point is noted on Figure 38. This plant however controls its discharge for release only during higher stream flow periods, and did not discharge during the summer of 2009. Because of this the Cygnet WWTP was not a source of enrichment observed in this survey.

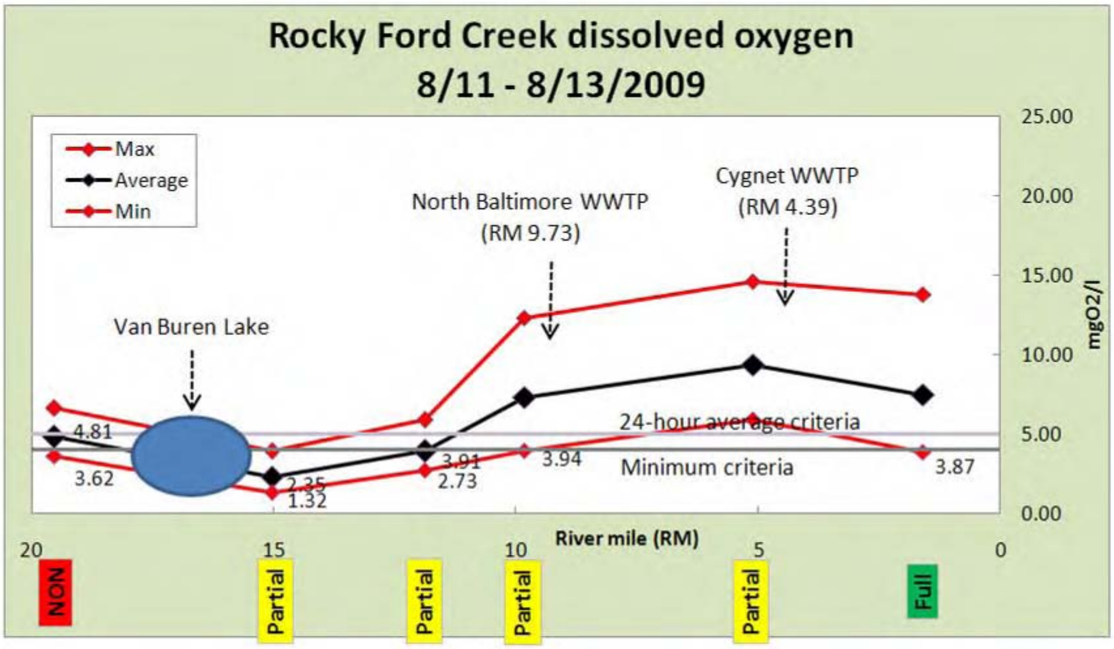

Figure 38. Rocky Ford Creek dissolved oxygen data from 2009 sonde sampling.

East Branch Portage River

Figure 39 shows the D.O. survey data on East Branch Portage River. All but one of the seven sites assessed on this stream failed to meet the D.O. minimum criteria. Low flow due to land use alterations, organic and nutrient enrichment and siltation are all listed among the causes of non-attainment for the most upstream assessed (RM 19.17). All of these factors likely contribute to the very low D.O. observed at this site. The RM 16.1 site's D.O. showed a signature more similar to nutrient enrichment; D.O. swing of 11.06 mg/l. A small dam just upstream of this site may be adding aeration to the stream increasing the D.O. of the entire minimum to maximum range for a short reach. Because of this, the minimum D.O. at this site does meet the associated minimum D.O. criteria. The D.O. observed at the RM 10.42 site confirmed the organic enrichment cause of impairment due to extremely low D.O. without a wide swing. This cause is attributed to impacts from Fostoria's CSOs. The next site downstream, RM 9.6, exhibited nutrient enrichment with a range of 8.75 mg/l. This site was downstream of the

Fostoria WWTP discharge. The D.O. at the most downstream site, RM 6.18, showed a reduced swing of 5.37 mg/l and a minimum of 3.98 mg/l, a value very near the minimum criterion limit. These less severe D.O. extremes were consistent with the full attainment for the associated WWH aquatic life use designation. This was likely attributed to improved stream habitat increasing nutrient assimilation.

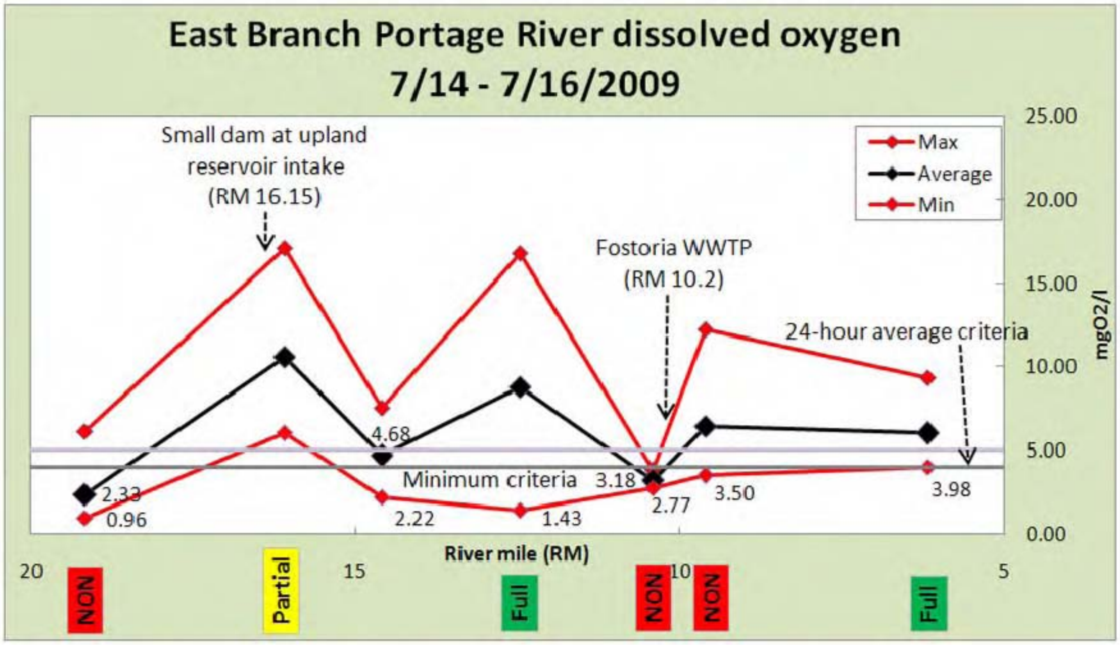

Figure 39. East Branch Portage River dissolved oxygen data from 2009 sonde sampling.

North Branch Portage River

Six sites were examined in the North Branch Portage River sonde survey (Figure 40). In general, the severity of observed low D.O. and large ranges of D.O. matched very well with the aquatic life use attainment at these six sites. Minimum D.O. criteria violations were observed at all but two sites.

At the most upstream site, RM 21.96, direct habitat alterations and siltation were determined the causes of impairment. Less than a week prior to the sonde deployment, channel work occurred which freshly ditched the site. This resulted in an absence of vegetated shading of the stream and was reflected by the very large D.O. and temperature ranges, 12.32 mg/l and 15.35°C, respectively. The maximum temperature observed at this site was 32.78°C, a violation of the temperature criteria of 29.4°C. The two sites upstream of the confluence with Poe Ditch, RMs 13.55 and 8.60, were impaired for siltation. During sonde deployment, thick deposits of unconsolidated sediments were noted in the channel. Efforts were carried out to make sure the sondes did not sink into the sediments throughout the deployment. High sediment oxygen demand was suspected due to the consistent low DO. The D.O. at the RM 8.6 site indicated extremely poor conditions for aquatic life. Downstream of Poe Ditch, North

Branch Portage River appeared more nutrient enriched. Nutrients from the Bowling Green WWTP, delivered by Poe Ditch, were the likely source.

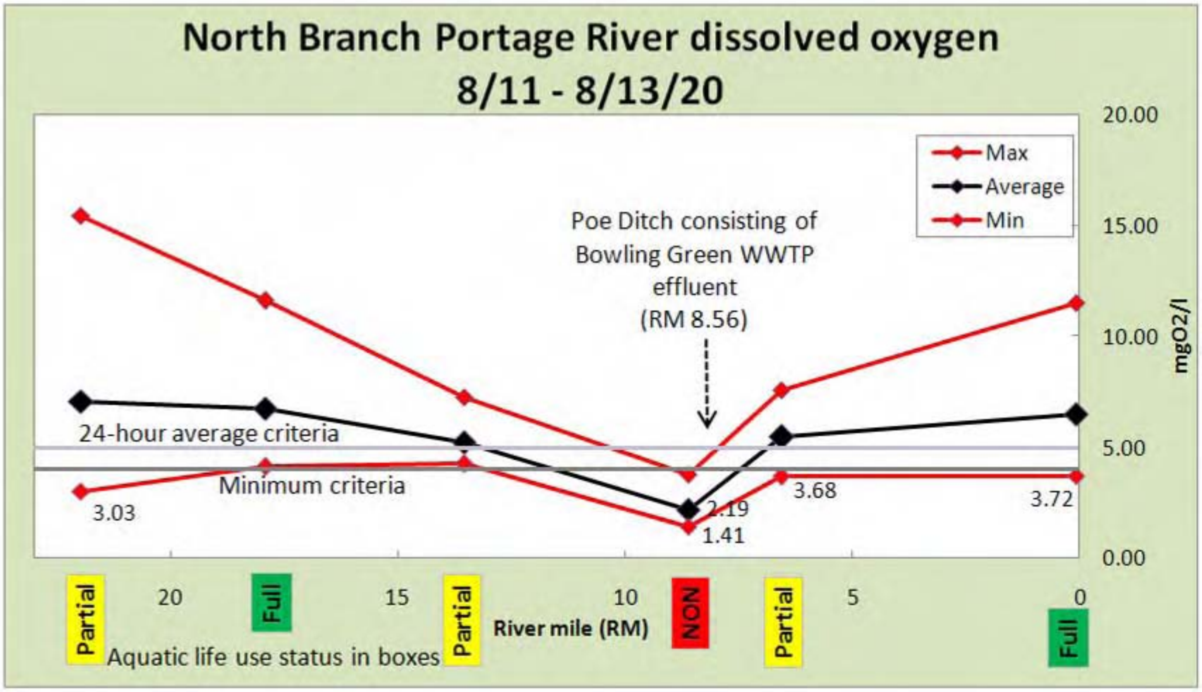

Figure 40. North Branch Portage River dissolved oxygen results from 2009 sonde sampling.

Portage River mainstem

Eight sondes were deployed for the mainstem Portage River survey, however Figure 41 only shows four of these sites' data. This is because the downstream sites were found to have notable vertical stratification, and the sondes were not placed sufficiently close to the surface to be comparative to the upstream sites. The four upstream sites shown on Figure 41 were all in full attainment of the WWH aquatic life use designation. However, all four sites indicated nutrient enrichment with D.O. swings of greater than 13.2 mg/l. At the most downstream site, RM 17.03 at State Route 590, a swing of 16.21 mg/l was observed. Sites further downstream were not meeting the WWH aquatic life use, and nutrient enrichment was a primary cause of impairment. The D.O. of the sites examined here and nutrient data outlined elsewhere in this report confirmed that excessive nutrient loads were being exported from the upstream portion of the Portage River watershed leading to impairment in the lower portion of the Portage River mainstem.

What is not evident here is what, if any, additional conditions were present causing the further downstream sites to be impaired. At the impaired sites, the Portage River transitions into a lacustuary, exhibiting larger cross sectional area and deeper, slower flowing waters. This is likely bringing about the conditions in which nutrient enrichment causes a greater impact on biological metrics than at upstream assessed sites.

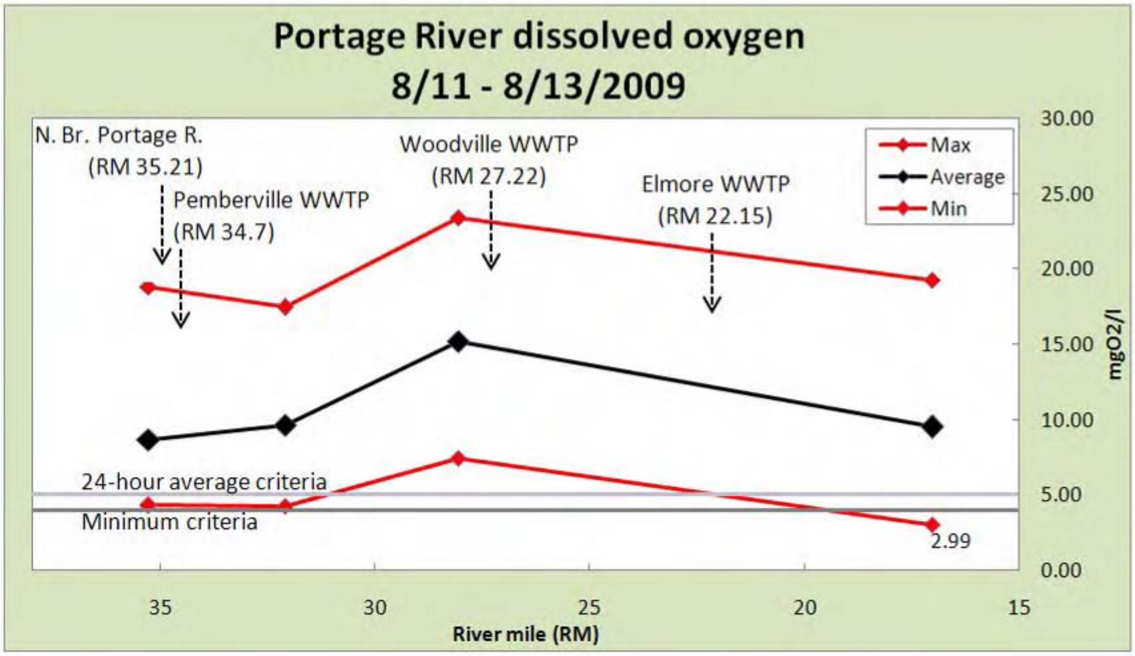

Figure 41. Portage River dissolved oxygen results from 2009 sonde sampling.

Recreational Use

There was widespread impairment of the recreation use in the Portage River basin, the select Maumee River tributaries and the select Lake Erie tributaries. Nearly every site exceeded the assigned or recommended recreation use criterion.

Recreation use was evaluated using *E. coli* counts in samples collected at 82 sites in the Portage River basin as presented in Table 8. If more than one sample was collected at a site, the geometric mean of the samples was calculated to determine attainment of the recreation use at that site. If only one sample was collected, it was compared to the maximum criteria to determine attainment. Only 10 of the 82 sites (12%) were in full attainment of the recreation use and more than half of the attaining sites were either lake affected sites or headwater sites.

Of particular note are the extremely high *E. coli* counts found downstream of the following sources:

McComb WWTP – Algire Creek and Rader Creek
Reysken's Dairy – Needles Creek RM 1.25 and Middle Branch Portage River RM 15.32
Rudolph (south side) – Middle Branch Portage River RM 10.9-8.64
Unknown source(s)* – East Branch Portage River RM 9.60
West Milgrove (unsewered) – East Branch Portage River RM 3.10

Unknown sources – South Branch Portage River entire length
Rising Sun (now sewered)/Hillbex Dairy – Sugar Creek RM 21.31
Unknown source(s) – Ninemile Creek
Brush Wellman – Hyde Run
Gibsonburg WWTP and/or unknown sources – Wolf Creek RM 6.51

*Source is listed as Unknown though HSTS and Fostoria WWTP are listed as possible sources in Table 8. This is because the pattern of high *E. coli* levels is possibly attributed to an as yet unknown HSTS in the vicinity of RM 9.60. While it is possible that the Fostoria WWTP sometimes contributes as a source, it is also unlikely to produce the numbers seen at RM 9.60.

Samples were collected at 29 sites in the Lake Erie tributaries portion of the study area (Table 9). Only 1 of the 29 sites was in full attainment of the recreation use: Wolf Creek at Yondota, which is a predominantly lake affected site. Of particular note at the remaining sampling locations were the extremely high *E. coli* counts found downstream of the following sources:

Martin (unsewered) – South Branch Turtle Creek
Unsewered rural residential – Ayers Ck and Crane Creek Tributary
Curtice (unsewered) – Cedar Ck RM 7.90 and Ditch to Cedar Creek
Unsewered industrial/residential – Dry Creek RM 7.00
Unsewered rural residential – Wolf Ditch/Creek RM 6.30
Unknown sources – Otter Creek RM 5.92 and RM 2.95

Samples were collected at 7 sites in the Maumee River tributaries (Table 10). Only 1 of the 7 sites was in full attainment of the recreation use: the site in Duck Creek immediately downstream of the Hecklinger Pond outlet. Extremely high *E. coli* counts were found within Grassy Creek and Delaware Creek, though the source of the contamination was unknown.

Some of the potential sources of bacterial contamination throughout the entire study area are indicated in Tables 8-10, but the sources listed have not necessarily been confirmed as a source of impairment nor are they exclusive of other possible sources. All bacteriological data for monitored sites are available in Appendix F.

Table 8. Recreation use attainment table for 83 locations in the Portage River Basin, May 1 through October 31, 2008, using Draft WQS. Attainment decisions were made based on cells outlined in bold.

Note: All *E. coli* values are expressed as colony forming units (cfu) per 100 ml of water. Gray shaded values exceed the criteria for the associated use (SCR or the assigned class of the PCR use):

Class A (lakes and popular paddling streams) - Geometric Mean <126 Single Sample Maximum Value ≤298

Class B (most streams; those that are not Class A or C) - Geometric Mean <161 Single Sample Maximum Value ≤523

Class C (streams that support infrequent recreation (e.g. wading)) - Geometric Mean <206 Single Sample Maximum Value ≤940

Station ID	Location	River Mile	Rec Use (PCR Class or SCR)	Number Samples	E. coli Geometric Mean	E. coli Maximum Value	Attainment Status	Source(s) of Bacteria
HUC 12	**041000100101- Rader Creek**							
S01K19	ALGIRE CK AT MAIN ST	1.78	B	4	1058	6700	**NON**	Golf course
S01K18	ALGIRE CK NR MOUTH ADJ AT SR 235 FARM LANE	0.10	B	5	2883	53000	**NON**	McComb WWTP; HSTS
300374	RADER CK AT MCCOMB RESERVOIR ACCESS RD.	13.55	B	5	1241	6600	**NON**	
S01S26	RADER CK AT CR 203	10.92	B	5	521	22000	**NON**	McComb WWTP; HSTS; Agric.
S01S24	RADER CK AT NEEDLES RD	5.20	B	5	475	7300	**NON**	HSTS; Agric.
201109	RADER CK AT CYGNET RD	0.80	B	5	683	6000	**NON**	HSTS; Agric.
S01K17	RADER CK TRIB (4.37) AT NEEDLES RD	0.45	B	5	602	3100	**NON**	Agric.
S01K20	RADER CK TRIB (4.03) AT NEEDLES RD	0.70	C	3	176	1000	FULL	
HUC 12	**041000100102 - Needles Creek above Rader Cr.**							
300511	NEEDLES CK AT HANCOCK-WOOD COUNTY LINE RD	8.35	B	4	618	4800	**NON**	CAFO; HSTS; Agric.
S01P30	NEEDLES CK AT SR 18	5.14	B	3	859	5900	**NON**	HSTS; Agric.
S01S48	NEEDLES CK AT CYGNET RD	1.25	B	4	388	10000	**NON**	CAFO; HSTS; Agric.
HUC 12	**041000100103 - Rocky Ford Creek**							
S01K13	ROCKY FORD TRIB (10.75) AT TR 112	3.57	SCR	4	495	1200	**NON**	HSTS
201105	ROCKY FORD TRIB (10.75) AT CR 139 (DST FENBURG #2)	2.00	SCR	5	544	1800	**NON**	HSTS
201106	TRIB TO ROCKY FORD TRIB (10.75/1.99) ADJ CR 139 (UST FENBURG #2)	1.80	SCR	5	910	2500	**NON**	HSTS

Station ID	Location	River Mile	Rec Use (PCR Class or SCR)	Number Samples	E. coli Geometric Mean	E. coli Maximum Value	Attainment Status	Source(s) of Bacteria
S01K12	ROCKY FORD AT CR 109	21.12	B	4	620	1100	**NON**	HSTS; Agric.
S01K11	ROCKY FORD AT CR 18	19.53	B	5	324	1300	**NON**	HSTS; Agric.
S01S06	ROCKY FORD AT CR 220 (MAIN ST) - DST VAN BUREN LAKE	15.04	B	3	82	200	FULL	
S01S05	ROCKY FORD AT TR 114	11.87	B	5	178	610	**NON**	HSTS; Van Buren; Agric.
S01P26	ROCKY FORD AT SR 18	10.74	B	5	689	2600	**NON**	HSTS; golf course
S01S04	ROCKY FORD UST N BALTIMORE WWTP AT E BROADWAY ST	9.82	B	5	480	1500	**NON**	CSOs
S01P28	ROCKY FORD AT CYGNET RD	5.10	B	5	228	1200	**NON**	HSTS ; N. Baltimore WWTP
300372	ROCKY FORD AT SOLETHER RD	1.59	B	4	499	1200	**NON**	HSTS; Agric.
HUC 12	**041000100104 - Middle Branch Portage River below Rader Cr. to above Rocky Ford Cr.**							
S01K09	M BR PORTAGE R AT JERRY CITY RD	15.32	B	5	697	6800	**NON**	HSTS; Radar/Needles Cks.
201099	M BR PORTAGE R AT RUDOLPH RD	10.90	B	5	531	7900	**NON**	HSTS; Rudolph
S01S44	M BR PORTAGE R UST ROCKY FORD AT SOLETHER RD	8.64	B	5	510	13000	**NON**	HSTS; Agric.
HUC 12	**041000100201 - Bull Creek**							
S01K10	BULL CK AT EAGLEVILLE RD	8.45	B	5	231	470	**NON**	HSTS; Agric.
S99Q05	BULL CK AT JERRY CITY RD	3.89	B	5	834	5200	**NON**	Package Plant ; HSTS; Jerry City
S01S45	BULL CK AT GREENSBURG PIKE RD	0.64	B	5	410	530	**NON**	HSTS; Agric.
HUC 12	**041000100202 - East Branch Portage River**							
S01K21	E BR PORTAGE R AT TR 214	19.17	B	3	773	1400	**NON**	HSTS; Agric.
300373	E BR PORTAGE R AT TR 217	16.10	B	3	407	1000	**NON**	HSTS; Agric.
S01S30	E BR PORTAGE R AT CR 226	12.47	B	5	46	300	FULL	
300512	E BR PORTAGE R DST FOSTORIA CSO AT PORTAGE PARK (UST WWTP)	10.30	B	5	1145	2000	**NON**	CSOs; Urban area
S01P03	E BR PORTAGE R AT STEARNS RD	9.60	B	5	1758	>10000	**NON**	HSTS ; Fostoria WWTP

Station ID	Location	River Mile	Rec Use (PCR Class or SCR)	Number Samples	E. coli Geometric Mean	Maximum Value	Attainment Status	Source(s) of Bacteria
S01P05	E BR PORTAGE R AT EAGLEVILLE RD	6.18	B	5	654	1200	**NON**	HSTS; Agric.
S01P07	E BR PORTAGE R AT CYGNET RD	3.10	B	5	2118	>200000	**NON**	HSTS; West Milgrove unsewered
S01P09	E BR PORTAGE R AT BAYS RD	0.80	B	6	868	1800	**NON**	HSTS; Agric.
HUC 12	**41000100203 - South Branch Portage River headwaters to above E. Branch Portage R.**							
S01K07	S BR PORTAGE R AT CR 109	24.77	B	5	603	12000	**NON**	HSTS; Arcadia
S01K06	S BR PORTAGE R AT TR 218	22.58	B	5	554	21000	**NON**	HSTS; Agric.
S01K05	S BR PORTAGE R AT STEARNS RD	17.77	B	5	1080	13000	**NON**	HSTS; Bloomdale WWTP; Agric.
S01K04	S BR PORTAGE R AT HALL RD	14.43	B	5	476	10000	**NON**	HSTS; Agric.
S01P10	S BR PORTAGE R AT PORTAGE VIEW RD	8.35	B	5	1224	6900	**NON**	HSTS; Agric.
HUC 12	**041000100204 - South Branch Portage River below E. Branch to above Middle Branch**							
S01P14	S BR PORTAGE R AT GREENSBURG PIKE	4.78	B	5	645	8500	**NON**	HSTS; Wayne WWTP; Southside Packers
S01S19	S BR PORTAGE R AT KEMNER RD	0.50	B	7	420	3600	**NON**	HSTS; Agric.
HUC 12	**041000100205 - Middle Branch Portage River below Rocky Ford Cr. to above S. Branch Portage R. [except Bull Cr.]**							
S01K08	M BR PORTAGE R AT BLOOMDALE RD	3.45	B	5	118	340	FULL	
S99Q04	M BR PORTAGE R AT CASKIE RD	0.55	B	7	181	20000	**NON**	HSTS; Agric.
HUC 12	**041000100301 - North Branch Portage River**							
S01K03	N BR PORTAGE R AT JERRY CITY RD	25.85	B	5	125	650	FULL	
S01K02	N BR PORTAGE R AT MERMILL RD	21.96	B	5	207	700	**NON**	HSTS; Agric.
S01S40	N BR PORTAGE R AT RUDOLPH RD	17.92	B	5	287	610	**NON**	HSTS
S01S11	N BR PORTAGE R AT LINWOOD RD	13.55	B	5	383	520	**NON**	HSTS; Agric.
S01S39	N BR PORTAGE R AT BOWLING GREEN RD	9.74	B	4	796	1200	**NON**	HSTS; Package Plants; Hartung Bros.
S01K01	N BR PORTAGE R JST UST POE DITCH (ADJ SR 105)	8.60	B	1	N/A	850	**NON**	HSTS

Station ID	Location	River Mile	Rec Use (PCR Class or SCR)	Number Samples	E. coli Geometric Mean	E. coli Maximum Value	Attainment Status	Source(s) of Bacteria
201093	N BR PORTAGE R AT BOWLING GREEN WWTP MIX ZONE	8.55	B	5	575	2800	**NON**	HSTS; Bowling Green WWTP; Agric.
S01S10	N BR PORTAGE R AT SILVERWOOD RD	6.55	A	5	746	1400	**NON**	HSTS; Agric.
500520	N BR PORTAGE R AT RIVER RD	0.08	A	7	295	2300	**NON**	HSTS
S01S41	POE DITCH DST BOWLING GREEN WWTP OUTFALL 001	2.42	B	4	374	2200	**NON**	Bowling Green WWTP
HUC 12	**041000100302 - Portage River below S. Branch to above N. Branch**							
S01S36	PORTAGE R AT BRIDGE ST	35.28	A	7	238	9200	**NON**	HSTS
HUC 12	**041000100401 - Sugar Creek**							
S02K06	COON CK AT CR 32 (ANDERSON RD)	0.34	B	5	296	3100	**NON**	HSTS; Package Plant; Agric.
S02K05	SUGAR CK AT GREENSBURG PIKE	21.31	B	5	1026	9000	**NON**	HSTS; CAFO; Agric.
201092	SUGAR CK AT US 6	18.50	B	5	619	3800	**NON**	HSTS; Agric.
S02S26	SUGAR CK AT CR 32 (ANDERSON RD)	13.38	B	5	338	8300	**NON**	HSTS; Agric.
S02S25	SUGAR CK AT US 20	8.90	B	5	403	3100	**NON**	HSTS; Gibsonburg WWTP; Agric.
S02P01	SUGAR CK AT ELMORE EASTERN RD	3.65	B	5	210	1300	**NON**	HSTS; Golf course
300371	SUGAR CK AT HESSVILLE RD	0.80	B	7	379	2400	**NON**	HSTS
HUC 12	**041000100402 - Portage River below N. Branch to above Sugar Cr. (includes Lacarpe Cr. outlet #4)**							
S01S12	PORTAGE R AT US 23	32.10	A	7	112	7400	FULL	
500510	PORTAGE R AT US 20 WOODVILLE	28.08	A	9	232	2700	**NON**	HSTS; CSOs
S02S20	PORTAGE R AT I80/90 OHIO TURNPIKE	24.10	A	7	225	4900	**NON**	HSTS; Woodville WWTP & CSOs
S02S18	PORTAGE R DST ELMORE WWTP OUTFALL 001	22.13	A	7	157	6800	**NON**	HSTS; Elmore WWTP; Package Plant
HUC 12	**041000100501 - Little Portage River**							
S02P04	LITTLE PORTAGE R AT CR 169	6.20	B	5	1888	4600	**NON**	HSTS; Agric.
S02S23	LITTLE PORTAGE R AT CR 17	1.79	B	6	84	590	FULL	

Station ID	Location	River Mile	Rec Use (PCR Class or SCR)	Number Samples	E. coli Geometric Mean	Maximum Value	Attainment Status	Source(s) of Bacteria
S02K02	NINEMILE CK AT TR 92 (HESSVILLE RD)	5.00	B	4	1151	9600	**NON**	HSTS; Agric.
S02K01	NINEMILE CK AT CR 141 (DUNMYER RD)	2.93	B	4	555	5700	**NON**	HSTS; Agric.
HUC 12	**041000100502 - Portage River below Sugar Cr. to Lake Erie including Lacarpe Cr. outlets 2 & 3 [except L. Portage R.]**							
S02P08	PORTAGE R AT SR 590	17.03	A	7	363	4800	**NON**	HSTS
S02S03	PORTAGE R AT HYDE RUN (BRUSH WELLMAN) MIX ZONE	16.53	A	7	457	6800	**NON**	HSTS; Brush Wellman
S02S17	PORTAGE R DST SLEMMER-PORTAGE RD	15.70	A	7	215	6700	**NON**	HSTS; Agric.
S02S16	PORTAGE R ADJ SR 105	14.02	A	7	334	2500	**NON**	HSTS; Agric.
S02P06	PORTAGE R AT SR 19	12.55	A	7	1811	6500	**NON**	HSTS
S02S14	PORTAGE R ADJ OAK RIDGE DR	11.10	A	7	339	7000	**NON**	HSTS; Oak Harbor WWTP
S99Q01	PORTAGE R 0.5 MILES UST LITTLE PORTAGE R	6.00	A	7	8	410	FULL	
S02S11	PORTAGE R UST PORT CLINTON WWTP	0.58	A	7	13	54	FULL	
S02S10	PORTAGE R DST PORT CLINTON WWTP OUTFALL 001	0.50	A	6	17	140	FULL	
S02S05	HYDE RUN (BRUSH WELLMAN TRIB 16.54) AT PORTAGE R SO RD	0.02	B	4	1745	25000	**NON**	Brush Wellman
S02K04	WOLF CK AT YEASTING RD.	6.51	B	5	2578	10000	**NON**	HSTS; Gibsonburg WWTP; Agric.

Table 9. Recreation use attainment table for 24 locations in the Lake Erie tributaries, May 1 through October 31, 2008 and 5 locations in the Lake Erie Tributaries, May 1 through October 31, 2006, using Draft WQS. Attainment decisions were made based on cells outlined in bold.

Note: All *E. coli* values are expressed as colony forming units (cfu) per 100 ml of water. Gray shaded values exceed PCR criteria for the assigned class:

Class A (lakes and popular paddling streams) - Geometric Mean <126 Single Sample Maximum Value ≤298

Class B (most streams; those that are not Class A or C) - Geometric Mean <161 Single Sample Maximum Value ≤523

Class C (streams that support infrequent recreation (e.g. wading)) - Geometric Mean <206 Single Sample Maximum Value ≤940

Station ID	Location	River Mile	Rec Use (PCR Class or SCR)	Number Samples	E. coli Geometric Mean	E. coli Maximum Value	Attainment Status	Source(s) of Bacteria
HUC 12	**041000100701 - Turtle Creek plus Lk. Erie drainage between Crane Cr. and Toussaint Cr.**							
S03K06	N BR TURTLE CK AT GENOA CLAY CENTER RD	3.00	B	5	1395	2300	**NON**	HSTS; Package Plants
201124	N BR TURTLE CK AT OPFER-LENTZ RD	0.80	B	4	551	1200	**NON**	HSTS; Package Plants
S03K07	S BR TURTLE CK AT MOLINE RD	2.65	B	5	2046	>10000	**NON**	Village of Martin; HSTS
S03K05	TURTLE CK AT NISSEN RD	11.62	B	5	911	2200	**NON**	HSTS; Package Plants
HUC 12	**041000100702 - Crane Creek (includes Henry Cr.)**							
S03K04	AYERS CK AT BILLMAN RD	0.60	B	3	2895	31000	**NON**	HSTS
S03P21	CRANE CK AT HANLEY RD W SIDE OF I-280	18.82	B	5	1043	2600	**NON**	HSTS; Package Plants
S03K02	CRANE CK AT COLLINS RD (CHERRY ST)	15.38	B	5	1244	5800	**NON**	HSTS; Package Plants
S03G21	CRANE CK AT MARTIN-WILLISTON RD	8.83	B	4	1782	2500	**NON**	HSTS; Williston unsewered; Package Plts
S03K01	CRANE CK AT ELLISTON RD (LACUSTUARY)	5.20	B	5	343	1200	**NON**	HSTS
S03K03	CRANE CK TRIB ( ) AT BILLMAN RD	0.42	B	5	2202	42000	**NON**	HSTS
S03S65	HENRY CK AT CUMMINS RD	3.73	B	5	647	1300	**NON**	HSTS; Package Plants
201118	HENRY CK NR MOUTH (BRADNER RD)	0.25	B	5	842	2800	**NON**	HSTS
HUC 12	**041000100703 - Cedar Creek including Reno Side Cut and Wards Canal plus Lk. Erie drainage between Reno Side Cut and Crane Cr.**							
S03S34	CEDAR CK AT OREGON RD	20.77	B	5	1003	2300	**NON**	HSTS
S03S60	CEDAR CK AT E BROADWAY	17.32	B	5	600	2200	**NON**	HSTS
S03S46	CEDAR CK AT LEMOYNE RD	14.50	B	5	389	1200	**NON**	HSTS
S03S44	CEDAR CK AT BILLMAN RD	9.59	B	5	580	1100	**NON**	HSTS

Station ID	Location	River Mile	Rec Use (PCR Class or SCR)	Number Samples	E. coli Geometric Mean	E. coli Maximum Value	Attainment Status	Source(s) of Bacteria
S03G22	CEDAR CK AT WILDACRE RD	7.90	B	5	1113	2300	**NON**	Curtice unsewered; HSTS
S03S55	CEDAR CK AT YONDOTA RD	4.27	B	4	382	760	**NON**	HSTS
S03G23	DITCH TO CEDAR CK (7.91) ADJ TO RR	0.01	B	5	42341	>200000	**NON**	Curtice unsewered; HSTS
S03S48	DRY CK AT MOUTH	0.01	B	5	358	490	**NON**	HSTS
S03S68	DRY CK AT E BROADWAY	7.00	B	6	5496	41000	**NON**	HSTS; Septic Discharges
HUC 12	**041000100704 - Lake Erie Drainage between Berger Ditch and Reno Side Cut**							
201144	WOLF CK/WILLIAMS DITCH AT YONDOTA RD	1.70	SCR	4	186	250	FULL	
HUC 12	**041000100705 - Wolf Ditch and Berger Ditch**							
201111	WOLF CK AT STADIUM RD	2.70	B	5	1556	3200	**NON**	HSTS
S03S50	WOLF CK UST CURTICE RD	6.30	C	5	852	>10000	**NON**	HSTS
HUC 12	**041000100706 – Otter Creek**							
S03P12	OTTER CK AT OAKDALE AVE	5.92	C	8	1343	>10000	**NON**	Package Plants
S03P08	OTTER CK AT CONSAUL ST	2.95	B	8	1987	>10000	**NON**	HSTS
S03P05	OTTER CK AT MILLARD AVE	2.13	B	8	440	5600	**NON**	HSTS
S03S25	OTTER CK ADJ CSX ROAD	0.40	B	2	212	4100	**NON**	HSTS
	STORM SEWER TO OTTER CK AT OAKDALE AVE		NA	1		2200	NA	

Table 10. Recreation use attainment table for sampling in the Maumee tributaries between May 1 through October 31, 2006 and May 1 through October 31, 2008, using Draft WQS. Attainment decisions were made based on cells outlined in bold.

Note: All *E. coli* values are expressed as colony forming units (cfu) per 100 ml of water. Gray shaded values exceed PCR criteria for the assigned class:

Class A (lakes and popular paddling streams) - Geometric Mean <126 Single Sample Maximum Value ≤298
Class B (most streams; those that are not Class A or C) - Geometric Mean <161 Single Sample Maximum Value ≤523
Class C (streams that support infrequent recreation (e.g. wading)) - Geometric Mean <206 Single Sample Maximum Value ≤940

Station ID	Location	River Mile	Rec Use (PCR Class or SCR)	Number Samples	E. coli		Attainment Status	Source(s) of Bacteria
					Geometric Mean	Maximum Value		
HUC 12	**041000090901 -. Grassy Creek Diversion**							
P11K19	GRASSY CK DIVERSION (10.85) AT GRAND RAPIDS RD (2006 data)	0.28	B	8	644	1200	NON	HSTS; Urban area
HUC 12	**041000090902 - Grassy Creek**							
P11A05	GRASSY CK AT FORD RD (2006 data)	4.85	B	7	1521	>10000	NON	HSTS; Urban area
P11K18	GRASSY CK AT GLENWOOD RD (2006 data)	0.98	B	8	1582	>10000	NON	HSTS; Urban area
HUC 12	**041000090904 - Maumee River below Grassy Cr. to Lake Erie [except Swan Cr.]**							
P11A07	DELAWARE CK AT ROHR DR (2006 data)	0.38	B	8	1614	>10000	NON	HSTS
300376	DUCK CK DST BURGER ST (DST HECKLINGER POND OUTLET) (2008 data)	4.00	B	4	54	150	**FULL**	
P11K22	DUCK CK AT CONSAUL ST (2008 data)	3.10	B	2	685	770	NON	HSTS
P11S56	DUCK CK AT YORK ST (2008 data)	2.52	B	2	954	1300	NON	HSTS; Golf course

Public Water Supplies

Three communities in the Portage River basin have surface water intakes for their drinking water supply, all in the headwaters of the watershed. The Village of McComb draws water from Rader Creek into its upground reservoir for storage and subsequent treatment. The Village of North Baltimore has 2 intakes on Rocky Ford Creek for drawing water into its upground reservoir. The City of Fostoria draws water from the East Branch Portage River into the first of two upground reservoirs it uses in series to store water prior to treatment for drinking. The storage capability of upground reservoirs allows operators to selectively pump water from streams when the flow and quality is optimum.

Samples were collected at or near each of the raw water intakes during the survey. All samples were analyzed for inorganic nutrient and metals parameters, and on some sampling dates additional samples were collected and analyzed for herbicides, organics, or PCBs.

Village of McComb

The Village of McComb has one drinking water intake on Rader Creek at RM 13.55 for drawing water from the creek to fill its upground reservoir. Seven samples were collected for inorganic nutrients and metals from Rader Creek at the intake during the survey.

Aluminum and iron concentrations exceeded the secondary drinking water MCLs in all samples (Table 3). The manganese secondary MCL was exceeded in 4 of the 7 samples collected. The TDS secondary MCL of 500 mg/l was barely exceeded in only one sample with 502 mg/l TDS. The same sample came close to the primary MCL for arsenic with a concentration of 9.8 ug/l, but did not exceed the MCL of 10 ug/l. No herbicides or other organics exceeded the drinking water standards.

Village of North Baltimore

The Village of North Baltimore has 2 drinking water intakes on Rocky Ford Creek at RMs 10.66 and 11.10 from which it draws water from the creek into 2 upground reservoirs. Samples were not collected at the intake sites, but upstream of each intake at RMs 10.74 and 11.87.

All 7 samples analyzed for inorganics and metals exceeded the secondary drinking water MCLs for aluminum, iron, and manganese (Table 3). Samples collected at both sites on 6/9/08 for herbicides, exceeded the primary drinking water MCL for atrazine, however these results were qualified because they were analyzed past the required holding time for this analysis (Table 6).

City of Fostoria

The City of Fostoria has one drinking water intake on the East Branch Portage River at RM 16.10 which it uses to draw water from the creek into Fostoria Reservoir #5, the first upground reservoir in series. Samples were collected from the East Branch right at the intake. Only 5 of 7 sampling attempts was successful, as this section of the East Branch Portage River went dry during late summer 2008.

Aluminum and iron concentrations exceeded the secondary drinking water MCLs in all 5 samples collected (Table 3). The manganese secondary MCL was exceeded in 2 of the 5 samples collected. The sample collected on 6/10/08 and analyzed for herbicides exceeded the primary drinking water MCLs for atrazine and simazine, although both results were qualified as estimated (Table 6).

Sediment Quality

Sediment samples were collected at 19 sites in the Portage River basin, 8 sites in selected Lake Erie tributaries, and 4 in selected Maumee River tributaries. Samples were tested for select inorganics and metals, semi-volatile organics, and PCBs. Of the samples collected in 2008, 22 did not get complete metals analyses due to a laboratory error. Results of the inorganics and metals analyses are presented in Tables 11-13. The results of organic/PCB analyses are presented in Tables 14-16, but since most organic compounds were below detection limits, only compounds that were detected at least once in any sample are shown.

Sediment quality was evaluated by comparing inorganics and metals results to the Ohio statewide or ecoregion specific Sediment Reference Values (SRV) (Ohio EPA, 2008). Additionally, the Consensus-Based Threshold Effect Concentrations (TEC) and Probable Effect Concentration (PEC) were also considered (MacDonald, et al., 2000). Organics and PCB results were compared to the TECs and PECs in the absence of specific sediment quality guidelines for these compounds in Ohio. Most of the organic compounds detected were polycyclic aromatic hydrocarbons (PAHs). PAH compounds are more common in urban areas and come from the incomplete combustion of fossil fuels.

In the spring and early summer of 2008, the Portage River basin experienced higher than normal flows due to a series of heavy rainfall events. There was another heavy rainfall event in mid September that also resulted in exceedingly high river flows for that time of the year. Since many of the substrates were scoured during these high flow conditions, surface sediments that were sampled in the fall of 2008 were either fairly recently deposited or older sediments that recently became exposed.

In the Portage River basin, sediments collected in the East Branch Portage River, upstream (RM 10.30) and downstream of the Fostoria WWTP (RM 9.60) resulted in exceedences of the Ohio SRV and the TEC for mercury and zinc. These same 2 sites had 18 different PAH compounds detected, with 15 exceeding the PEC at RM 10.30 (total PAHs = 739 mg/kg) and 6 exceeding the PEC at RM 9.60 (total PAHs = 51.5 mg/kg). Sediments at these 2 sites also contained total PCBs in exceedence of the TEC with concentrations of 274 ɥg/kg and 80.7 ɥg/kg, respectively. These results are more than double the concentrations of PAHs and PCBs present in sediment samples collected near these locations during Ohio EPA sampling in 1994.

Releases of PAHs into the environment occur from combustion processes as they are a natural component of most fossil fuels. PAHs are found in industries that produce or use coal tar, coke, or bitumen (asphalt). They are emitted by coal gasification plants, smokehouses, municipal incinerators, and some aluminum production facilities (ATSDR, 2008). While PAHs are still used today in industries, PCBs have been banned since 1977 when their environmental persistence and potential for harm became apparent. PCBs can be released into the general environment from poorly maintained toxic waste sites; by illegal or improper dumping of PCB wastes, such as transformer fluids; through leaks or fugitive emissions from electrical transformers containing PCBs; and by disposal of PCB-containing consumer products in municipal landfills (ATSDR, 2000).

Ohio EPA Division of Emergency and Remedial Response (DERR) had reports of 101 spills from within Fostoria and the surrounding area between 1995 and 2009. The majority of spills included diesel fuel, lube oil, gasoline, crude oil, motor oil, petroleum, and transformer oil. The southwestern portion of Fostoria is highly industrialized and there is also a railyard through Fostoria which has been associated with several of the spills. The multiple CSOs within Fostoria could act as conveyances for contaminants from these areas. In addition, the Fostoria City Dump, which is also known as Portage Park, is a historic dump that was closed before regulations were in place regarding proper closure methodology. The site is along the East Branch Portage River, and could potentially be a source for the PAHs and PCBs. The site should be investigated further to determine if it is the source of the sediment contamination in the East Branch Portage River.

The Ohio SRV for strontium and beryllium were exceeded in the Portage River at RM 14.02. In the Portage River immediately downstream of Hyde Run (RM 16.53 – Brush Wellman "mix zone"), calcium exceeded the Ohio SRV (Table 11). Four sites in the Portage River from RM 16.53 (Hyde Run confluence) to RM 11.10 downstream of Oak Harbor had levels of total PCBs that exceeded the TEC (Table 14). The variability in PCB concentrations between surveys provided below may be the result of the unknown scour and deposition associated with excessive flows in the Portage River in recent years:

Portage River	RM 16.53	RM 15.70	RM 14.00	RM 12.55	RM 11.10
Total PCBS in:					
2008	151	NA	171	239	81
1994	1645	55	46	45	NA

However, as mentioned in the Biological and Water Quality Study of the Portage River Basin, 1995, "PCBs were below detection levels upstream of Brush Wellman at RMs 22.5 and 29.3, implying the PCBs originated at Brush Wellman" (Ohio EPA, 1995). The continued absence of PCBs in the sediment above Brush Wellman (RM 17.03 in 2008) supports this conclusion.

The Ohio SRV for strontium was exceeded in the Middle Branch Portage River (RM 0.55), and Coon Creek. In the North Branch Portage River downstream of the Bowling Green WWTP (RM 8.55), mercury exceeded the Ohio SRV and the TEC, and zinc exceeded the TEC (Table 11). PAHs were also detected at North Branch Portage River RM 8.55, with 6 of the 10 compounds detected exceeding the PEC (Table 14). Although there were no exceedences of inorganics and metals in Rocky Ford Creek, 10 PAH compounds were detected upstream of the North Baltimore WWTP (RM 9.82 – downstream of the CSO); 4 exceeded the TEC, and 2 exceeded the PEC (Table 14).

In the selected Lake Erie tributaries, sediments collected during 2008 in Crane Creek (RM 18.82), Cedar Creek (RM 9.59) and Dry Creek (RM 7.00) resulted in exceedences of the Ohio SRV for strontium (Table 12). In the Crane Creek sample, 10 PAHs were detected (with 6 exceeding the PEC), and total PCBs were present at 37.9 ųg/kg, but below the TEC. The PAHs, fluoranthene and pyrene, were detected in Cedar Creek and Dry Creek, above the TEC, and another PAH, chrysene, was also detected above the TEC in Dry Creek (Table 15).

Sediments collected from all 4 Otter Creek sites in 2006 were extremely contaminated with many metals parameters exceeding Ohio SRVs as well as Consensus-Based TECs and PECs (Table 12). Eleven PAHs were detected, with 6 or more values greater than the PEC at each of the 4 sites. PCBs were also present in the sediments, above the TEC at 3 sites and above the PEC at 1 site (Table 15). The most upstream site (RM 6.00 – Oakdale Rd.) had the highest level of total PAHs, and RM 2.13 (Millard Rd.) had the highest concentration of total PCBs. The highly contaminated sediments are likely a result of the intensive industrial land use, uncontrolled waste sites and historical spills.

In the selected Maumee River tributaries, sediments were collected from Grassy Creek (RM 0.98) in 2006 and from Duck Creek (RMs 4.00, 3.10, and 2.52) in 2008 (Tables 13 & 16). There were no exceedences of Ohio SRVs in Grassy Creek, but 10 PAHs were detected, with 6 greater than the TEC or PEC. Duck Creek sediments were extremely contaminated, although no results were available for some of the heavy metals (Table 13). Mercury exceeded the Ohio SRV at RM 4.00 (just downstream of the Hecklinger Pond outlet), and zinc exceeded the SRV and the TEC at both RMs 4.00 & 3.10. Strontium concentrations exceeded the SRV at all 3 sites. Calcium and magnesium also exceeded the SRVs at the 2 most downstream sites. Both PAHs and PCBs were also detected in Duck Creek. The most contaminated site, and the only site where PCBs were detected, was the most downstream site, RM 2.52 (York St.). Fourteen different PAH compounds were detected, with 6-8 PAH compounds exceeding the Consensus-Based PECs at each site (Table 16). The highly contaminated sediments in the headwaters are a result of the intensive urban landscape, while further downstream historical intensive industrial land use, uncontrolled waste sites and historical spills were likely responsible for the contaminated sediments.

Table 11. Metals concentrations (mg/kg or ppm dry weight) in sediment samples collected in 2008 from the Portage River basin (HELP ecoregion). Values reported as less than (<) were below the quantitation limit.

HUC10→	Rocky Ford / Middle Branch Portage River (04100010-01)			
Parameter	(-01) Rader Ck ust Reservoir Access Rd. (RM 13.55)	(-03) Rocky Ford at TR 114 (RM 1.87)	(-03) Rocky Ford at SR 18 (RM 10.74)	(-03) Rocky Ford at East Broadway St (RM 9.80)
Solids (%)	56%	64.6%	66.2%	68.1%
TOC (%)	2.2%	1.6%	1.8%	2.1%
Aluminum	17200	7360	4950	3180
Arsenic	NA	NA	NA	NA
Barium	115	48.3	33.4	26.3
Cadmium	NA	NA	NA	NA
Chromium	NA	NA	NA	NA
Copper	NA	NA	NA	NA
Iron	24700	15100	11700	9360
Lead	NA	NA	NA	NA
Manganese	358	250	192	178
Mercury	NA	NA	NA	NA
Nickel	NA	NA	NA	NA
Selenium	NA	NA	NA	NA
Strontium	58	43	47	51
Zinc	94.4	51.8	39.6	52.1
Calcium	10700	8280	13600	34200
Magnesium	4700	4020	4040	12900
Potassium	2510	1130	<1010	<1070
Sodium	<3030	<2210	<2520	<2670

HUC10→	South Branch / Middle Branch Portage River (04100010-02)		
Parameter	(-01) Bull Ck at Greensburg Pike (RM 0.64)	(-02) East Branch Portage R ust Fostoria WWTP (RM 10.30)	(-02) East Branch Portage R at Stearns Rd. (RM 9.60)
Solids (%)	73%	64.2%	38.4%
TOC (%)	2.9%	8.7%	6.4%
Aluminum	5550	3500	8120
Arsenic	NA	NA	NA
Barium	36.6	138	85.9
Cadmium	NA	NA	NA
Chromium	NA	NA	NA
Copper	NA	NA	NA
Iron	12900	10700	17000
Lead	NA	NA	NA
Manganese	317	130	373
Mercury	NA	**0.319*[1]**	**0.777*[1]**
Nickel	NA	NA	NA
Selenium	NA	NA	NA
Strontium	130	152	120
Zinc	46	**301*[1]**	**282*[1]**
Calcium	51900	51200	37300
Magnesium	12000	19900	15000
Potassium	1310	<1180	<1930
Sodium	<2140	<2940	<4820

HUC10→	South Branch / Middle Branch Portage River (04100010-02)		Upper Portage River (04100010-03)
Parameter	(-04) South Branch Portage R at Kemner Rd. (RM 0.50)	(-05) Middle Branch Portage R at Caskie Rd. (RM 0.55)	(-01) North Branch Portage R dst Poe Ditch (RM 8.55)
Solids (%)	51.2%	58.7%	67.5%
TOC (%)	3.3%	3.6%	2.8%
Aluminum	7820	6800	5080
Arsenic	NA	NA	NA
Barium	56.5	54.9	69.1
Cadmium	NA	NA	NA
Chromium	NA	NA	NA
Copper	NA	NA	NA
Iron	15100	14700	14600
Lead	NA	NA	NA
Manganese	342	426	378
Mercury	NA	NA	**0.181*[1]**
Nickel	NA	NA	NA
Selenium	NA	NA	NA
Strontium	105	**260***	249
Zinc	75.3	77.3	**139[1]**
Calcium	14800	63000	39800
Magnesium	5500	13100	8150
Potassium	1400	1490	1200
Sodium	<2600	<2160	<2850

HUC10→	Middle Branch Portage River (04100010-04)		
Parameter	(-01) Coon Ck at CR 32 (Anderson Rd.) (RM 0.34)	(-01) Sugar Ck at CR 32 (Anderson Rd) (RM 13.38)	(-01) Sugar Ck at US 20 (RM 8.90)
Solids (%)	51%	63.6%	62.8%
TOC (%)	4.6%	3.5%	3.2%
Aluminum	9140	4510	4370
Arsenic	NA	NA	NA
Barium	86.3	40.0	43.9
Cadmium	NA	NA	NA
Chromium	NA	NA	NA
Copper	NA	NA	NA
Iron	20700	13000	10000
Lead	NA	NA	NA
Manganese	323	289	187
Mercury	<0.042	<0.031	<0.033
Nickel	NA	NA	NA
Selenium	NA	NA	NA
Strontium	**286***	237	248
Zinc	87.1	51.5	51.5
Calcium	84500	61700	33600
Magnesium	16700	10900	9030
Potassium	2140	1040	<1030
Sodium	<3700	<2210	<2570

HUC10→	Lower Portage River / Frontal Lake Erie (04100010-05)					
Parameter	(-02) Portage R at SR 590 (RM 17.03)	(-02) Portage R at Hyde Run Mix Zone (RM 16.53)	(-02) Portage R dst Slemmer-Portage Rd. (RM 15.70)	(-02) Portage R adj 105 SR (RM 14.02)	(-02) Portage R at SR 19 (RM 12.55)	(-02) Portage R dst Oak Harbor WWTP (RM 11.10)
Solids (%)	81.8%	66.3%	50.7%	53.6%	60.9%	59%
TOC (%)	3.0%	4.7%	2.4%	3.4%	2.7%	2.2%
Aluminum	5610	9130	9480	7970 J	6940 J	7880 J
Arsenic	2.19	7.33	4.83	4.73	NA	NA
Barium	43.3	40.0	64.4	62	84.1	63.5
Beryllium	0.262	0.733	0.677	**1.7***	NA	NA
Cadmium	0.200	0.346	0.303	0.381	NA	NA
Chromium	8.04	13.6	13.4	11.6	NA	NA
Copper	10.9	16.0	15.2	19.0	NA	NA
Iron	10700	18900	17800	17100	13300	15800
Lead	7.81	8.45	16.3	13.2	NA	NA
Manganese	165	719	378	281	306	285
Mercury	NA	NA	NA	NA	NA	NA
Nickel	11.0	20.6	16.1	16.3	NA	NA
Selenium	<0.94	<0.93	<1.43	<1.00	NA	NA
Strontium	183	206	261	**287***	209	194
Zinc	45.0	51.2	69.1	75.2	80.1	71.4
Calcium	17200	**158000***	44200	34700	36500	38400
Magnesium	5210	27600	14300	9890	10200	11400
Potassium	<940	2620	1900	1380	<1290	1240
Sodium	<2350	<2320	<3590	<2490	<3220	<2970

* - Equals or Exceeds the Ohio statewide or ecoregion specific Sediment Reference Value (SRV).

1 -Equals or Exceeds the Consensus-Based Threshold Effect Concentration (TEC) below which harmful effects are unlikely to be observed (from MacDonald, et al. 2000).

2 -Equals or Exceeds the Consensus-Based Probable Effect Concentration (PEC) above which harmful effects are likely to be observed (from MacDonald, et al. 2000).

J - The analyte was positively identified, but the associated numerical result is estimated.

Table 12. Metals concentrations (mg/kg or ppm dry weight) in sediment samples collected in 2006 and 2008 from selected Lake Erie tributaries (HELP ecoregion). Values reported as less than (<) were below the quantitation limit.

HUC10→	Cedar Creek / Frontal Lake Erie (04100010-07)			
Parameter	(-02) Crane Ck at Hanley Rd. - west side of I-280 (RM 18.82) 2008	(-03) Cedar Ck at E. Broadway (RM 17.32) 2008	(-03) Cedar Ck at Billman Rd. (RM 9.59) 2008	(-03) Dry Creek at E. Broadway (RM 7.00) 2008
Solids (%)	57.0%	68.5%	71.0%	46.7%
TOC (%)	3.9%	2.9%	1.8%	4.5%
Aluminum	6300	8670	6930	11800
Arsenic	NA	NA	NA	NA
Barium	66.0	64.9	55.9	81.8
Cadmium	NA	NA	NA	NA
Chromium	NA	NA	NA	NA
Copper	NA	NA	NA	NA
Iron	16100	18100	17400	22000
Lead	NA	NA	NA	NA
Manganese	539	442	443	473
Mercury	0.035	0.024	0.026	<0.042
Nickel	NA	NA	NA	NA
Selenium	NA	NA	NA	NA
Strontium	**258***	135	**259***	**1100***
Zinc	144	72.8	64.2	139
Calcium	42000	49800	20400	47800
Magnesium	11100	11300	6030	18700
Potassium	1240	1600	1100	1820
Sodium	<2400	<2560	<2310	<3630

HUC10→	Cedar Creek / Frontal Lake Erie (04100010-07)			
Parameter	(-06) Otter Ck at Oakdale Rd (RM 6.00) 2006	(-06) Otter Ck at Consaul St (RM 3.10) 2006	(-06) Otter Ck at Millard Rd (RM 2.13) 2006	(-06) Otter Ck at CSX Bridge (RM 0.50) 2006
Solids (%)	46.0%	47.5%	45.7%	42.8%
TOC (%)	4.6%	7.3%	3.9%	5.9%
Aluminum	6090 J	10700	7760	11000 J
Arsenic	**25.9*[1]**	**24.5*[1]**	**12.4*[1]**	**11.4*[1]**
Barium	80.1	142	138	115
Cadmium	0.913	**1.25*[1]**	0.724	**1.02*[1]**
Chromium	39	**191*[2]**	**174*[2]**	**81*[1]**
Copper	**43.8*[1]**	**156*[2]**	**73.0*[1]**	**89.7*[1]**
Iron	22800	21300	16700	20000
Lead	**61*[1]**	**130*[2]**	**94*[1]**	**85*[1]**
Manganese	366	389	385	431
Mercury	**0.106***	**0.327*[1]**	**0.463*[1]**	**0.273*[1]**
Nickel	**32[1]**	**36*[1]**	<28	<34
Selenium	<1.52	**10.4***	<1.39	<1.70
Strontium	**251***	216	**500***	**260***
Zinc	**236*[1]**	**330*[1]**	152[1]	**231*[1]**
Calcium	42200	56500	**235000***	94400
Magnesium	12900	19000	9460	13600
Potassium	<1520	1790	<1390	<1700
Sodium	<3810	<3970	<3470	<4250
Ammonia	200	180	200	240
Phosphorus, T	859	1490	916	1210

* - Equals or Exceeds the Ohio statewide or ecoregion specific Sediment Reference Value (SRV).

1- Equals or Exceeds the Consensus-Based Threshold Effect Concentration (TEC) below which harmful effects are unlikely to be observed (from MacDonald, et al. 2000).

2- Equals or Exceeds the Consensus-Based Probable Effect Concentration (PEC) above which harmful effects are likely to be observed (from MacDonald, et al. 2000).

J - The analyte was positively identified, but the associated numerical result is estimated.

Table 13. Metals concentrations (mg/kg or ppm dry weight) in sediment samples collected in 2006 and 2008 from Selected Maumee River Tributaries (HELP ecoregion). Values reported as less than (<) were below the quantitation limit.

HUC10→	Grassy Creek / Maumee River River (04100009-09)			
Parameter	(-02) Grassy Ck at Glenwood Rd (RM 0.98) 2006	(-04) Duck Ck dst Burger St (RM 4.00) 2008	(-04) Duck Ck at Consaul St (RM 3.10) 2008	(-04) Duck Ck at York St. (RM 2.52) 2008
Solids (%)	67.2%	43.8%	44.2%	61.6%
TOC (%)	3.5%	7.6%	8.3%	6.6%
Aluminum	4350	8890	6910	13900
Arsenic	6.24	NA	NA	NA
Barium	34.4	95.7	133	190
Beryllium	NA	NA	NA	NA
Cadmium	0.385	NA	NA	NA
Chromium	<16	NA	NA	NA
Copper	15.8	NA	NA	NA
Iron	10400	21800	9000	10100
Lead	26	NA	NA	NA
Manganese	194	471	580	808
Mercury	0.038	**0.121***	0.056	0.082
Nickel	<22	NA	NA	NA
Selenium	<1.08	NA	NA	NA
Strontium	106	**297***	**403***	**279***
Zinc	95.8	**145**[1]	**224***[1]	111
Calcium	42200	53000	**120000***	**132000***
Magnesium	10200	13300	**40300***	**33300***
Potassium	<1080	1750	1290	986
Sodium	<2700	<3170	<3100	<2290
Ammonia	99	NA	NA	NA
Phosphorus, T	545	NA	NA	NA

*- Equals or Exceeds the Ohio statewide or ecoregion specific Sediment Reference Value (SRV).
1 - Equals or Exceeds the Consensus-Based Threshold Effect Concentration (TEC) below which harmful effects are unlikely to be observed (from MacDonald, et al. 2000).
2 - Equals or Exceeds the Consensus-Based Probable Effect Concentration (PEC) above which harmful effects are likely to be observed (from MacDonald, et al. 2000).

Table 14**.** Organic Compounds detected in sediment samples collected in 2008 at 9 sites in the Portage River basin. Units are mg/kg unless otherwise noted.

HUC 12 - 04100010-01-03 Rocky Ford		
(CAS)	**Compound Detected**	**Rocky Ford ust North Baltimore WWTP (dst CSO) RM 9.80**
000117-81-7	bis(2-Ethylhexyl)phthalate	0.56
PAHs:		
000056-55-3	Benz[a]anthracene	**0.95 ***
000050-32-8	Benzo[a]pyrene	**0.91 ***
000205-99-2	Benzo[b]fluoranthene	0.90
000191-24-2	Benzo[g,h,i]perylene	0.56
000207-08-9	Benzo[k]fluoranthene	0.73
000218-01-9	Chrysene	**1.00 ***
000206-44-0	Fluoranthene	**2.00 ***
000193-39-5	Indeno[1,2,3-cd]pyrene	0.64
000085-01-8	Phenanthrene	**1.26 ****
000129-00-0	Pyrene	**1.65 ****
Total PAHs:		**10.60 ***

HUC 12 04100010-02-02 East Branch Portage River			
(CAS)	**Compound Detected**	**East Branch Portage River ust Fostoria WWTP (dst CSOs) RM 10.30**	**East Branch Portage River at Stearns Rd. RM 9.60**
000106-46-7	1,4-Dichlorobenzene	0.94	-
000108-88-3	Toluene	0.4	-
000106-46-7	1,4-Dichlorobenzene	4.28 PT	-
000091-57-6	2-Methylnaphthalene	7.67 PT	-
000067-64-1	Acetone	-	0.287
000106-44-5	3&4-Methylphenol	5.44	1.77
000117-81-7	bis(2-Ethylhexyl)phthalate	5.53	3.59
PAHs:			
000083-32-9	Acenaphthene	19.5 PT	-
000208-96-8	Acenaphthylene	0.76 PT	-
000120-12-7	Anthracene	**27.5 **PT**	-
000056-55-3	Benz[a]anthracene	**60.0 **PT**	**4.25 ****
000050-32-8	Benzo[a]pyrene	**53.2 **PT**	**5.56 ****
000205-99-2	Benzo[b]fluoranthene	53.9 PT	6.13
000191-24-2	Benzo[g,h,i]perylene	28.9 PT	4.50
000207-08-9	Benzo[k]fluoranthene	-	3.80
000218-01-9	Chrysene	**56.6 **PT**	**5.21 ****
000053-70-3	Dibenz[a,h]anthracene	1.46 PT	-
000132-64-9	Dibenzofuran	21.1 PT	-
000117-84-0	Di-n-octylphthalate	1.1 PT	-
000206-44-0	Fluoranthene	**144 **PT**	**7.70 ****
000193-39-5	Indeno[1,2,3-cd]pyrene	33.4 PT	4.69
000091-20-3	Naphthalene	**0.88 ****	-
000091-20-3	Naphthalene	**5.55 **PT**	-
000085-01-8	Phenanthrene	**122 **PT**	**3.14 ****
000129-00-0	Pyrene	**110 **PT**	**6.50 ****
Total PAHs:		**738.97 **PT**	**51.48 ****
PCBs:			
011096-82-5	PCB-1260 (ųg/kg)	274 J	80.7 J
Total PCBs:		**274 *J**	**80.7 *J**

HUC 12 04100010-03-01 North Branch Portage River		
(CAS)	**Compound Detected**	**North Branch Portage River dst Poe Ditch RM 8.55**
PAHs:		
000056-55-3	Benz[a]anthracene	**1.81 ****
000050-32-8	Benzo[a]pyrene	**1.70 ****
000205-99-2	Benzo[b]fluoranthene	1.79
000191-24-2	Benzo[g,h,i]perylene	1.04
000207-08-9	Benzo[k]fluoranthene	1.17
000218-01-9	Chrysene	**2.00 ****
000206-44-0	Fluoranthene	**4.33 ****
000193-39-5	Indeno[1,2,3-cd]pyrene	1.20
000085-01-8	Phenanthrene	**2.71 ****
000129-00-0	Pyrene	**3.40 **J**
Total PAHs:		**21.15 ***

HUC 12 - 04100010-04-01 Sugar Creek		
(CAS)	**Compound Detected**	**Coon Creek at CR 32 Anderson Rd. RM 0.34**
000117-81-7	bis(2-Ethylhexyl)phthalate	0.99

HUC 12 - 04100010-05-02 Portage River below Sugar Ck to Lake Erie					
(CAS)	**Compound Detected**	**Portage River at Hyde Run Mix Zone RM 16.53**	**Portage River adj. SR 105 RM 14.02**	**Portage River at SR 19 RM 12.55**	**Portage River dst Oak Harbor WWTP RM 11.10**
000067-64-1	Acetone	-	0.09	-	-
PCBs:					
011096-82-5	PCB-1242 (ųg/kg)	151 UJ	171	239	81
Total PCBs:		**151 *UJ**	**171 ***	**239 ***	**81 ***

Equals or Exceeds the Consensus-Based Threshold Effect Concentration (TEC) below which harmful effects are unlikely to be observed (from MacDonald, et al. 2000).

****** Equals or Exceeds the Consensus-Based Probable Effect Concentration (PEC) above which harmful effects are likely to be observed (from MacDonald, et al. 2000).

PT - result is estimated because sample was not analyzed within the required holding time.

J - The analyte was positively identified, but the associated numerical result is estimated.
UJ - The analyte was not detected above the quantitation limit (QL), however the QL is estimated.

Table 15**.** Organic Compounds detected in sediment samples collected in 2008 (Otter Ck samples were collected in 2006) at 8 sites in selected Lake Erie tributaries. Units are mg/kg unless otherwise noted.

HUC 12 - 04100010-07-02 Crane Creek [includes Henry Ck.]		
(CAS)	**Compound Detected**	**Crane Creek at Hanley Rd. (west side of I-280) RM 18.82**
PAHs:		
000056-55-3	Benz[a]anthracene	**2.32 ****
000050-32-8	Benzo[a]pyrene	**2.16 ****
000205-99-2	Benzo[b]fluoranthene	2.56
000191-24-2	Benzo[g,h,i]perylene	1.69
000207-08-9	Benzo[k]fluoranthene	1.99
000218-01-9	Chrysene	**2.74 ****
000206-44-0	Fluoranthene	**4.41 ****
000193-39-5	Indeno[1,2,3-cd]pyrene	1.88
000085-01-8	Phenanthrene	**2.22 ****
000129-00-0	Pyrene	**3.44 ****
Total PAHs:		**25.41 ****
PCBs:		
011096-82-5	PCB-1260 (ųg/kg)	37.9 J
Total PCBs:		**37.9 J**

HUC 12 - 04100010-07-03 Cedar Creek [includes Reno Side Cut, Wards Canal] and L. Erie drainage between Reno Side Cut and Crane Ck.				
(CAS)	**Compound Detected**	**Cedar Creek at E. Broadway RM 17.32**	**Cedar Creek at Billman Rd. RM 9.59**	**Dry Creek at E. Broadway RM 7.00**
PAHs:				
000218-01-9	Chrysene	-	-	**0.86 ***
000206-44-0	Fluoranthene	**0.77 ***	**0.60 ***	**1.60 ***
000129-00-0	Pyrene	**0.68 ***	-	**1.30 ***
Total PAHs:		**1.45**	**0.60**	**3.76 ***

HUC 12 - 04100010-07-06 Lake Erie Drainage between Maumee R. and Berger Ditch [includes Otter Creek]					
(CAS)	**Compound Detected**	**Otter Ck at Oakdale Rd RM 6.00**	**Otter Ck at Consaul St RM 3.10**	**Otter Ck at Millard Rd RM 2.13**	**Otter Ck at CSX Bridge RM 0.50**
000072-54-8	4,4'-DDD (ųg/kg)	**21.4 ***	**16.6 ***	**34.3 ****	**16.0 ***
000072-55-9	4,4'-DDE (ųg/kg)	**21.3 ***	-	-	**16.1 ***
005103-74-2	Gamma-Chlordane (ųg/kg)	**9.6 ***	**11.6 ***	**24.9 ****	-
000117-81-7	bis(2-Ethylhexyl)phthalate	2.43	1.66	1.51	1.44
000106-44-5	3&4-Methylphenol	-	-	4.64	-
000091-57-6	2-Methylnaphthalene	-	-	-	0.95
PAHs:					
000120-12-7	Anthracene	-	**1.19 ****	-	-
000056-55-3	Benz[a]anthracene	**3.12 ****	**2.20 ****	**1.41 ****	**1.52 ****
000050-32-8	Benzo[a]pyrene	**3.79 ****	**2.91 ****	**1.49 ****	**1.93 ****
000205-99-2	Benzo[b]fluoranthene	4.48	3.85	1.76	2.44
000191-24-2	Benzo[g,h,i]perylene	3.63	2.76	1.18	2.03
000207-08-9	Benzo[k]fluoranthene	3.97	1.33		1.43
000218-01-9	Chrysene	**5.29 ****	**3.90 ****	**2.90 ****	**3.20 ****
000206-44-0	Fluoranthene	**9.60 ****	**5.17 ****	**2.22 ***	**3.05 ****
000193-39-5	Indeno[1,2,3-cd]pyrene	3.95	2.62	0.88	1.70
000085-01-8	Phenanthrene	**4.11 ****	**2.90 ****	**1.53 ****	**2.12 ****
000129-00-0	Pyrene	**7.57 ****	**6.07 ****	**4.35 ****	**3.71 ****
Total PAHs:		**49.51 ****	**34.90 ****	**17.72 ****	**23.13 ****
PCBs					
053469-21-9	PCB-1242 (ųg/kg)	92.0			
011097-69-1	PCB-1254 (ųg/kg)		105.0	1840	282
011096-82-5	PCB-1260 (ųg/kg)	64.7		172	46.2
Total PCBs:		**156.7 ***	**105.0 ***	**2012 ****	**328.2 ***

***** Equals or Exceeds the Consensus-Based Threshold Effect Concentration (TEC) below which harmful effects are unlikely to be observed (from MacDonald, et al. 2000).

****** Equals or Exceeds the Consensus-Based Probable Effect Concentration (PEC) above which harmful effects are likely to be observed (from MacDonald, et al. 2000).

J - The analyte was positively identified, but the associated numerical result is estimated.

Table 16. Organic Compounds detected in sediment samples collected in 2008 (Grassy Ck samples collected in 2006) at 4 sites in Selected Maumee Tributaries. Units are mg/kg unless otherwise noted.

HUC 12 - 04100009-09-02 Grassy Creek		
(CAS)	**Compound Detected**	**Grassy Ck at Glenwood Rd RM 0.98**
PAHs:		
000056-55-3	Benz[a]anthracene	**0.72 ***
000050-32-8	Benzo[a]pyrene	**0.82 ***
000205-99-2	Benzo[b]fluoranthene	1.12
000191-24-2	Benzo[g,h,i]perylene	0.77
000207-08-9	Benzo[k]fluoranthene	0.97
000218-01-9	Chrysene	**1.29 ****
000206-44-0	Fluoranthene	**2.59 ****
000193-39-5	Indeno[1,2,3-cd]pyrene	0.89
000085-01-8	Phenanthrene	**1.24 ****
000129-00-0	Pyrene	**1.89 ****
Total PAHs:		**12.30 ***

HUC 12 - 04100009-09-04 Maumee River below Grassy Cr. to Lake Erie [incl. Delaware Ck and Duck Ck; excl. Swan Ck]				
(CAS)	**Compound Detected**	**Duck Ck dst Burger St RM 4.00**	**Duck Ck at Consaul St RM 3.10**	**Duck Ck at York St. RM 2.52**
000085-68-7	Butylbenzylphthalate	-	1.05	-
000117-81-7	bis(2-Ethylhexyl)phthalate		1.31	1.07
PAHs:				
000083-32-9	Acenaphthene	-	-	1.24
000120-12-7	Anthracene	**2.46 ****	-	**2.87 ****
000056-55-3	Benz[a]anthracene	**9.40 ****	**4.44 ****	**7.08 ****
000050-32-8	Benzo[a]pyrene	**8.63 ****	**4.58 ****	**5.98 ****
000205-99-2	Benzo[b]fluoranthene	7.26	5.20	5.27
000191-24-2	Benzo[g,h,i]perylene	4.49	2.91	2.77
000207-08-9	Benzo[k]fluoranthene	8.45	4.43	5.37
000218-01-9	Chrysene	**8.62 ****	**5.86 ****	**6.89 ****
000132-64-9	Dibenzofuran	-	-	0.69
000206-44-0	Fluoranthene	**14.7 ****	**10.5 ****	**15.3 ****
000086-73-7	Fluorene	-	-	**1.07 ****
000193-39-5	Indeno[1,2,3-cd]pyrene	5.25	3.28	3.25
000085-01-8	Phenanthrene	**7.08 ****	**4.28 ****	**10.2 ****
000129-00-0	Pyrene	**12.2 ****	**8.57 ****	**11.8 ****
Total PAHs:		**88.54 ****	**54.05 ****	**79.78 ****
PCBs:				
011096-82-5	PCB-1260 (ųg/kg)	-	-	49.6
Total PCBs:		**-**	**-**	**49.6**

* Equals or Exceeds the Consensus-Based Threshold Effect Concentration (TEC) below which harmful effects are unlikely to be observed (from MacDonald, et al. 2000).

** Equals or Exceeds the Consensus-Based Probable Effect Concentration (PEC) above which harmful effects are likely to be observed (from MacDonald, et al. 2000).

Physical Habitat

Stream habitat was evaluated at 92 of the 93 fish sampling locations (Table 17 and Appendix G). Excellent stream habitat was noted at only one location, East Branch Portage River at Eagleville Road (RM 6.18). Good stream habitat was recorded at 22 sites (24%), fair habitat was noted at 22 locations (24%), poor habitat was documented at 38 locations (41%), and very poor habitat was documented at 9 locations (10%) (Table 17). The average QHEI score for the watershed was 45.2, towards the low end of the fair range. This low average score reflects the low habitat quality throughout the study area which is a direct result of extensive channel modifications.

Figure 42. As noted in the above picture, channel modifications for agricultural activities are impacting the water quality of the Portage River basin. This destroys habitat, limits the amount of pollution that streams can process, and increases the severity of flooding downstream.

Figure 43. Good habitat quality is present in larger drainage area streams, such as North Branch Portage River. Diverse substrates with low silt provide habitat for aquatic organisms and the dense riparian corridor assists with nutrient assimilation within the stream.

The Portage River mainstem had good to fair habitat quality at six locations, with poor to very poor habitat quality at four locations due to excessive silt from channel modifications and agricultural activities. Tributaries of the Portage River exhibited poor to very poor habitat quality at 47% of the sampling locations. Channel modifications from urban and agricultural activities resulted in excessively embedded substrates, high silt loads and often sparse instream cover and poor riparian corridor quality.

Within the Portage River watershed, 46 combined miles of South Branch Portage River and East Branch Portage River are proposed to be ‘cleaned’ through petition (Figure 51). Manipulation of streams for drainage purposes is often referred to as ‘cleaning’ by Ohio county officials and engineers as it involves removal of substrates, woody debris, logs, sinuosity, floodplain and vegetation from a stream and riparian area to increase the rate of drainage for agricultural purposes. Cleaning of streams results in monotonous, pool habitat with little instream cover or varied flow regime to support balanced fish communities (Figures 42 & 43). As shown in Figure 44, existing IBI scores correlated strongly with QHEI scores in both the South Branch and East Branch Portage River. Where habitat conditions are less than ideal, the fish community generally performs less than WWH expectations. Therefore, if the proposed cleaning alters the existing stream habitat quality, the fish community structure will also suffer.

Historical channelization activities provided evidence of the importance of habitat on fish community integrity. The headwaters of South Branch Portage River (RMs 24.77 and 22.58) have not recovered from past channelization activities, and had increased siltation which contributed to the respective non and partial attainment of WWH biocriteria noted. Further downstream, habitat quality improved with QHEI scores ranging from 60.5-71.0, and all sites within the lower reach were in full attainment of WWH biocriteria. Within East Branch Portage River, QHEI scores generally improved from a low score of 43.0 near Township Road 214 (RM 19.71) to a high score of 78.5 near Eagleville Road (RM 6.18) (Table 2). Channelization activities and siltation at the two upper most sites (RMs 19.17 and 16.10) contributed to the respective non and partial attainment of the biocriteria noted at these sites. While stream habitat quality improved downstream with QHEIs ranging from 47.5-78.5 (average 60.6), Fostoria's CSOs and WWTP contributed to non-attainment at RMs 18.4 and 18.7. If the proposed stream channelization and snagging goes forward, the impacts from Fostoria's CSOs and WWTP will likely extend further downstream. The stream will not be able to process the excess nutrient and organic enrichment as efficiently as occurred with the documented habitat conditions. The proposed stream cleaning will decrease habitat quality throughout both South Branch and East Branch Portage River, likely resulting in future poor fish community integrity and decreased stream habitat quality.

Only five of the nineteen Lake Erie tributaries sampling locations had fair to good habitat quality. Channelization through industrial areas resulted in poor to very poor habitat within Otter Creek. Henry Creek and Crane Creek had low habitat quality as a result of channel modifications within urbanizing areas. Channel modifications for agricultural practices resulted in increased siltation at the remaining Lake Erie tributaries sampling locations with poor to very poor habitat quality (Table 17 and Appendix G).

Three of the five Maumee River tributaries sampling locations exhibited fair to good habitat. However, the two sampling locations on Duck Creek had poor to very poor habitat as a result of excessive siltation. Channel modifications from the surrounding urbanized area contributed to the excessive siltation (Table 17 and Appendix G).

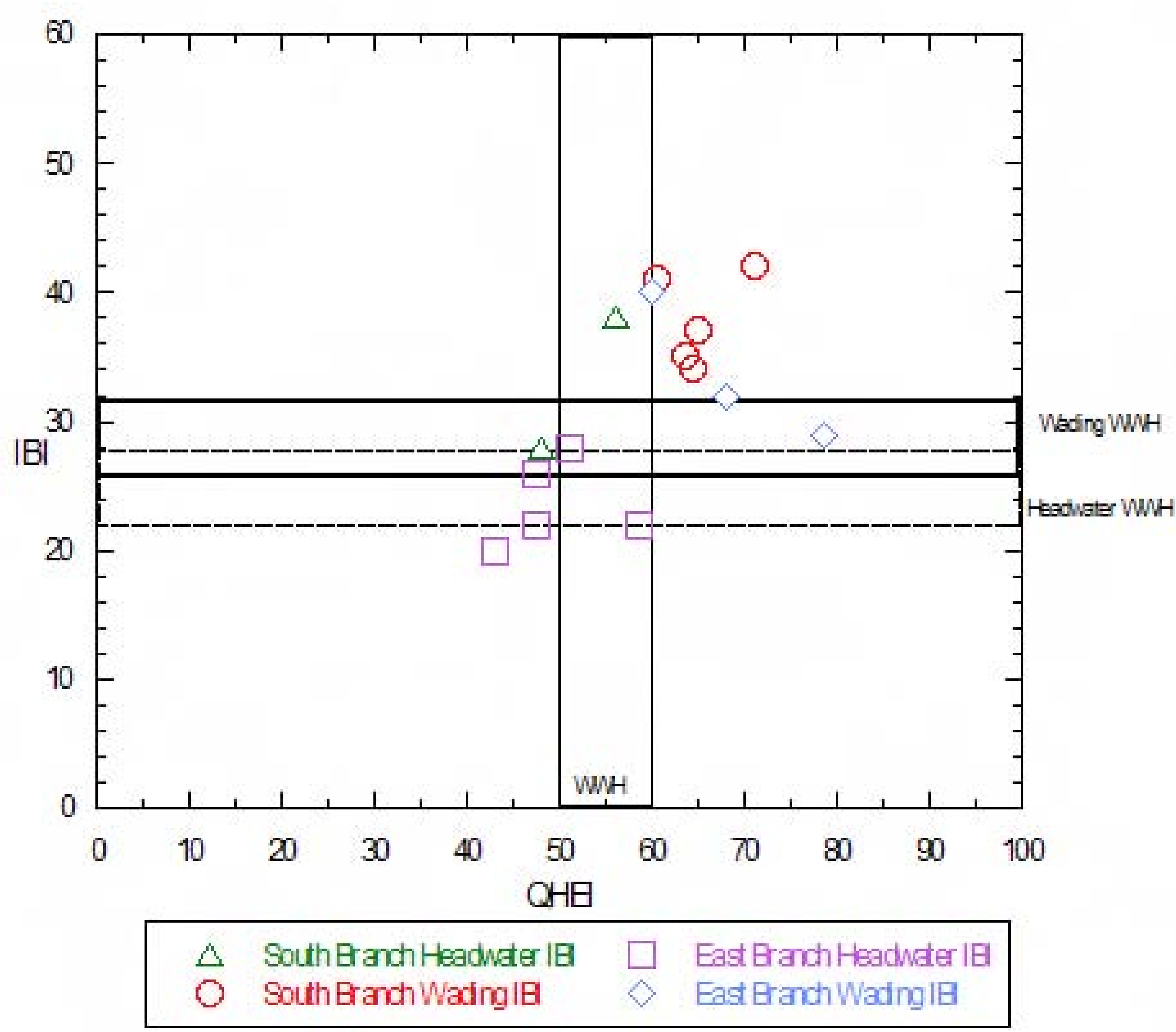

Figure 44. IBI scores versus QHEI scores for South Branch Portage River and East Branch Portage River, 2009.

Table 17. Stream physical habitat (QHEI) summarized results for the Portage River basin, select Lake Erie tributaries and select Maumee River tributaries, 2006-2008.

Stream	River Mile	Drainage (mi^2)	Location	QHEI	Comments
EXCELLENT					
East Branch Portage River	6.18	23.0	Eagleville Road	78.5	
GOOD					
Portage River	24.2	430.0	Upstream Ohio Turnpike	68.5	
Portage River	17.03	495.0	State Route 590	65.5	
South Branch Portage River	22.58	17.0	Township Road 218	56.0	Interstitial
South Branch Portage River	17.77	32.0	Stearns Road	64.5	
South Branch Portage River	14.43	34.0	Hall Road	63.5	
South Branch Portage River	8.35	54.0	Portage View Road	60.5	No riffle
South Branch Portage River	4.78	100.0	Greensburg Pike	65.0	
South Branch Portage River	0.50	110.0	Kenner Road	71.0	
East Branch Portage River	10.42	18.4	WWTP access road	58.5	Moderate/extensive embeddedness
East Branch Portage River	3.10	26.0	Cygnet Road	68.0	
East Branch Portage River	0.80	35.0	Bays Road	60.0	Moderate silt load/embedded substrates
Rocky Ford Creek	19.53	16.2	County Road 18	58.0	Moderate silt load/embedded substrates
Rocky Ford Creek	15.04	23	County Road 220	66.0	Extensively embedded substrates
Rocky Ford Creek	9.80	57	Upstream North Baltimore WWTP	70.5	Extensively embedded substrates
Bull Creek	3.89	19.0	Jerry City Road	56.5	Moderate silt load/embedded substrates
North Branch Portage River	0.08	59.0	River Road	64.5	
Sugar Creek	8.80	51.0	US 20	67.0	Riffle extensively embedded
Sugar Creek	3.65	56.0	Elmore-Eastern Road	64.5	Moderate silt load/embedded substrates
Sugar Creek	0.80	58.0	Hessville Road	69.0	Substrates extensively embedded
Crane Creek	15.38	19.9	Collins Road	55.0	Moderate silt load/embedded substrates
Grassy Creek	3.85	8.4	Buck Road	59.5	No riffle
Grassy Creek Diversion Channel	0.30	14.3	Grand Rapids Road	66.5	Extensively embedded substrates
FAIR					
Portage River	35.28	353.0	Bridge Street	53.0	Moderately embedded substrates
Portage River	32.10	418.0	US 23	54.0	Moderate/extensive embeddedness
Portage River	22.10	432.0	Downstream Elmore WWTP	48.5	Channel modification and no riffle
Portage River	15.70	496.0	Downstream Slemmer-Portage Road	47.5	Channel modification and no riffle
South Branch Portage River	24.77	7.0	County Road 109	48.0	Moderately heavy silt load
East Branch Portage River	19.17	9.4	Township Road 214	43.0	No riffle
East Branch Portage River	16.10	12.3	Township Road 217	47.5	No riffle
East Branch Portage River	12.47	15.3	County Road 226	51.0	Extensively embedded substrates
East Branch Portage River	9.60	18.7	Sterns Road	47.5	No riffle
Middle Branch Portage River	10.90	73.0	Rudolph Road	50.0	Moderately embedded substrates
Middle Branch Portage River	8.64	95.0	Solether Road	52.5	Channel modification and moderately embedded substrates
Middle Branch Portage River	0.55	224.0	Caskie Road	53.5	Channel modification
Needles Creek	5.14	17.0	State Route 18	44.5	Unstable banks
Needles Creek	1.25	32.0	Cygnet Road	45.5	Moderately embedded substrates
Trib to trib of Rocky Ford Creek RM 10.75 at RM 1.99	1.80	7.5	County Road 139	50.5	Moderately heavy silt load
Bull Creek	8.45	8.3	Huffman Road	43.5	Moderate/extensive embeddedness

Stream	River Mile	Drainage (mi^2)	Location	QHEI	Comments
Ninemile Creek	2.93	8.7	Dunmyer Road	43.5	Moderate silt load and embeddedness
Cedar Creek	20.77	12.1	Oregon Road	45.0	Moderately embedded substrates
Cedar Creek	9.59	38.0	Billman Road	51.5	Moderately embedded substrates
Dry Creek	0.01	13.8	At mouth	50.0	Moderately heavy silt load
Crane Creek	8.83	34.0	Martin-Willston Road	52.5	Moderately extensive embeddedness
Delaware Creek	0.38	2.5	Rohr Drive	45.0	No riffle and extensive silt and embedded substrates
POOR					
Portage River	28.08	429.0	US 20 gauge	42.5	Channel modification and no riffle
Portage River	12.55	516.0	Downstream State Route 19	38.5	Heavy silt load
Portage River	11.10	518.0	Downstream Oak Harbor WWTP	32.5	Heavy silt load
Middle Branch Portage River	15.32	64.0	Jerry City Road	30.0	Channel modification and no riffle
Middle Branch Portage River	3.45	216.0	Bloomdale Road	37.5	Channel modification and nearly absent instream cover
Needles Creek	8.35	11.0	Hancock-Wood County Road	30.5	Channel modification and no riffle
Rader Creek	10.92	7.3	County Road 203	37.5	Moderately embedded substrates and poor riparian quality
Rader Creek	5.20	18.1	Needles Road	35.0	Extensively embedded substrates and poor riparian quality
Rader Creek	0.80	32.0	Cygnet Road	40.5	Channel modification and moderately extensive embeddedness
Rocky Ford Creek	21.12	7.6	County Road 109	39.5	Extensively embedded substrates
Rocky Ford Creek	11.87	31.0	Township Road 114	42.0	Heavy silt load and extensive embeddedness
Rocky Ford Creek	5.10	66.0	Cygnet Road	35.0	Channel modification and no riffle
Rocky Ford Creek	1.59	72.0	Solether Road	46.0	Moderately embedded substrates and poor riparian quality
Trib to Rocky Ford Creek at RM 10.75	3.57	8.9	Township Road 112	41.5	Channel modification
Trib to Rocky Ford Creek at RM 10.75	2.00	18.7	County Road 139	39.0	Extensively embedded substrates and poor riparian quality
Bull Creek	0.64	29.8	Greensburg Pike	40.5	Moderately embedded substrates
North Branch Portage River	17.92	24.0	Rudolph Road	34.0	Hardpan and silt substrates with extensive embeddedness
North Branch Portage River	13.55	34.0	Linwood Road	43.0	No riffle and extensive embeddedness
North Branch Portage River	8.60	46.0	State Route 105	31.5	No riffle, silt substrates with extensive embeddedness
North Branch Portage River	6.55	48.0	Silverwood Road	38.0	No riffle, silt substrates with extensive embeddedness
Sugar Creek	21.31	12.0	Greensburg Pike	34.5	Channel modification and no riffle
Sugar Creek	18.50	17.0	US 6	38.5	Channel modification and extensively embedded substrates
Sugar Creek	13.38	35.0	Anderson Road	38.0	Extensively embedded substrates
Coon Creek	0.34	7.8	Anderson Road	30.5	Channel modification, no riffle and extensively embedded substrates
Wolf Creek	6.51	9.2	Yeasting Road	40.5	Heavy silt load and extensive embeddedness with no riffle
Little Portage River	6.20	21.0	County Road 169	33.0	Channel cleaned by community, no riffle and lack of instream cover
Little Portage River	1.79	30.0	County Road 17	43.5	Heavy silt and extensive invasive vegetation
Cedar Creek	17.32	18.5	East Broadway Road	33.0	Channel modification and moderately heavy silt load
Cedar Creek	14.50	23.0	LeMoyne Road	38.0	Heavy silt load and extensive embeddedness with no riffle
Wolf Creek/Williams Ditch	1.70	7.6	Yondota Road	31.0	Heavy silt load and extensive embeddedness with no riffle

Stream	River Mile	Drainage (mi^2)	Location	QHEI	Comments
Henry Creek	0.25	7.8	Bradner Road	34.0	Channel modification and extensive embedded substrates
Turtle Creek	11.62	21.0	Nissen Road	30.5	Channel modification with silt substrates, extensive embeddedness and no riffle
North Branch Turtle Creek	0.80	7.8	Opfer-Lentz Road	31.5	Moderately heavy silt load
South Branch Turtle Creek	2.65	10.6	Moline Road	39.5	Extensively embedded substrates
Wolf Ditch/Berger Ditch	2.70	7.8	Stadium Road	34.5	Heavy silt load and extensive embeddedness with no riffle
Otter Creek	2.13	6.6	Millard Road	30.0	Heavy silt load and extensive embeddedness with no riffle
Otter Creek	0.50	10000	Adjacent CSX Road near mouth	35.0	Heavy silt load and extensive embeddedness with no riffle
Duck Creek	3.10	0.6	Consaul Street	30.0	Heavy silt load and extensive embeddedness with no riffle
Very Poor					
Portage River	6.00	540.0	Upstream Little Portage River	26.0	Heavy silt load with little instream cover and very abundant invasive vegetation
North Branch Portage River	25.85	8.1	Jerry City Road	29.0	Channel modification, heavy silt load and extensive embeddedness with no riffle
North Branch Portage River	21.96	14.3	Mermill Road	25.5	Channel modification, heavy silt load and extensive embeddedness with no riffle
Ninemile Creek	5.00	7.8	Hessville Road	26.0	Channel modification
Dry Creek	7.00	8.2	East Broadway Road	26.5	Channel modification and heavy silt load with extensive embeddedness
Crane Creek	18.82	9.0	Hanley Road	29.5	Channel modification and heavy silt load with extensive embeddedness
Otter Creek	6.00	2.8	Oakland Avenue	23.0	Heavy silt load and extensive embeddedness with no riffle
Otter Creek	3.14	5.8	Yarrow Street/Consaul Street	25.5	Channel modification and heavy silt load with extensive embeddedness and no riffle
Duck Creek	2.52	0.8	York Street	22.0	Channel modification and heavy silt load with extensive embeddedness and no riffle

General narrative ranges assigned to QHEI scores.				
Narrative Rating		QHEI Range		
		Headwaters ($\leq$20 sq mi)	Larger Streams	Lacustuary
Excellent		$\geq$70	$\geq$75	$\geq$80
Good		55 to 69	60 to 74	60 to 80
Fair		43 to 54	45 to 59	45 to 59
Poor		30 to 42	30 to 44	30 to 44
Very Poor		<30	<30	<30

Fish Community

A total of 96,207 fish representing 66 species were collected from the study area between June 2006 and October 2008. Three very sensitive species were collected, though twelve tolerant species, often in high numbers, were also collected throughout the study area. Relative numbers and species collected per location are presented in Appendix H, and IBI and MIwb scores are presented in Appendix I. Sampling locations were evaluated using either Warmwater Habitat or Modified Warmwater Habitat biocriteria, according to the assigned or recommended aquatic life use designation. A summary of the fish data are presented in Table 18.

Portage River mainstem sites sampled during 2008 achieved the applicable WWH fish biocriteria at 7 of the 11 sites evaluated (64%). Three sites were partially achieving the biocriteria. One site was not achieving the WWH biocriteria, representing 9% of the mainstem sites. The mainstem site downstream of Elmore WWTP (RM 22.10) was in partially met the fish biocriteria with an IBI=35 and MIwb=6.5 (Table 18). The MIwb measures relative number, weight, and how evenly relative number and weight are distributed among species. The low MIwb score downstream of Elmore WWTP was a result of the predominance of rock bass which comprised 41.6% by number and 85.68% by weight of the fish community. The fish community within the lacustuary portion of the Portage River was in partial attainment near RMs 12.55 and 11.10, and in non-attainment near RM 6.0. The low percentage of top carnivores, between 4-14% at each site, along with only 1-2 cyprinid species per site contributed to the overall low IBI scores: 32, 36, and 26, respectively. The low MIwb score upstream of Little Portage River (RM 6.0) reflected the dominance of the fish community by carp, which comprised 74.01% of the fish community by weight.

Thirty-nine (87%) of the fish sites within the fifteen tributary streams of the Portage River were in full attainment and the remaining six (13%) of the fish sites were in non-attainment of the fish community biocriteria (Table 18). Two of the low fish community scores, East Branch Portage River RMs 10.42 and 9.6, reflected the organic enrichment from Fostoria's CSOs and WWTP with tolerant fish comprising 72-95%, respectively, of the fish community by number. Siltation from agricultural activities contributed to the low IBI scores at East Branch Portage River RM 19.17, Rocky Ford Creek RMs 21.1 and 19.5, and North Branch Portage River RM 25.85. Tolerant fish comprised between 86-95% of the fish community at each Rocky Ford Creek site and the East Branch Portage River site. Little Portage River RM 1.79 was a lacustuary site which received a lacustuary IBI=21 and MIwb=7.7 (Table 18). These poor to fair fish scores were reflective of the siltation and nutrient/organic enrichment attributed to the upstream agricultural land use. Top carnivores comprised only 9% of the fish community and no cyprinid species were collected (Appendix I).

Eleven (58%) of the nineteen fish sites on the ten Lake Erie tributary streams were in full attainment. Two of the fish communities were in partial attainment and the remaining six fish sites were in non-attainment of the fish biocriteria. The MIwb scores for Cedar Creek RMs 14.5 and 9.59 and Turtle Creek RM 11.62 were all below WWH expectations, with scores of 6.5, 5.9, and 5.6, respectively. The imbalance of the fish communities reflected in the low MIwbs were related to the dominance of the fish community by creek chub (38% by number, 44% by weight), and common shiner (27% by number and 17% by weight) at Cedar Creek RM 14.5 and by creek chub (24% by number, 50% by weight) and round goby (40% by number and 11% by weight) at Cedar Creek RM 9.59 and by bluntnose minnow (33% by number, 14% by weight), and creek chub (20% by number and 56% by weight) at Turtle Creek 11.62 (Appendix H). Excessive siltation from the surrounding agricultural activities and channelization were the primary cause and sources for the partial attainment at these sites. Low IBI scores at Dry Creek RM 7.0 (IBI=22) and South Branch Turtle Creek RM 2.65 (IBI=16) resulted in non-attainment of the fish biocriterion. No sensitive species were collected at either site and tolerant fish comprised between 68% and 97% of the fish collected at each site, respectively. Failing HSTS at both locations contributed to the impaired fish communities, though the surrounding agricultural landscape contributed increased siltation near Dry Creek RM 7.0. Otter Creek, the only MWH stream in the study area, had three of the four fish sites in non-attainment of the fish biocriterion. The fish community of Otter Creek at RMs 6.0 and 3.1 were dominated by tolerant species (99% and 94%, respectively), while the lacustuary site at RM 0.5 was dominated by tolerant species (57%) due to contaminated sediment and excessive siltation from the surrounding industrial landscape and landfills (Appendix I).

The fish communities of three of the five Maumee River tributaries (Grassy Creek, Grassy Creek Diversion, and Delaware Creek) were meeting WWH fish biocriterion, but both fish sites on Duck Creek (RMs 3.1 and 2.52) were in non-attainment of the fish biocriterion. The lowest IBI score possible is a 12, which was recorded at each of the Duck Creek fish sampling locations. The low score reflected the excessive siltation (>30 cm deep) throughout each zone attributed to the historical channelization and urban runoff within the area.

The intensive agricultural landscape throughout the Portage River basin and Lake Erie tributaries combined with occasional point sources such as failing HSTS, CSOs and WWTPs contributed to the overall impairments noted within the fish communities. Areas of industrial use, such as that surrounding Otter Creek, led to excessive siltation and sedimentation (much of which was contaminated with PCBs) which impaired the fish community. The urbanized landscape of the Maumee River tributaries led to the impaired fish communities with excessive siltation and sedimentation. Improvements with sewage treatments, both for HSTS and municipal WWTPs would assist in improving the fish community integrity throughout the areas affected, while encouragement of BMPs and decrease of channelization activities with increased planting of trees in riparian corridors would likely improve nearly all streams within the study area.

Trends

Since 1985, fish community sampling has occurred at various locations within the study area. Similar to many other areas sampled across the state of Ohio, water quality has generally improved over time. However, there are several areas where point sources are still a concern and nonpoint issues need to be addressed in order for full attainment of biocriteria expectations to occur.

The Portage River mainstem had been previously sampled in 1985, 1994, 2002, and 2003 before being most recently sampled in 2008 (Figure 45). The most thorough historical sampling, which occurred in 1994, indicated the fish community was exceeding WWH expectation in the headwaters until reaching Brush Wellman, where a slight drop in fish community scores were noted. Downstream of Brush Wellman, IBI and MIwb scores improved until impacts from siltation and nutrient enrichment from a combination of upstream agricultural sources, Brush Wellman and CSOs and WWTP issues from Oak Harbor were observed. In 2008, IBI and MIwb scores mirrored results in 1994, with a drop in scores downstream of Elmore WWTP (RM 22.1), within the Brush Wellman mix zone (RM 16.53), and upstream of Little Portage River (RM 6.0). During the summer of 2008, Woodville and Oak Harbor continued to have CSOs, and Elmore has a raw sewage bypass that will not be eliminated until 2013. However, specifically within the lacustuary portion of the river, IBI scores dropped below WWH at three locations from downstream State Route 19 (RM 12.55) to upstream Little Portage River (RM 6.0). In 1994, the only lacustuary IBI score below WWH expectations was near the Little Portage River (RM 5.6). Improvements addressing WWTP and CSO issues are needed within each municipality along the Portage River mainstem in order for the fish community to meet WWH expectations in the future.

The fish community of the East Branch Portage River headwaters (RM 19.17) was first sampled in 2008 and was impaired due to impacts from the adjacent row crop agriculture. However, significant improvement over historical sampling in 1988 and 1994 was noted throughout the remainder of the East Branch Portage River (Figure 46). In 1994, the only site meeting WWH expectations was at RM 0.8. The lack of proper sewage treatment at Fostoria WWTP in addition to the CSOs was partially responsible for the poor fish community performance in 1994, with historical channelization yielding heavily embedded substrates and low instream cover. In 2008, a dip in fish community performance was still noted within and downstream of Fostoria due to unresolved issues with the WWTP and CSOs. However, the quality of habitat had improved from an average QHEI score of 56.8 in 2008 compared to 46.9 in 1994. As mentioned in the 1994 report, “Natural recovery processes, if permitted to work, should result in habitat redevelopment which would be capable of supporting the relaxed biological criteria for the Huron-Erie Lake Plain ecoregion, even with QHEI scores less than 60.” (Ohio EPA, 1995). Though fish community attainment at nearly all sites on East Branch Portage River occurred in 2008, it is threatened by the proposed stream alterations discussed within the Habitat section of this document. If the project goes forward as proposed, it is likely that the fish community will revert to the lower quality present in 1994 and earlier.

The quality of the fish community of Rocky Ford Creek has improved over time, though agricultural activities, Van Buren Lake, and the North Baltimore sanitary system continue to cause degradation to the aquatic community (Figure 47). The headwaters of Rocky Ford Creek (RMs 21.12 and 19.53) showed evidence of channelization and siltation from the surrounding agricultural land use. The low quality habitat resulted in poor fish community scores in the headwaters. However, fish community scores generally increased in a downstream direction, with all of the lower sites meeting IBI and MIwb WWH biocriteria, which had not occurred with historical sampling. Improved habitat conditions are likely responsible for the improved fish community scores, as North Baltimore has just begun to address CSOs, though they may not be complete until 2017. The improved habitat conditions are natural recovery processes from recent channelization activities noted in 1994.

Lake Erie tributaries which have been sampled in the past include Cedar Creek, Dry Creek, Crane Creek, and Otter Creek. The fish community of Cedar Creek has improved greatly since 1994. Previously, IBI scores for Cedar Creek ranged between 18-22, and MIwb scores averaged 5.4, none of which met WWH expectations. IBI scores for 2008 ranged between 26-32 and MIwb scores averaged 6.2. All of the 2008 IBI scores met WWH expectations, and though the MIwb scores did not meet WWH criterion, the average 0.8 improvement in score reflects a more balanced fish community in 2008 than in 1994. Dry Creek, a tributary to Cedar Creek, improved from an average IB of 18 in 1993 to an average of 27 in 2008. Intensive agricultural land use continues to impact the aquatic communities of these streams.

Crane Creek also flows through areas with agriculture, but impacts were noted from run-off near the more urbanized area of Hanley Road (RM 18.82). Similar to Cedar Creek and Dry Creek, IBI scores improved from an average of 18.5 in 1993 to an average of 26.6 in 2008. Outreach regarding improved BMPs may help improve fish community scores in the future.

The urbanized and industrial landscape of Otter Creek has continually impacted the fish community over time. Similar to historical scores, sites between RMs 8.0 and 2.5 scored far below WWH expectations with IBI scores of 16 and 18 at RMs 6.0 and 3.1, respectively, in 2008. Scores have improved over time within the lacustuary portion of Otter Creek, with lacustuary IBI scores at RM 0.5 has increased from 4 to 12 to 36, respectively, from 1986, 1993 and 2008. However, the contaminated sediments and excessive siltation throughout Otter Creek need to be addressed before additional fish community improvement would likely be observed.

The fish community of Duck Creek was the only Maumee River tributary which had been sampled prior to 2008. The sampling in 2008 was only within the free flowing portion of the stream, at RMs 3.1 and 2.52. Both sites received an IBI score of 12 in 2008, which is the lowest possible score for free flowing streams. This was similar to historical sampling which included an IBI of 15 in 1986 and an IBI of 18 in 1997 at RM 2.4. The excessive siltation and sedimentation from the surrounding urban landscape will continue to impede attainment of WWH biocriterion for the fish community.

Table 18. Fish community summaries based on pulsed D.C. electrofishing sampling conducted by Ohio EPA in the Portage River basin, select Maumee River tributaries, and select Lake Erie tributaries from June 2006 – September 2008. Relative numbers and weight are per 1.0 km for boat sites and 0.3 km for wading and headwater sites.

Location	STORET (RM)[a]	Drain. (mi^2)	Fish Species Total	Relative number	Relative Weight	IBI	MIwb[b]	QHEI	Narrative Evaluation
Portage River (16-001)	**WWH Existing**								
Portage River - Bridge Street	S01S36 35.28	353.0[W]	19	1380.75	15.687	39	7.8	53	Good
Portage River – US 23	S01S12 32.1	418.0[W]	21	440.25	20.258	43	8.1	54	Good
Portage River – US 20 gauge	500510 28.08	429.0[W]	25	443.19	24.369	42	7.9	42.5	Good
Portage River – Upstream Ohio Turnpike	S02S20 24.2	430.0[W]	25	1480.5	57.619	36	9	68.5	Marginally Good
Portage River - Downstream Elmore WWTP	300581 22.1	432.0[W]	16	340.5	15.022	35	6.5*	48.5	Fair
Portage River - State Route 590	S02P08 17.03	495.0[W]	26	995.25	17.128	42	9	65.5	Good
Portage River – Brush Wellman Mix Zone	S02S03 16.53	496.0[W]	9	336	N/A	32	6.5	N/A	Fair
Portage River – Downstream Slemmer-Portage Road	S02S17 15.7	496.0[W]	27	787.5	25.777	38	8.5	47.5	Good
Portage River – Downstream State Route 19	S02P06 12.55	516.0[B]	24	399	97.025	32	9	38.5	Fair
Portage River – Downstream Oak Harbor WWTP	S02S14 11.1	518.0[B]	25	571	109.201	36	9.5	32.5	Fair
Portage River – Upstream Little Portage River	S99Q01 6	540.0[B]	21	262.67	54.864	26	6.9	26	Poor
South Branch Portage River (16-100) Tributary to Portage River at RM 40.84 - WWH Existing									
South Branch Portage River – County Road 109	S01K07 24.77	7.0[H]	13	1659.4	N/A	28	N/A	48	Fair
South Branch Portage River – Township Road 218	S01K06 22.58	17.0[H]	17	3616	N/A	38	N/A	56	Marginally Good

Location	STORET (RM)[a]	Drain. (mi²)	Fish Species Total	Relative number	Relative Weight	IBI	MIwb[b]	QHEI	Narrative Evaluation
South Branch Portage River – Stearns Road	S01K05 17.77	32.0[W]	17	911.25	9.615	34	7.1[ns]	64.5	Fair
South Branch Portage River – Hall Road	S01K04 14.43	34.0[W]	16	1584	10.504	35	7.6	63.5	Marginally Good
South Branch Portage River – Portage View Road	S01P10 8.35	54.0[W]	19	2137.5	22.747	41	8.2	60.5	Good
South Branch Portage River – Greensburg Pike	S01P14 4.78	100.0[W]	21	2672.21	28.619	37	9.1	65	Marginally Good
South Branch Portage River – Kenner Road	S01S19 0.5	110.0[W]	20	269.25	27.344	42	7.8	71	Marginally Good
East Branch Portage River (16-105) Tributary to South Branch Portage River at RM 7.87 – WWH Existing									
East Branch Portage River – Township Road 214	S01K21 19.17	9.4[H]	9	234	N/A	20*	N/A	43	Poor
East Branch Portage River – Township Road 217	300373 16.1	12.3[H]	11	718	N/A	26[ns]	N/A	47.5	Poor
East Branch Portage River – County Road 226	S01S30 12.47	15.3[H]	13	1590	N/A	28	N/A	51	Fair
East Branch Portage River – WWTP access road	S01P02 10.42	18.4[H]	15	634.5	N/A	22*	N/A	58.5	Poor
East Branch Portage River – Sterns Road	S01P03 9.6	18.7[H]	13	502.5	N/A	22*	N/A	47.5	Poor
East Branch Portage River – Eagleville Road	S01P05 6.18	23.0[W]	14	1777.5	11.281	29	6.9[ns]	78.5	Fair
East Branch Portage River – Cygnet Road	S01P07 3.1	26.0[W]	12	1941	11.669	32	7.2[ns]	68	Fair
East Branch Portage River – Bays Road	S01P09 0.8	35.0[W]	21	1186.5	21.164	40	8	60	Marginally Good
Middle Branch Portage River (16-101) Tributary to Portage River at RM 40.83 – WWH Existing									
Middle Branch Portage River - Jerry City Road	S01K09 15.32	64[W]	27	958.5	72.957	36	8.6	30	Marginally Good
Middle Branch Portage River -	201099	73[W]	23	1338	6.502	29	7.4	50	Fair

Location	STORET (RM)[a]	Drain. (mi²)	Fish Species Total	Relative number	Relative Weight	IBI	MIwb[b]	QHEI	Narrative Evaluation
Rudolph Road	10.9								
Middle Branch Portage River - Solether Road	S01S44 8.64	95 [W]	26	789.75	12.172	42	8.9	52.5	Good
Middle Branch Portage River - Bloomdale Road	S01K08 3.45	216 [W]	29	1164	24.752	44	9.1	37.5	Good
Middle Branch Portage River - Caskie Road	S99Q04 0.55	224 [W]	25	601.5	10.32	42	8.2	53.5	Good
Needles Creek (16-104) Tributary to Middle Branch Portage River at RM 15.50 – WWH Existing									
Needles Creek – Hancock-Wood County Road	S01S25 8.35	11.0 [H]	20	1358	N/A	34	N/A	30.5	Fair
Needles Creek – State Route 18	S01P30 (5.14)	17.0 [H]	13	2450.65	N/A	26[ns]	N/A	44.5	Poor
Needles Creek – Cygnet Road	S01S48 1.25	32.0 [W]	28	1692.75	18.788	38	8.7	45.5	Marginally Good
Rader Creek (16-111) Tributary to Middle Branch Portage River at RM 15.50 – Undesignated/Recommend WWH									
Rader Creek – County Road 203	S01S26 10.92	7.3 [H]	20	2330	N/A	46	N/A	37.5	Good
Rader Creek – Needles Road	S01S24 5.2	18.1 [H]	17	2128	N/A	38	N/A	35	Fair
Rader Creek – Cygnet Road	201109 0.8	32 [W]	26	1677	13.657	39	8.7	40.5	Fair
Rocky Ford Creek (16-103) Tributary to Middle Branch Portage River at RM 8.23 – WWH Existing									
Rocky Ford Creek – County Road 109	S01K12 21.12	7.6 [H]	6	1146	N/A	18*	N/A	39.5	Poor
Rocky Ford Creek – County Road 18	S01K11 19.53	16.2 [H]	9	1560	N/A	22*	N/A	58	Poor
Rocky Ford Creek – County Road 220	S01S06 15.04	23 [W]	24	955.5	17.942	36	7.8	66	Marginally Good
Rocky Ford Creek – Township Road 114	S01S05 11.87	31 [W]	21	706.5	5.665	30	7.0[ns]	42	Fair

Location	STORET (RM)[a]	Drain. (mi²)	Fish Species Total	Relative number	Relative Weight	IBI	MIwb[b]	QHEI	Narrative Evaluation
Rocky Ford Creek – Upstream North Baltimore WWTP	S01S04 9.8	57 [W]	28	1055.25	16.021	44	8.7	70.5	Good
Rocky Ford Creek – Cygnet Road	S01P28 5.1	66 [W]	27	783.75	28.415	35	7.6	35	Fair
Rocky Ford Creek – Solether Road	300372 1.59	72 [W]	25	1414.5	14.075	39	9	46	Marginally Good
Tributary to Rocky Ford Creek at RM 10.75 (16-112) Existing LRW/Recommend WWH									
Tributary to Rocky Ford Creek at RM 10.75 – Township Road 112	S01K13 3.57	8.9 [H]	14	3074	N/A	38	N/A	41.5	Marginally Good
Tributary to Rocky Ford Creek at RM 10.75 – County Road 139	201105 2	18.7 [H]	20	2032	N/A	38	N/A	39	Marginally Good
Tributary to a tributary of Rocky Ford Creek RM 10.75 at RM 1.99 (16-113) Existing LRW/Recommend WWH									
Tributary to a tributary of Rocky Ford Creek RM 10.75 at RM 1.99 – County Road 139	201106 1.8	7.5 [H]	13	856	N/A	34	N/A	50.5	Fair
Bull Creek (16-102) Tributary to Middle Branch Portage River at 6.1 – WWH Existing									
Bull Creek – Huffman Road	S99Q05 8.45	8.3 [H]	15	2498	N/A	34	N/A	43.5	Fair
Bull Creek – Jerry City Road	S01K10 3.89	19.0 [H]	20	4360	N/A	42	N/A	56.5	Marginally Good
Bull Creek – Greensburg Pike	S01S45 0.64	29.8 [W]	26	2179.5	10.738	38	9.1	40.5	Marginally Good
North Branch Portage River (16-007) Tributary to Portage River at RM 35.31 – WWH Existing									
North Branch Portage River - Jerry City Road	S01K03 25.85	8.1 [H]	7	84	N/A	<u>22*</u>	N/A	29	Poor
North Branch Portage River - Mermill Road	S01K02 21.96	14.3 [H]	17	1082	N/A	34	N/A	25.5	Fair
North Branch Portage River – Rudolph Road	S01S40 17.92	24.0 [W]	23	1388	8.087	31	7.5	34	Fair
North Branch Portage River -	S01S11	34.0 [W]	15	263.25	4.022	41	6.8[ns]	43	Fair

Location	STORET (RM)[a]	Drain. (mi²)	Fish Species Total	Relative number	Relative Weight	IBI	MIwb[b]	QHEI	Narrative Evaluation
Linwood Road	13.55								
North Branch Portage River - State Route 105	S01K01 8.6	46.0[W]	14	342	6.734	35	6.4*	31.5	Fair
North Branch Portage River – Silverwood Road	S01S10 6.55	48.0[W]	22	669	53.695	35	7.9	38	Marginally Good
North Branch Portage River – River Road	500520 0.08	59.0[W]	13	1602.75	13.771	38	7.0[ns]	64.5	Fair
Sugar Creek (16-006) Tributary to Portage River at RM 17.5 – WWH Existing									
Sugar Creek - Greensburg Pike	S02K05 21.31	12.0[H]	13	1092	N/A	30	N/A	34.5	Fair
Sugar Creek – US 6	201092 18.5	17.0[H]	15	2046	N/A	32	N/A	38.5	Fair
Sugar Creek – Anderson Road	S02S26 13.38	35.0[W]	20	2092.75	14.968	35	8.7	38	Fair
Sugar Creek – US 20	S02S25 8.8	51.0[W]	15	787.5	4.407	42	7.2[ns]	67	Fair
Sugar Creek – Elmore-Eastern Road	S02P01 3.65	56.0[W]	29	549.75	11.055	49	8	64.5	Good
Sugar Creek – Hessville Road	300371 0.8	58.0[W]	23	280.5	9.032	42	7.2[ns]	69	Fair
Coon Creek (16-012) Tributary to Sugar Creek at RM 12.4 – Undesignated /Recommend WWH									
Coon Creek – Anderson Road	S02K06 0.34	7.8[H]	14	292	N/A	28	N/A	30.5	Fair
Wolf Creek (16-005) Tributary to Portage River at RM 13.82 – WWH Existing									
Wolf Creek – Yeasting Road	S02K04 6.51	9.2[H]	14	602	N/A	30	N/A	40.5	Fair
Little Portage River (16-002) Tributary to Portage River at RM 5.5 – WWH Existing									
Little Portage River – County Road 169	S02P04 6.2	21[W]	29	1164	18.722	31	7.1[ns]	33	Fair
Little Portage River – County	S02S23	30[B]	16	486	57.979	21	7.1	43.5	Poor

Location	STORET (RM)[a]	Drain. (mi²)	Fish Species Total	Relative number	Relative Weight	IBI	MIwb[b]	QHEI	Narrative Evaluation
Road 17	1.79								
Ninemile Creek (16-003) Tributary to Little Portage River at RM 9.10 – WWH Existing									
Ninemile Creek – Hessville Road	S02K02 5	7.8 H	9	1446	N/A	24[NS]	N/A	26	Poor
Ninemile Creek – Dunmyer Road	S02K01 2.93	8.7 H	14	2614	N/A	30	N/A	43.5	Fair
Cedar Creek (16-202) Tributary to Lake Erie – WWH Existing									
Cedar Creek – Oregon Road	S03S34 20.77	12.1 H	17	3666	N/A	30	N/A	45	Fair
Cedar Creek – East Broadway Road	S03S60 17.32	18.5 H	17	4648	N/A	26[NS]	N/A	33	Poor
Cedar Creek – LeMoyne Road	S03S46 14.5	23 W	18	966	11.53	32	6.5*	38	Fair
Cedar Creek – Billman Road	S03S44 9.59	38 W	18	684.75	7.192	28	5.9*	51.5	Fair
Dry Creek (16-203) Tributary to Cedar Creek at RM 9.58 – WWH Existing									
Dry Creek – East Broadway Road	S03S68 7	8.2 H	11	560	N/A	22*	N/A	26.5	Poor
Dry Creek – at mouth	S03S48 0.01	13.8 H	14	760	N/A	32	N/A	50	Fair
Wolf Creek/Williams Ditch (16-223) Tributary to Cedar Creek at RM .01 – LRW Existing/ Recommend WWH									
Wolf Creek/Williams Ditch – Yondota Road	201144 1.7	7.6 B	20	796	62.357	30	N/A	31	Poor
Crane Creek (16-205) Tributary to Lake Erie – WWH Existing									
Crane Creek – Hanley Road	S03P21 18.82	9.0 H	12	954	N/A	24[ns]	N/A	29.5	Poor
Crane Creek – Collins Road	S03K02 15.38	19.9 H	16	802.5	N/A	28	N/A	55	Fair
Crane Creek – Martin-Willston Road	S03G21 8.83	34.0 W	21	1815	17.485	28	7.1[NS]	52.5	Fair

Location	STORET (RM)[a]	Drain. (mi²)	Fish Species Total	Relative number	Relative Weight	IBI	MIwb[b]	QHEI	Narrative Evaluation
Henry Creek (16-208) Tributary to Crane Creek at RM 15.55 – WWH Existing									
Henry Creek – Bradner Road	201118 0.25	7.8 H	14	1478	N/A	28	N/A	34	Fair
Turtle Creek (16-210) Tributary to Lake Erie – WWH Existing									
Turtle Creek – Nissen Road	S03K05 11.62	21.0 W	19	1470.75	10.641	24 ns	5.6*	30.5	Poor
North Branch Turtle Creek (16-211) Tributary to Turtle Creek at RM 11.95 – WWH Existing									
North Branch Turtle Creek – Opfer-Lentz Road	201124 0.8	7.8 H	8	816	N/A	28	N/A	31.5	Fair
South Branch Turtle Creek (16-212) Tributary to Turtle Creek at RM 11.96 – WWH Existing									
South Branch Turtle Creek – Moline Road	S03K07 2.65	10.6 H	6	75 752	N/A	16*	N/A	39.5	Very Poor
Wolf Ditch/Berger Ditch (16-201) Tributary to Lake Erie – Undesignated / Recommend WWH									
Wolf Ditch/Berger Ditch – Stadium Road	201111 2.7	7.8 H	14	368	N/A	34	N/A	34.5	Fair
Otter Creek (16-200) Tributary to Lake Erie – MWH Existing									
Otter Creek – Oakdale Avenue	S03P12 6	2.8 H	4	218	N/A	16*	N/A	23	Very Poor
Otter Creek – Yarrow Street / Consaul Street	S03P08 (3.1/3.0)	5.8 H	7	198	N/A	18*	N/A	25.5	Poor
Otter Creek – Millard Road	S03P05 (2.2/2.1)	6.6 H	8	54	N/A	28	N/A	30	Fair
Otter Creek – Adjacent CSX Road near mouth	S03S25 (0.5)	7.4 B	27	632	40.257	36	8.0	35	Fair
Duck Creek (04-002) Tributary to Maumee River at RM 0.7 - WWH Existing									
Duck Creek – Consaul Street	P11K22 3.1	0.6 H	3	10	N/A	12*	N/A	30	Very Poor
Duck Creek – York Street	P11S56 2.52	0.8 H	4	57	N/A	12*	N/A	22	Very Poor
Grassy Creek (04-012) Tributary to Maumee River at RM 9.6 - WWH Existing									

Location	STORET (RM)[a]	Drain. (mi²)	Fish Species Total	Relative number	Relative Weight	IBI	MIwb[b]	QHEI	Narrative Evaluation
Grassy Creek – Buck Road	P11Q07 (3.9/3.8)	8.4 [H]	11	380	N/A	24[ns]	N/A	59.5	Poor
Grassy Creek Diversion (04-086) Tributary to Maumee River at RM 17.1 - Undesignated / Recommend WWH									
Grassy Creek Diversion – Grand Rapids Road	P11K19 0.3	14.3 [H]	20	276	N/A	40	N/A	66.5	Good
Delaware Creek (04-011) Tributary to Maumee River at RM 9.2 - WWH Existing									
Delaware Creek – Rohr Drive	P11A07 (0.3/0.4)	2.5 [H]	8	70	N/A	26[ns]	N/A	45	Poor

a - Results not used in the attainment status due to short sampling distance.
ns - Nonsignificant departure from biocriterion (≤4 IBI or ICI units; ≤0.5 MIwb units).
* - Significant departure from biocriterion (>4 IBI or ICI units; >0.5 MIwb units). Poor and very poor results are underlined.

	Biological Criteria							Lacustuary Benchmarks[1]				
	Eastern Corn Belt Plains			Huron Erie Lake Plain								
Index – Site Type	**EWH**	**WWH**	**MWH**	**EWH**	**WWH**	**MWH**	**LRW**	**Exceptional**	**Good**	**Fair**	**Poor**	**Very Poor**
IBI – Headwaters	50	40	24	50	28	20	18	N/A	N/A	N/A	N/A	N/A
IBI – Wading	50	40	24	50	32	22	18	N/A	N/A	N/A	N/A	N/A
IBI – Boat	48	42	24	48	34	20	16	50	42	31	17	<17
MIwb – Wading	9.4	8.3	6.2	9.4	7.3	5.6	4.5	N/A	N/A	N/A	N/A	N/A
MIwb – Boat	9.6	8.5	5.8	9.6	8.6	5.7	5.0	10	8.6	5.6	5.1	<5.1

1- Proposed Lacustuary scoring breakpoints. These have not yet been adopted into rule.

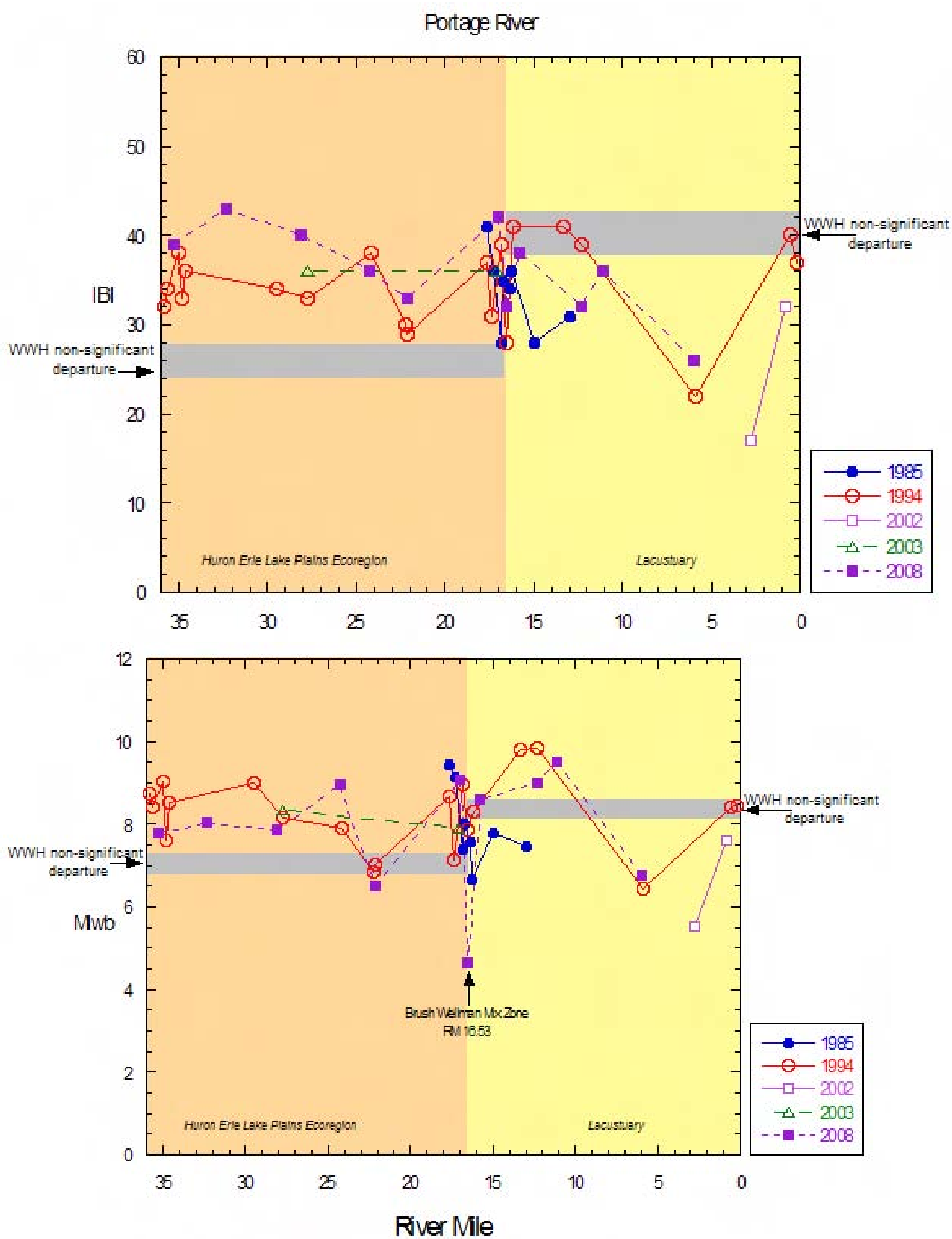

Figure 45. IBI and MIwb scores for the Portage River mainstem, 1985, 1994, 2002, 2003, and 2008.

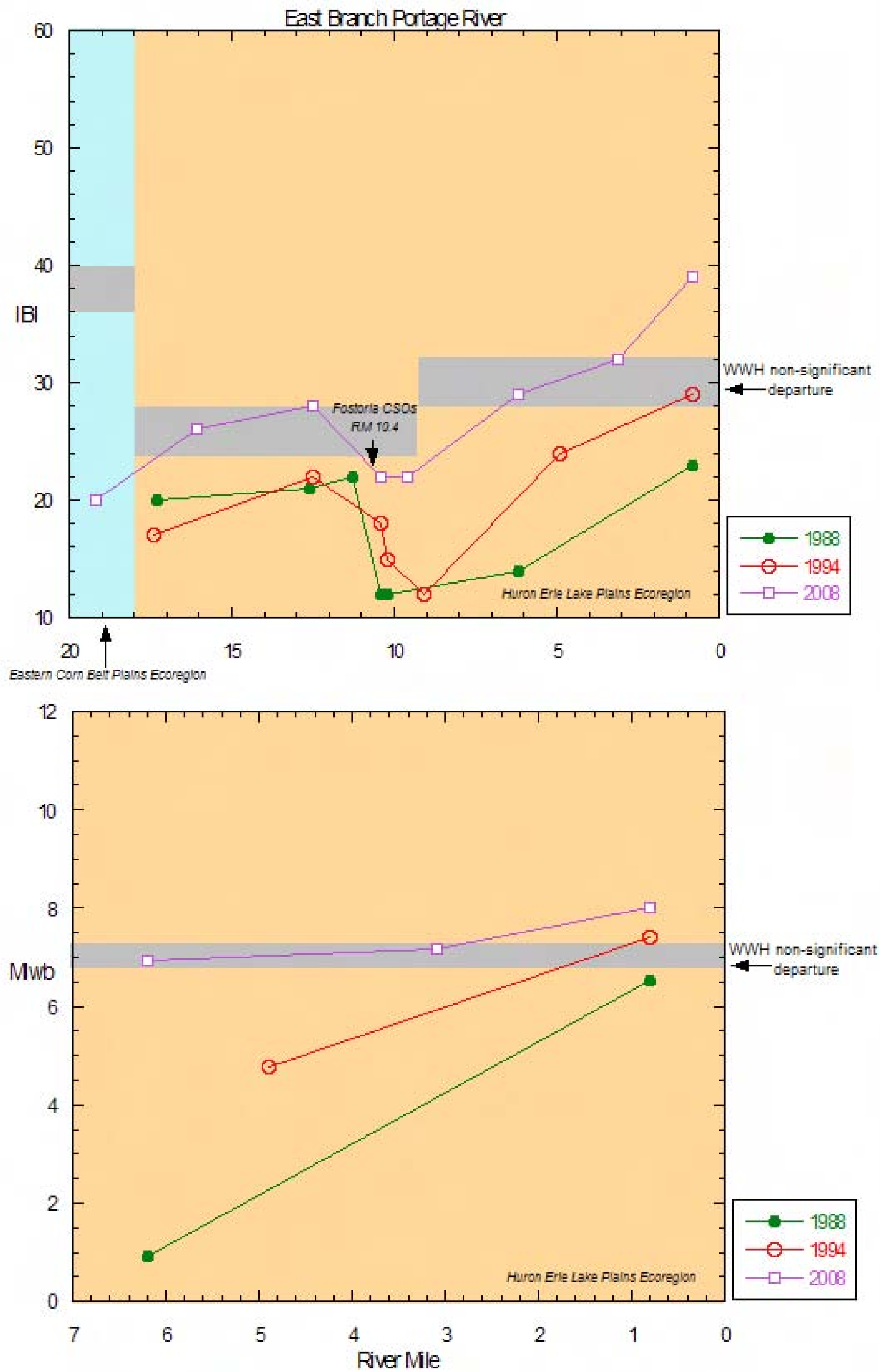

Figure 46. East Branch Portage River IBI and MIwb scores for 1988, 1994, and 2008. MIwb is not applicable to streams <20 mi^2 drainage area.

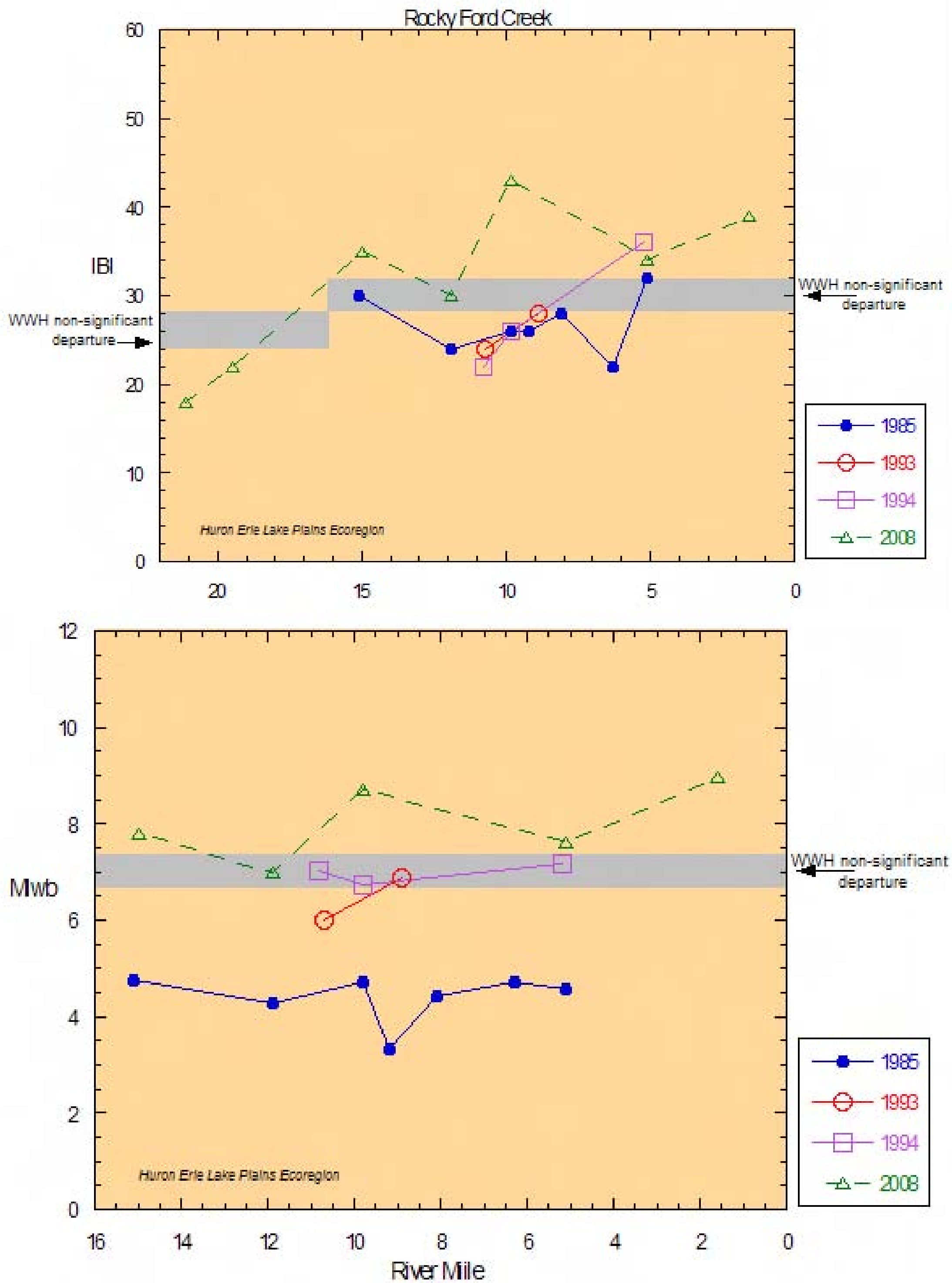

Figure 47. Rocky Ford Creek IBI and MIwb scores for 1985, 1993, 1994, and 2008. MIwb is not applicable for site <20mi^2 drainage area.

Macroinvertebrate Communities

Macroinvertebrate communities were evaluated at 91 stations in the Portage River, select Lake Erie tributaries, and select Maumee River tributaries study areas (Table 19, Appendices J and K). The community performance was evaluated as exceptional at four stations, very good at eight, good at 17, marginally good at 16, fair at 30, poor at 11, and very poor at five stations. The station with the highest total mayfly (Ephemeroptera), stonefly (Plecoptera), and caddisfly (Trichoptera) taxa richness (EPT) was on Middle Branch Portage River at Caskie Road (RM 0.55) with 26 taxa. The station with the highest number of total sensitive taxa was on Portage River at SR 590 (RM 17.03) with 37 taxa. The only uncommonly collected sensitive taxon (excluding the freshwater mussels) found in this study area was the caddisfly *Protoptila sp.* collected from the Portage River at RM 17.03. Thirteen species of freshwater mussels (Unionidae) were collected live or fresh-dead from the Portage River watershed (Table 20). State listed species collected in this watershed were *Truncilla donaciformis* (Fawnsfoot-Threatened Species) from the Portage River, *Truncilla truncata* (Deertoe-Species of Concern) from the Portage River and Middle Branch Portage River, and *Uniomerus tetralasmus* (Pondhorn-Threatened Species) from the North Branch Portage River. Only two species of freshwater mussels were collected from the Lake Erie tributaries. One of the Maumee River tributaries (Grassy Creek Diversion) was inhabited by four species of freshwater mussels including the state listed *Lasmigona compressa* (Creek Heelsplitter-Species of Concern). Watters et al. (2009) presented historic records for 21 species of freshwater mussels in the Portage River watershed. All records not found in this study (except two) were old records (before 1980) and those species may be extirpated from the watershed (a total of seven species). The collection of *Uniomerus tetralasmus* during this study was the first time that species was recorded in the Portage River watershed.

Portage River

Macroinvertebrate communities collected from the free-flowing portion of the Portage River were evaluated as good to exceptional (Figure 48, Table 19). Ten species of freshwater mussels were found to be extant in the Portage River during this study (Table 20) including the state threatened species *Truncilla donaciformis* (Fawnsfoot) and the state species of concern *Truncilla truncata* (Deertoe). Indications of mild impact to the macroinvertebrate communities included high organism density at RM 35.28 (3794 organism/ft^2); high relative abundance of flatworms at RMs 35.28, 32.1, 24.8, and 22.1; and high percentage of the ICI metric Other Diptera and Non-Insects at RMs 35.28 (55.4%), 27.4 (52.7%), 22.1 (65.0%), and 15.7 (46.6%). Excessive algal growth was observed at RMs 35.28, 24.8, and 15.7 which was an indication of nutrient enrichment. Siltation was observed at most sites which was a potential impact to community health. There were declines in EPT and sensitive taxa diversities and ICI scores downstream from the Woodvillle WWTP (RM 27.22), Elmore WWTP (RM 22.15), and Brush Wellman (RM 16.54). However, the general composition of the community downstream from the Woodville WWTP did not change substantially, the sampling locations downstream from the Elmore WWTP and Brush Wellman were limited by lack of riffle and strong run habitats, and the station downstream from Brush Wellman was starting to be affected by the upstream most reach of the lacustuary. No significant impact was attributed to these dischargers. The community collected from the Brush Wellman mixing zone (RM 16.53) was evaluated as good and did not exhibit significant indications of toxicity. The communities sampled in the lacustuary were all performing below expectations. The communities were characterized by low diversity and high numbers of the tolerant midges *Glyptotendipes* and *Dicrotendipes simpsoni*. No significant impact was evident from the Oak Harbor WWTP which discharges at RM 12.03.

South Branch Portage River

Macroinvertebrate communities collected from the headwaters (RMs 24.77, 22.58) of South Branch Portage River were not meeting WWH expectations and were characterized by low EPT (1-4) and sensitive taxa (4-5) diversity, and predominance of facultative and tolerant taxa. Community performance at downstream stations demonstrated moderate improvement in diversity (5-9 EPT, 6-9 sensitive taxa) with substantial improvement (16 EPT, 23 sensitive taxa) at the downstream most site at Kemner Road (RM 0.5). Stream habitat alterations and siltation were observed impacts to community health in this stream.

East Branch Portage River

Macroinvertebrate communities collected upstream from Fostoria were not or marginally meeting WWH expectations (Figure 49, Table 19). Organic and nutrient enrichment, siltation, and low flow alterations impaired the communities. Community performance declined to the low fair range at the station (RM 10.42) just upstream from the Fostoria WWTP discharge (RM 10.20). This station receives urban runoff and CSO discharges from Fostoria. As mentioned in the Sediment Quality section, a determination of contaminant sources should be undertaken within Fostoria to improve water quality. Community performance downstream (RM 9.6) from the Fostoria WWTP declined into the poor range due to the WWTP discharge. This was the only station in this stream where no mayflies or sensitive taxa were collected. The EPT and sensitive taxa diversity at downstream communities improved to conditions comparable to upstream from Fostoria. However, the ICI scored in the very good range at these stations due to high relative abundances of facultative taxa of mayflies and caddisflies and relatively low abundances of tolerant taxa.

Middle Branch Portage River

Macroinvertebrate communities sampled in the Middle Branch Portage River were evaluated as marginally good to exceptional. Eight species of freshwater mussels were found to be extant in the Middle Branch Portage River during this study (Table 20) including the state species of concern *Truncilla truncata* (Deertoe). Potential impacts to the biotic integrity of this stream were habitat alterations, siltation, organic enrichment immediately downstream from the Rudolph Road bridge (RM 10.9), high water temperatures (32°C at RM 10.9 on 3 September, 30°C at RM 8.6 on 3 September, 31°C at RM 3.45 on 28 July) and organic enrichment from dumped soybeans at the Solether Road bridge (RM 8.64).

Rocky Ford Creek
Macroinvertebrate communities sampled in Rocky Ford Creek were generally not meeting expectations and were characterized by low EPT (3-9) and sensitive taxa (3-8) diversity and predominance of primarily facultative and tolerant taxa. Observed impairments to the biotic integrity of this stream were habitat alterations, siltation, and low flow (at RMs 15.04, 9.8). The community improved into the good range at Solether Road (RM 1.59) with increased EPT (18) and sensitive taxa (17) diversity; however, relatively high abundance of tolerant taxa (14.6%) was an indication of continuous impact. The two unnamed tributaries sampled were supporting communities that were marginally meeting or meeting WWH expectations with EPT diversity ranging from 10 to 19 and sensitive taxa diversity from 6 to 12. Potential impacts to their biotic integrity were habitat alteration and siltation.

Tributaries to Middle Branch Portage River
The macroinvertebrate communities collected from Needles Creek were not (RMs 8.35, and 1.25) or marginally (RM 5.14) meeting WWH expectations and were characterized by low EPT (7-10) and sensitive taxa (3-11) diversity and predominance of primarily facultative taxa. Seven species of freshwater mussels were found to be extant at the downstream station (RM 1.25) during this study (Table 20). Observed impairments to the biotic integrity of this stream were low flow alterations, habitat alterations, and siltation.

The macroinvertebrate community collected from the headwaters of Rader Creek (RM 10.92) was not meeting WWH expectations with low EPT (6) and sensitive taxa (1) diversity and predominance of primarily facultative taxa. Observed impairments to this station were attributed to the McComb Village WWTP (discharges into Algire Creek), channelization, siltation, and possibly low flow. Communities improved at downstream stations into the marginally good range with increased EPT (12-13) and sensitive taxa (7-16) diversity. Six species of freshwater mussels were found to be extant at the downstream station (RM 0.8) during this study (Table 20).

The macroinvertebrate community collected from the headwaters of Bull Creek (RM 8.45) was not meeting WWH expectations with low EPT (8) and sensitive taxa (8) diversity and predominance of primarily facultative taxa. Observed impairments to this station were habitat alteration, and siltation. Communities improved at downstream stations into the good range with increased EPT (15-16) and sensitive taxa (12-17) diversity. Six species of freshwater mussels were found to be extant at the downstream station (RM 0.64) during this study (Table 20).

The upstream stations on Needles Creek (RM 8.35) and Bull Creek (RM 8.45) were supposedly engineered to be two-stage stream channels. This channel design is supposed to create a wider channel that allows the stream room to form some sinuosity and have "benches" on the sides of the stream for the deposition of sediments. The stream channels observed at these two stations appeared to be wholly inadequate in terms of channel width and constructed benches to provide aquatic life use benefits. This view is supported by the substandard macroinvertebrate community performance at these stations.

North Branch Portage River

The macroinvertebrate communities collected from the North Branch Portage River were characterized by low EPT (1-11) and sensitive taxa (1-10) diversity and predominance of primarily facultative taxa. Observed impairments to the biotic integrity of this stream were nutrients, habitat alteration, and siltation. The Bowling Green WWTP discharges into Poe Ditch, which joins with the North Branch at RM 8.56. There was no discernable impact to the macroinvertebrate community from the Bowling Green WWTP two miles downstream (RM 6.55) from the confluence of Poe Ditch.

Other Tributaries to the Portage River

The macroinvertebrate communities collected from Sugar Creek were generally meeting WWH expectations and were characterized by moderate EPT (10-15) and low to moderate sensitive taxa (9-17) diversity. Five species of freshwater mussels were found to be extant at the Elmore-Eastern Road station (RM 3.65) during this study (Table 20). However, the low sensitive taxa (9-13) diversity at four of the six stations and the predominance of primarily facultative taxa at the majority of stations were indications of mild to moderate impact to the biotic integrity of this community. Potential impacts to the biotic integrity of this stream were habitat alteration, siltation, and nutrient enrichment.

Macroinvertebrate communities collected from Coon Creek, Wolf Creek, Little Portage River, and Ninemile Creek were not meeting WWH expectations and were characterized by low EPT (2-5) and sensitive taxa (0-10) diversity. Impairments to the biotic integrity of these streams included habitat alteration, siltation, and nutrient enrichment. The downstream station on Little Portage River (RM 1.79) was a Lake Erie lacustuary and was likely impacted by siltation and nutrient enrichment.

Lake Erie Tributaries

Macroinvertebrate communities collected from Cedar Creek and Dry Creek were characterized by low EPT (5-11) and sensitive taxa (3-8) diversity and predominance of primarily facultative taxa. The ICI score at the downstream station on Cedar Creek (RM 9.59) was within WWH expectations primarily due to high diversity of midges and relatively high abundance of Tanytarsini midges. Another indication that this station was moderately impacted was that no sensitive mayflies or caddisflies were collected from the natural or artificial substrates. Impairments to the biotic integrity of these streams were attributed to siltation in both streams and organic/nutrient enrichment and low dissolved oxygen levels in Dry Creek.

Macroinvertebrate communities collected from Crane Creek and Henry Creek were characterized by low EPT (3-9) and sensitive taxa (1-5) diversity and predominance of primarily facultative taxa. The ICI score at the downstream station on Crane Creek (RM 8.83) was within WWH expectations primarily due to high diversity of midges and relatively high abundance of Tanytarsini midges. The primary impairment to the biotic integrity of these streams was siltation.

Macroinvertebrate communities collected from Turtle Creek, North Branch Turtle Creek, and South Branch Turtle Creek were not meeting WWH expectations and were characterized by low EPT (4-9) and sensitive taxa (2-6) diversity and predominance of primarily facultative taxa. Observed impairments to the biotic integrity of these streams were siltation, habitat alteration, and organic/nutrient enrichment.

The macroinvertebrate community collected from Wolf Ditch/Berger Ditch was not meeting WWH expectations with very low EPT (1) and sensitive taxa (1) diversity and predominance of facultative and tolerant taxa. Observed threats to the biotic integrity of this stream were siltation, channelization, and on-site treatment systems.

The macroinvertebrate communities collected from Otter Creek were not meeting MWH expectations with very low EPT (0-1) and sensitive taxa (0) diversity and predominance of primarily tolerant taxa. Impairments to the biotic integrity of this stream were attributed to contaminated mucky sediments, habitat alteration and industrial runoff.

Maumee River Tributaries

The macroinvertebrate communities collected from Duck Creek were not meeting WWH expectations with very low EPT (1) and sensitive taxa (1) diversity and predominance of primarily tolerant taxa. Impairments to the biotic integrity of this stream were attributed to contaminated mucky sediments and habitat alteration.

The macroinvertebrate community collected from Grassy Creek was not meeting WWH expectations with low EPT (7) and very low sensitive taxa (3) diversity and predominance of primarily facultative taxa. The primary impairment to the biotic integrity of this stream was siltation.

The macroinvertebrate community collected from Grassy Creek Diversion was meeting WWH expectations with moderate EPT (13) diversity. Four species of freshwater mussels were found to be extant in Grassy Creek Diversion during this study (Table 20) including the state species of concern *Lasmigona compressa* (Creek Heelsplitter).

However, low sensitive taxa (13) diversity and the predominance of primarily facultative taxa were indications of mild to moderate impact to the biotic integrity of this community.

The macroinvertebrate community collected from Delaware Creek was not meeting WWH expectations with very low EPT (3) and sensitive taxa (0) diversity and predominance of facultative and tolerant taxa. This stream flows through a high urbanized portion of Toledo which probably contributes substantial urban runoff.

Trends

Macroinvertebrate communities collected from the Portage River during this study were comparable to the 1994 effort (Figure 48). The results from both studies demonstrated that communities within the free-flowing portion of the river were meeting WWH expectations. However, the 1994 study found a stronger decline downstream from the Woodville WWTP. Both years reflected a marked decline in macroinvertebrate performance within the lacustuary.

Macroinvertebrate communities collected from the East Branch Portage River during this study demonstrated an improvement compared to previous studies (Figure 49). The greatest improvement was seen in the ICI scores from the downstream stations (RMs 6.18, 3.1, 0.8). These stations had a substantial reduction in the relative abundance of tolerant taxa and increases in mayfly and caddisfly diversity and relative abundances. However, the mayfly and caddisfly components were almost entirely composed of facultative taxa, which was an indication of lingering impact despite all three sites meeting WWH expectations.

The macroinvertebrate communities in Duck Creek and Otter Creek, evaluated four times since 1986, have consistently been highly degraded. These two streams are adjacent drainages within an industrial and residential area of southeastern Toledo. They have similar causes and sources of impairment and would require a considerable effort to prevent further inputs of pollutants (potentially from sources like industrial landfills), dredge contaminated sediments, and provide for a more natural stream channel design.

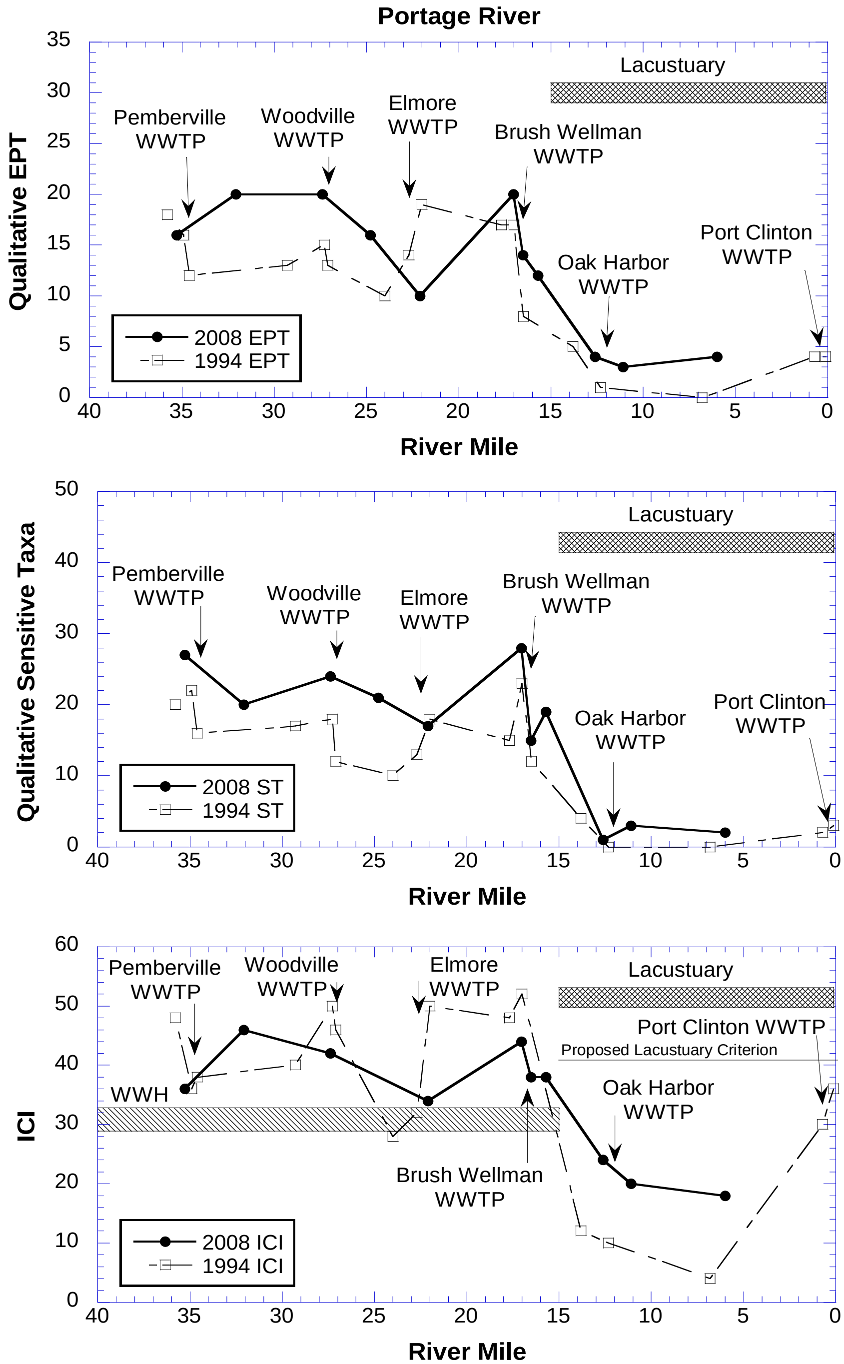

Figure 48. Longitudinal trend of the number of EPT taxa in the qualitative sample, number of sensitive taxa (ST) in the qualitative sample, and Invertebrate Community Index (ICI) in the Portage River, 1994 - 2008.

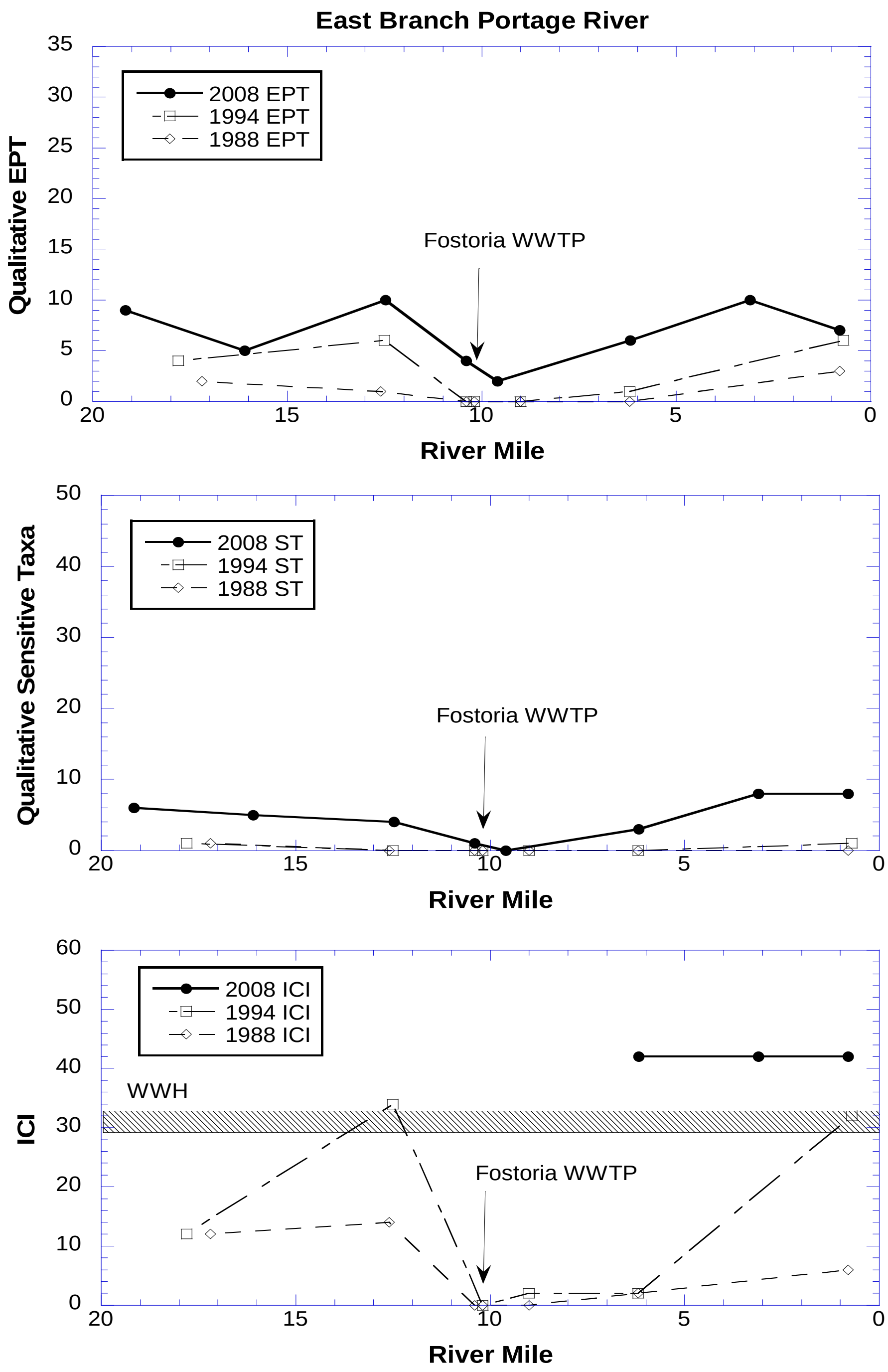

Figure 49. Longitudinal trend of the number of EPT taxa in the qualitative sample, number of sensitive taxa (ST) in the qualitative sample, and Invertebrate Community Index (ICI) in the East Branch Portage River, 1988 - 2008.

Table 19. Summary of macroinvertebrate data collected from artificial substrates (quantitative sampling) and natural substrates (qualitative sampling) in the Portage River, select Lake Erie tributaries, and select Maumee River tributaries study areas, July to October, 2008. Sites with data collected in 2006 are Otter Creek, Grassy Creek, Grassy Creek Diversion, and Delaware Creek.

Stream RM	Dr. Ar. (sq. mi.)	Data Codes	Qual. Taxa	EPT Ql. / Total	Sensitive Taxa Ql. / Total	Density Ql. / Qt.	CW Taxa	Predominant Organisms on the Natural Substrates With Tolerance Category(ies)	ICI[a]	Narrative Evaluation
Portage River (16-001)										
35.28	353	-	72	16 / 18	27 / 33	H / 3794	0	Hydropsychid caddisflies (F,MI), flatworms (F), baetid mayflies (F)	36	
32.10	420	-	57	20 / 23	20 / 31	M / 711	0	Hydropsychid caddisflies (F,MI), baetid mayflies (F), flatworms (F)	46	
27.40	429	-	59	20 / 21	24 / 30	M / 757	0	Hydropsychid caddisflies (F,MI), baetid mayflies (F), midges (F)	42	
24.80	430	-	62	16	21	M	0	Caddisflies (F,MI), mayflies (F,MI), flatworms (F)	-	Good
22.10	432	13,15	45	10 / 16	17 / 31	L / 255	0	*Elimia* snails (MI), hydroptilid caddisflies (F), midges (F)	34	
17.03	495	13	63	20 / 22	28 / 37	L / 669	0	Caddisflies (F,MI), baetid mayflies (F), *Petrophila* moth larvae (MI)	44	
16.53	496	8,13, 21	41	14 / 17	15 / 25	L / 119	0	*Elimia* snails (MI), *Petrophila* moth larvae (MI), mayflies (MI,F)	38	
15.70	496	8	47	12 / 19	19 / 28	L / 103	0	*Petrophila* moth larvae (MI), *Elimia* snails (MI)	38	
12.63	516	8,11	29	4 / 5	1 / 3	L / 1558	0	Midges (MT,F), damselflies (F)	26[L]	
11.10	518	8,11	37	3 / 3	3 / 3	L / 2124	0	Midges (MT), flatworms (F), bryozoans (F)	20[L]	
6.00	540	8,11	30	4 / 4	2 / 3	L / 2017	0	Midges (MT,T), snails (T), bryozoans (F)	18[L]	
South Branch Portage River (16-100)										
24.77	7.0	-	37	1	5	L	0	Midges (T,F,MI)	-	Poor
22.58	17.0	-	27	4	4	L	0	Midges (T,F), baetid mayflies (F)	-	Low Fair
17.77	29.5	-	38	5 / 5	9 / 12	L-M / 471	0	Flatworms (F)	30	

Stream RM	Dr. Ar. (sq. mi.)	Data Codes	Qual. Taxa	EPT Ql. / Total	Sensitive Taxa Ql. / Total	Density Ql. / Qt.	CW Taxa	Predominant Organisms on the Natural Substrates With Tolerance Category(ies)	ICI[a]	Narrative Evaluation
14.43	34	15	34	6 / 9	6 / 14	L / 135	1	Hydropsychid caddisflies (F), sowbugs (F), midges (MI,F)	38	
8.35	54	8	35	9 / 9	9 / 14	L / 69	0	Sow bugs (F), heptageniid mayflies (F)	(20)	Marg. Good
4.78	100	-	40	9 / 9	9 / 16	M / 383	0	Hydropsychid caddisflies (F), baetid mayflies (F), midges (F,MI,T)	36	
0.50	110	-	61	16 / 18	23 / 29	M / 723	0	Baetid mayflies (F), hydropsychid caddisflies (F), midges (MI,F)	46	
East Branch Portage River (16-105)										
19.17	9.4	-	46	9	6	M	0	Sow bugs (F), blackflies (F), caddisflies (F)	-	Fair
16.10	12.3	-	34	5	5	L-M	0	Sow bugs (F), midges (MI,F), snails (T)	-	Low Fair
12.47	15.3	-	41	10	4	M-H	0	Midges (T,F), hydropsychid caddisflies (F), blackflies (F)	-	Marg. Good
10.42	18.4	-	38	4	1	L	1	Oligochaete worms (T), midges (F), hydropsychid caddisflies (F)	-	Low Fair
9.6	18.7	-	33	2	0	L-M	1	Oligochaete worms (T), midges (MT,F), hydropsychid caddisflies (F)	-	Poor
6.18	23.0	-	35	6 / 7	3 / 8	M / 629	0	Baetid mayflies (F), hydropsychid caddisflies (F), flatworms (F)	42	
3.10	26.0	-	46	10 / 10	8 / 14	M / 380	0	Baetid mayflies (F), hydropsychid caddisflies (F), midges (F)	42	
0.80	35.5	-	28	7 / 7	8 / 15	L / 548	0	Mayflies (F), midges (MI,F), hydropsychid caddisflies (F)	42	
Middle Branch Portage River (16-101)										
15.32	64	6,8	48	12 / 13	12 / 18	L / 67	0	Hydroptilid caddisflies (F), midges (F), flatworms (F)	(24)	Marg. Good
10.9	73	8,13	51	16 / 17	19 / 22	M-H / 397	0	Hydropsychid caddisflies (F), flatworms (F)	(24)	Good
8.64	95	8	50	19 / 20	19 / 22	M / 251	0	Hydropsychid caddisflies (F,MI), flatworms (F), midges (F)	(26)	Good

Stream RM	Dr. Ar. (sq. mi.)	Data Codes	Qual. Taxa	EPT Ql. / Total	Sensitive Taxa Ql. / Total	Density Ql. / Qt.	CW Taxa	Predominant Organisms on the Natural Substrates With Tolerance Category(ies)	ICI[a]	Narrative Evaluation
3.45	216	15	60	17 / 21	26 / 30	L-M / 520	0	Riffle beetles (F), heptageniid mayflies (MI), midges (MI,F)	48	
0.55	224	15	71	25 / 26	30 / 34	M-H / 644	0	Hydropsychid caddisflies (F,MI), baetid mayflies (F), flatworms (F)	44	
Needles Creek (16-104)										
8.35	11.3	-	39	8	3	M	0	Blackflies (F), midges (T,F), caddisflies (F)	-	Fair
5.14	17.0	-	39	10	5	M	0	Hydropsychid caddisflies (F), midges (F,T), blackflies (F)	-	Marg. Good
1.25	32	9	44	7	11	-	0	Water boatmen (F), beetles (F), midges (F)	-	Fair
Rader Creek (16-111)										
10.92	7.3	-	37	6	1	L-M	0	Midges (T,F), baetid mayflies (F), flatworms (F)	-	Low Fair
5.20	18.1	-	49	12	7	M	0	Hydropsychid caddisflies (F), baetid mayflies (F), midges (F,T)	-	Marg. Good
0.80	32.1	8	60	13 / 14	16 / 21	L	0	*Petrophila* moth larvae (MI), water boatmen (F), midges (F)	(26)	Marg. Good
Rocky Ford Creek (16-103)										
21.12	7.6	-	37	3	7	L-M	1	Midges (T,F), blackflies (F)	-	Low Fair
19.53	16.2	-	34	7	6	L-M	0	Midges (T,F,MI), hydropsychid caddisflies (F), blackflies (F)	-	Fair
15.04	23.0	9	37	4	3	L-M	0	Midges (MI,F,MT), oligochaete worms (T)	-	Low Fair
11.87	31	8	45	5 / 5	6 / 9	L / 104	0	Midges (T,MI), hydropsychid caddisflies (F), fingernail clams (F)	20	
9.80	57	-	46	7	8	L-M	0	Flatworms (F), midges (F), mosquito larvae (F)	-	Fair
5.10	66	8	36	9 / 11	8 / 13	L-M / 214	0	Midges (MT,F), heptageniid mayflies (F)	26	
1.59	72	8	59	18 / 18	17 / 24	M-H / 475	0	Hydropsychid caddisflies (F), baetid mayflies (F), flatworms (F)	34	

Stream RM	Dr. Ar. (sq. mi.)	Data Codes	Qual. Taxa	EPT Ql. / Total	Sensitive Taxa Ql. / Total	Density Ql. / Qt.	CW Taxa	Predominant Organisms on the Natural Substrates With Tolerance Category(ies)	ICI[a]	Narrative Evaluation
Tributary to Rocky Ford Creek @ RM 10.75 (16-112)										
3.57	8.9	-	48	11	6	M	0	Hydropsychid caddisflies (F), midges (T,F), baetid mayflies (F)	-	Marg. Good
2.00	18.7	-	51	19	12	M	0	Hydropsychid caddisflies (F), baetid mayflies (F), midges (T,MT,F)	-	Good
Tributary to Rocky Ford Creek @ RM 10.75, 1.99 (16-113)										
1.80	7.5	-	36	10	8	L-M	0	Midges (F), hydropsychid caddisflies (F), blacklies (F)	-	Marg. Good
Bull Creek (16-102)										
8.45	8.3	-	37	8	8	M	0	Sowbugs (F), flatworms (F), midges (T,F,MI)	-	Fair
3.89	19.0	-	52	15	12	M	0	Caddisflies (F), mayflies (F,MI), midges (F,MI)	-	Good
0.64	29.8	-	62	16	17	L	0	Water boatmen (F), beetles (F), flatworms (F)	-	Good
North Branch Portage River (16-007)										
25.85	8.1	-	25	1	1	L	0	Beetles (F), water boatmen (F), midges (VT,T)	-	Poor
21.96	14.3	-	39	6	4	L	0	Midges (T,F)	-	Low Fair
17.92	24.0	5,8	51	8 / 9	7 / 12	L / 200	0	Midges (MI,MT), burrowing mayflies (MI)	30	
13.55	34	8	26	7 / 10	5 / 11	L / 55	0	Heptageniid mayflies (F)	26	
8.60	41	8	19	2 / 2	2 / 7	L / 16	0	Crayfish (F), water boatmen (F), scuds (F)	8	
6.55	48	-	46	6 / 6	4 / 11	L-M / 191	0	Midges (T,MI,F)	26	
0.08	59.1	-	38	11	10	L	0	Hydropsychid caddisflies (F,MI), midges (F)	-	Marg. Good
Sugar Creek (16-006)										
21.31	12.0	-	51	11	9	M	0	Caddisflies (F), sowbugs (F), midges (T,MI)	-	Marg. Good
18.50	17.0	-	51	15	10	M-H	0	Caddisflies (F), baetid mayflies (F), sowbugs (F)	-	Good

Stream RM	Dr. Ar. (sq. mi.)	Data Codes	Qual. Taxa	EPT Ql. / Total	Sensitive Taxa Ql. / Total	Density Ql. / Qt.	CW Taxa	Predominant Organisms on the Natural Substrates With Tolerance Category(ies)	ICI[a]	Narrative Evaluation
13.38	35	-	51	14 / 19	17 / 28	M / 519	0	Riffle beetles (F), *Helicopsyche* caddisflies (MI)	52	
8.80	51	-	49	15 / 16	14 / 19	M / 531	0	Baetid mayflies (F), hydropsychid caddisflies (F), riffle beetles (F)	42	
3.65	56	-	41	10	13	L	0	Baetid mayflies (F), oligochaete worms (T)	-	Marg. Good
0.80	58	15	35	10 / 12	9 / 21	L / 77	0	Mayflies (F), riffle beetles (F)	38	
Coon Creek (16-012)										
0.34	7.8	-	44	4	10	M	0	Midges (F,T,MI), blackflies (F), *Physella* snails (T)	-	Low Fair
Wolf Creek (16-005)										
6.51	9.2	-	25	2	2	L-M	0	Midges (F,T,MI), blackflies (F), hydropsychid caddisflies (F)	-	Poor
Little Portage River (16-002)										
6.20	21.2	8	37	4 / 5	5 / 5	L / 240	0	Midges (MT,T,MI), phantam midges (T)	20	
1.79	30	8,11	32	3 / 3	0 / 0	M / 2730	0	Water boatmen (F), damselflies (F), Scuds (F)	14[L]	
Ninemile Creek (16-003)										
5.00	7.9	-	41	5	6	M	0	Midges (T,F), blackflies (F)	-	Low Fair
2.93	9.6	-	34	4	2	L-M	0	Midges (T), fingernail clams (F)	-	Low Fair
Cedar Creek (16-202)										
20.77	12.1	-	44	8	6	L-M	0	Midges (MI,F), flatworms (F), sow bugs (F)	-	Fair
17.32	18.5	-	43	11	3	M	0	Hydropsychid caddisflies (F), baetid mayflies (F), blackflies (F)	-	Marg. Good
14.50	23.2	-	41	7 / 8	8 / 11	M / 471	0	Hydropsychid caddisflies (F), midges (MI,MT,F)	32	
9.59	38.6	-	35	5 / 6	6 / 11	L-M / 816	0	Mayflies (F), midges (MI,MT), hydropsychid caddisflies (F)	42	
Dry Creek (16-203)										

Stream RM	Dr. Ar. (sq. mi.)	Data Codes	Qual. Taxa	EPT Ql. / Total	Sensitive Taxa Ql. / Total	Density Ql. / Qt.	CW Taxa	Predominant Organisms on the Natural Substrates With Tolerance Category(ies)	ICI[a]	Narrative Evaluation
7.00	8.2	-	50	5	5	L-M	0	Midges (T,MI,F)	-	Low Fair
0.01	13.8	-	38	7	3	L-M	0	Baetid mayflies (F), hydropsychid caddisflies (F)	-	Fair
Crane Creek (16-205)										
18.82	9.0	-	25	3	1	L-M	0	Midges (F,T), sowbugs (F), baetid mayflies (F)	-	Poor
15.38	19.9	15	30	5 / 6	3 / 9	L / 246	1	Hydropsychid caddisflies (F), midges (F,MI), sowbugs (F)	30	
8.83	34	-	40	9 / 10	5 / 11	M / 1165	0	Flatworms (F), hydropsychid caddisflies (F), baetid mayflies (F,I)	40	
Henry Creek (16-208)										
0.25	7.8	-	34	7	2	L-M	0	Hydropsychid caddisflies (F), baetid mayflies (F), midges (F)	-	Fair
Turtle Creek (16-210)										
11.62	21.4	-	36	4 / 6	2 / 7	L / 147	0	Scuds (F)	24	
North Branch Turtle Creek (16-211)										
0.80	7.8	-	50	7	4	M	1	Hydropsychid caddisflies (F), baetid mayflies (F), midges (F,T,MI)	-	Fair
South Branch Turtle Creek (16-212)										
2.65		-	45	9	6	M-H	0	Flatworms (F), blackflies (F), midges (MI,F)	-	Fair
Wolf Ditch/Berger Ditch (16-201)										
2.70		-	32	1	1	L	0	Midges (F,T), sow bugs (MT), blackflies (F)	-	Poor
Otter Creek (16-200)										
6.0[b]	2.8	-	12	0	0	L-M	0	Flatworms (F), sow bugs (MT,F)	-	Very Poor
3.0[b]	5.9	-	15	1	0	L	0	Sow bugs (MT)	-	Very Poor
2.1[b]	6.6	-	13	1	0	L	0	Midges (MT,F), oligochaete worms (T)	-	Very Poor
Duck Creek (04-002)										

Stream RM	Dr. Ar. (sq. mi.)	Data Codes	Qual. Taxa	EPT Ql. / Total	Sensitive Taxa Ql. / Total	Density Ql. / Qt.	CW Taxa	Predominant Organisms on the Natural Substrates With Tolerance Category(ies)	ICI[a]	Narrative Evaluation
3.10	0.6	-	23	1	1	L-M	1	Midges (F,T,VT), sow bugs (MT)	-	Very Poor
2.52	0.8	-	22	1	1	M-H	0	Flatworms (F), midges (T)	-	Very Poor
Grassy Creek (04-012)										
3.8 [b]	8.4	-	33	7	3	M	0	Midges (F,MI), baetid mayflies (F), hydropsychid caddisflies (F)	-	Fair
Grassy Creek Diversion (04-086)										
0.3 [b]	14.3	-	44	13	13	M	1	Hydropsychid caddisflies (F), baetid mayflies (F), midges (F)	-	Good
Delaware Creek (04-011)										
0.4 [b]	2.5	-	22	3	0	M	0	Midges (T,F)	-	Poor

RM: River Mile.
Dr. Ar.: Drainage Area
Data Codes: 5=3 HD Only, 6=4 HD Only, 8=Non-Detectable Current, 9=Intermittent or Near-Intermittent Conditions, 11=Lake Erie Influence (Lacustuaries), 13=Suspected Disturbance by Vandalism, 15=Current >0.0 fps but <0.3 fps, 21=Mixing Zone Sample.
Ql.: Qualitative sample collected from the natural substrates.
Sensitive Taxa: Taxa listed on the Ohio EPA Macroinvertebrate Taxa List as MI (moderately intolerant) or I (intolerant).
Qt.: Quantitative sample collected on Hester-Dendy artificial substrates, density is expressed in organisms per square foot.
Qualitative sample relative density: L=Low, M=Moderate, H=High.
CW: Cold Water.
Tolerance Categories: VT=Very Tolerant, T=Tolerant, MT=Moderately Tolerant, F=Facultative, MI=Moderately Intolerant, I=Intolerant
a - ICI values in parentheses are invalidated due to insufficient current speed over the artificial substrates. The station evaluation is based on the qualitative sample narrative evaluation.
b - Sample was collected in 2006.
L - Lacustuary ICI

Table 20. Freshwater mussel species collected live or fresh dead in the Portage River, select Lake Erie tributaries, and select Maumee River tributaries study areas, July to October, 2008. State listed species are designated with T for Threatened Species and SC for Species of Concern. Grassy Creek Diversion was sampled in 2006.

Stream River Mile	***Anodontoides ferrussacianus***	***Fusconaia flava***	***Lampsilis radiata luteola***	***Lasmigona complanata***	***Lasmigona compressa* (SC)**	***Leptodea fragilis***	***Potamilus alatus***	***Pyganodon grandis***	***Quadrula quadrula***	***Strophitus undulatus***	***Toxolasma parvum***	***Truncilla donaciformis* (T)**	***Truncilla truncata* (SC)**	***Uniomerus tetralasmus* (T)**
Portage River Watershed														
Portage River (16-001)														
35.28		X	X	X				X	X				X	
32.10														
27.40				X		X		X					X	
24.80									X					
22.10			X	X		X	X		X					
17.03				X		X	X	X	X		X	X	X	
16.53														
15.70				X		X	X	X	X					
12.63														
11.10														
6.00														
South Branch Portage River (16-100)														
24.77	X													
22.58														
17.77	X							X						
14.43	X							X						
8.35		X						X						
4.78								X						
0.50		X	X	X				X						
East Branch Portage River (16-105)														
19.17														

Stream **River Mile**	***Anodontoides ferrussacianus***	***Fusconaia flava***	***Lampsilis radiata luteola***	***Lasmigona complanata***	***Lasmigona compressa* (SC)**	***Leptodea fragilis***	***Potamilus alatus***	***Pyganodon grandis***	***Quadrula quadrula***	***Strophitus undulatus***	***Toxolasma parvum***	***Truncilla donaciformis* (T)**	***Truncilla truncata* (SC)**	***Uniomerus tetralasmus* (T)**
16.10														
12.47											X			
10.42														
9.6														
6.18														
3.10														
0.80														
Middle Branch Portage River (16-101)														
15.32	X	X	X	X				X		X				
10.9		X	X	X						X				
8.64		X	X	X				X						
3.45		X	X					X		X			X	
0.55	X	X	X	X		X		X		X			X	
Needles Creek (16-104)														
8.35														
5.14														
1.25	X	X	X	X				X		X	X			
Rader Creek (16-111)														
10.92														
5.20														
0.80		X	X	X				X	X		X			
Rocky Ford Creek (16-103)														
21.12														
19.53														
15.04								X						

Stream **River Mile**	***Anodontoides ferrussacianus***	***Fusconaia flava***	***Lampsilis radiata luteola***	***Lasmigona complanata***	***Lasmigona compressa* (SC)**	***Leptodea fragilis***	***Potamilus alatus***	***Pyganodon grandis***	***Quadrula quadrula***	***Strophitus undulatus***	***Toxolasma parvum***	***Truncilla donaciformis* (T)**	***Truncilla truncata* (SC)**	***Uniomerus tetralasmus* (T)**
11.87								X						
9.80								X		X				
5.10				X				X						
1.59			X					X	X	X				
Bull Creek (16-102)														
8.45														
3.89														
0.64	X	X	X	X				X			X			
North Branch Portage River (16-007)														
25.85														
21.96														
17.92			X	X		X		X		X				X
13.55			X											
8.60														
6.55														
0.08														
Sugar Creek (16-006)														
21.31														
18.50														
13.38	X			X										
8.80														
3.65	X		X	X		X		X						
0.80														
Coon Creek (16-012)														
0.34											X			
Little Portage Creek (16-002)														

Stream River Mile	***Anodontoides ferrussacianus***	***Fusconaia flava***	***Lampsilis radiata luteola***	***Lasmigona complanata***	***Lasmigona compressa* (SC)**	***Leptodea fragilis***	***Potamilus alatus***	***Pyganodon grandis***	***Quadrula quadrula***	***Strophitus undulatus***	***Toxolasma parvum***	***Truncilla donaciformis* (T)**	***Truncilla truncata* (SC)**	***Uniomerus tetralasmus* (T)**
6.20				X				X						
1.79														
Lake Erie Tributaries														
Cedar Creek (16-202)														
20.77														
17.32														
14.50	X							X						
9.59														
Crane Creek (16-205)														
18.82														
15.38														
8.83								X						
Maumee River Tributaries														
Grassy Creek Diversion (04-086)														
0.3 (collected in 2006)				X	X		X			X				

Fish Consumption Advisory

The Ohio fish consumption advisories are issued by the Ohio Department of Health for sport fish caught in Ohio waters. Fish consumption advisories for waters throughout the state are available at: http://www.epa.state.oh.us/dsw/fishadvisory/index.aspx. Specific advisories for waters in the study area are listed below:

- Veteran's Memorial Reservoir has a less restrictive consumption advisory of no more than 2 meals per week of white crappie and a more restrictive consumption advisory of no more than one meal per month of common carp. Both restrictions are due to mercury contamination.

- North Branch Portage River has an advisory of eating no more than one meal of common carp per two months due to PCB contamination.

- Portage River mainstem has a limit of one meal every two months for channel catfish and common carp due to PCB contamination.

The extent of the consumption advisory on the Portage River mainstem extends from RM 16.4 to the mouth and is more restrictive than in years past. The PCB contamination may be attributable to legacy contamination in the sediments from Brush Wellman. As discussed in the sediment section of this report, PCB contamination below Brush Wellman was documented both in 1994 and 2008 sampling, though no PCBs were documented upstream of Brush Wellman. Channel catfish and common carp collected near RM 12.5 in 2008 had similar concentrations of PCBs as similar sized channel catfish and common carp in the lower reaches. This indicates that the fish, especially those with a limited home range, may have taken up the contaminants from within the Portage River mainstem itself, and not Lake Erie. Fish tissue sampling results for the Portage river mainstem are available in Appendix L.

Lake Sampling Results

The monitoring and assessment of lakes, including natural lakes and manmade impounded or upground reservoirs, is an important compliment to the study of stream ecosystems. Lakes act as watershed sinks for the upstream loading of sediment, nutrients and pesticides. Thus, their assessment may be the best indicator of the combined effects that both point and non-point pollution sources have on surface water quality.

Lake Description

Veterans Memorial Reservoir (Fostoria Reservoir #6) was constructed to provide a reliable source of drinking water and to increase storage capacity. It was built using an upground design that consists of a 32 foot tall by 12 foot wide earthen levee and 2:1 side slopes. The inside of the levee is covered with limestone riprap to protect the shoreline from wind and wave erosion. The basin was filled with water in 1992 and at normal stage holds about 1.3 billion gallons and covers a surface area of 165 acres.

Veterans Memorial Reservoir, along with Lake LeComte (Fostoria Reservoir #5), is the second of a series of two storage lakes. The East Branch Portage River supplies source water for the two lakes (hydrologic unit 04100010-02-02) and a dam constructed at river mile 16.15 pools water so it can be pumped into Lake LeComte. A pipeline connects Lake LeComte to Veterans Memorial Reservoir so it can be filled. At times, flow in the river is too low to pump due to a small drainage area of about 12.3 mi^2.

The lake is open to the public and is a popular destination for fishing and hiking, but swimming is not allowed. Amenities include a concrete boat ramp and a paved parking lot. Gasoline outboard motors with a maximum of 9.9 hp are permitted and there is a no wake restriction. Fish management activities include routine stocking, population monitoring and angler harvest studies. Fish production was enhanced by placement of several reefs and spawning areas.

Water Quality

Guidance used to assess lake water quality is currently under development. The Lake Habitat use designation and associated numerical criteria and assessment methods are scheduled to be previewed in the Ohio 2010 Integrated Water Quality Monitoring and Assessment Report (Ohio EPA, 2010). A standard lake assessment spans two years and includes 5 sets of samples collected each year during the May 1 – October 31 recreation season. The use is evaluated based on both a set of tiered and base aquatic life criteria. Veterans Memorial Reservoir is considered to be in non support.

The non support determination was made due to a median chlorophyll *a* value that exceeds the draft criterion. The median calculated chlorophyll a value from 10 samples collected over 2 seasons was 10.5 µg/L and the draft criterion is 6.0 µg/L. Algae blooms can reach nuisance levels in the lake and copper sulfate treatments are used when needed. The median secchi depth over the assessment period was found to be 2.11 m and this is below the draft criterion of 2.68 m, but this would not itself trigger impairment. It is likely that the lower than expected water clarity is due to turbidity caused by algae, but some is probably from inorganic matter such as silt and clay as well. Nutrient parameters including phosphorus, nitrogen and ammonia were also evaluated. The median total nitrogen value of 1,830 µg/L exceeds the draft criterion of 1,150 µg/L. The median phosphorus value was well below the draft criterion, so the algal community is probably dominated by types that do well in an environment with a high N:P ratio. Controls to reduce nitrate levels in source water obtained from the East Branch Portage River would be of great benefit to lake water quality and also reduce the cost of drinking water treatment.

None of the base aquatic life criteria were exceeded. Typical parameters evaluated include dissolved solids and metals. The majority of metal concentrations were below the lab reporting limit. Low levels of copper were detected in the fall samples as a result of algae bloom treatments, but concentrations were below OMZA criteria and should not have a negative effect on aquatic life. Application rates need to be carefully measured to ensure that there are no problems in the future.

Sediment Quality

The evaluation of sediment in lakes is important because it has an impact on storage capacity, recreation, water quality, and aquatic life. Loss of storage capacity due to sedimentation can reduce the useful life of a lake and make costly dredging necessary. No known % capacity loss data exists for Veterans Memorial Reservoir, but not much is expected due to its young age. None was evident based on contour maps and field sonar measurements. Management practices such as limestone riprap along the shoreline and selective pumping help minimize sedimentation.

A dredge was used to collect a sample for analysis of mercury, PCBs, PAHs and heavy metals. The sample consisted of 38.6 % solids and 2.3 % organic carbon. Mercury and PCBs are of particular concern because they bioaccumulate in the food chain and trigger fish advisories. PAHs are a concern because people who come in contact with them can develop skin cancer when they are exposed to sunlight. Certain metals can be toxic to aquatic life depending on their bioavailability.

The data was evaluated using both Sediment Reference Values (Ohio EPA, 2008) and Consensus Based Sediment Quality Guidelines (MacDonald et al., 2000). All results passed initial screening and the sediment is considered to be uncontaminated. Mercury and all of the organic compounds tested were found to be below individual reporting limits. Even though the sediment tested clean, Veterans Memorial Reservoir is listed in the Ohio 2009 Sport Fish Consumption Advisory (Ohio EPA, 2009). The lake has an advisory for Largemouth Bass of no more than 1 meal per month triggered by mercury. Women of childbearing age and children 15 and under are particularly sensitive to mercury because it can damage the brain, kidneys and developing fetus.

Levels of ammonia and phosphorus were also measured. Too much ammonia in pore water can be directly toxic to benthic organisms and under aerobic conditions bacteria convert it into nitrate, making it biologically available for plant growth. Elevated nitrate in drinking water is also a human health concern because it can cause oxygen starvation in tissues and result in a potentially fatal condition known as methemoglobinemia (blue baby syndrome). Phosphorus in sediment is usually tightly bound to clay particles, but under anaerobic conditions orthophosphate is released into the water column, making it biologically available for plant growth. This process of internal nutrient cycling can be enough to stimulate algae blooms. If blooms reach a nuisance level, they can impair aquatic life by resulting in wide diel variations in dissolved oxygen and pH concentration and ultimately cause oxygen depletion when they decompose. Algae are also a human health concern and can cause problems during the drinking water treatment process. The cells provide a source of carbon in the formation of suspected human carcinogenic trihalomethanes when chlorine is added for disinfection. Certain types of blue green algae (Cyanobacteria) are known to produce cyanotoxins. One of these toxins is microcystin and it can cause severe liver damage. Microcystin was tested in the lake and finished drinking water in September 2009 and both samples were below detection.

The ammonia and phosphorus levels in sediment were 92 and 792 mg/kg, respectively. Little guidance is available for evaluating nutrient levels in sediment. The ranking system below was developed using data from upground reservoirs in Ohio. It ranks relative concentrations based on the median plus 1, 2, 4 and 8 inter-quartile range values. Sediment nutrients in Veterans Memorial Reservoir are considered non elevated based on this screening level assessment (Table 21).

Table 21. Ammonia and phosphorus ranking system based upon upground reservoir sampling in Ohio.

Parameter (mg/kg)	**non elevated**	**slightly elevated**	**elevated**	**highly elevated**	**extremely elevated**
ammonia	< 148	148 – 207	208 – 327	328 – 567	≥ 568
phosphorus	< 932	932 – 1106	1107 – 1456	1457 – 2156	≥ 2157

SUMMARY WATERSHED ASSESSMENT UNITS

The Portage River basin, select Lake Erie tributaries, and select Maumee River tributaries are comprised of seven 10-digit Hydrologic Unit Code (HUC10) watersheds. These may be further divided into twenty-four 12-digit Hydrologic Unit Code (HUC12) watersheds. Data from individual sampling locations in an assessment unit are accumulated and analyzed; summary information for each WAU is presented in this section (Table 22). Data used in this analysis were collected in 2006, and 2008. High magnitude causes and sources contributing to the biological impairment (partial and non-attainment percents) are noted. This information was used in aggregate statewide statistics for Ohio's universe of assessed principal streams and large rivers, and will be reported in Ohio's 2010 Integrated Water Quality Monitoring and Assessment Report. The report is available at:
http://www.epa.ohio.gov/dsw/tmdl/2010IntReport/2010OhioIntegratedReport_draft.aspx.

The Rocky Ford-Middle Branch Portage River (HUC 10 – 0410001001) contained four HUC 12s which included a total of 19 sites (Table 22 and Figure 50). Direct habitat alterations, and sedimentation/siltation from non-irrigated crop production and channelization along with low flow alterations from Van Buren Lake were the attributed causes and sources of impairment to eight of the nine sites found to be in partial or non-attainment of the WWH aquatic life use designation. The Rader Creek RM 10.92 site was also in partial attainment, but the cause was a combination of ammonia (total), dissolved oxygen, nitrate/nitrite (nitrite + nitrate as N), phosphorus (total), and pH as a result of McComb's WWTP discharges, channelization, and non-irrigated crop production. The remaining 10 sites were in full attainment of the WWH aquatic life use designation (Table 22 and Figure 50).

The Portage River (HUC 10 – 0410001002) contains five HUC 12s which included 20 sampling locations. Two of the HUC 12s, Rhodes Ditch-South Branch Portage River (041000100204) and Cessna Ditch-Middle Branch Portage River (041000100205) each had two sites and were found to be in full attainment of the WWH biocriterion. Bull Creek (041000100201) had two of three sites in full attainment. Bull Creek RM 8.45 was in partial attainment due to direct habitat alterations, sedimentation/siltation as a result of non-irrigated crop production and channelization activities. East Branch Portage River (041000100202) had four of eight sites in full attainment. East Branch Portage River RM 16.10 had partial attainment from low flow alterations, and sedimentation/siltation associated with non-irrigated crop production and channelization activities. Non-attainment at East Branch Portage River RM 19.17 was caused by nutrient and organic enrichment from manure run-off, and low flow alterations with sedimentation/siltation from non-irrigated crop production. East Branch Portage River RMs 10.42 and 9.6 were in non-attainment due to nutrient and organic enrichment from the combined sewer overflows and WWTP within Fostoria. The Town of Bloomdale-South Branch Portage River (041000100203) had three of five sites in full attainment. Total dissolved solids from an unknown source(s) in combination with direct habitat alterations and sedimentation/siltation from channelization and non-irrigated crop production resulted in non-attainment at South Branch Portage River RM 24.77. Further downstream, South Branch Portage River RM 22.58 was in non-attainment as a result of siltation/sediment from non-irrigated crop production (Table 22 and Figure 51).

The Upper Portage River (HUC10 – 0410001003) contained two HUC 12s with a total of eight sampling locations. Only one sampling location was within Town of Pemberville – Portage River (041000100302) and it was in full attainment. Only two of seven sampling locations within North Branch Portage River (041000100301) were in full attainment. Sedimentation/siltation attributed to non-irrigated crop production and channelization was associated with all of the partial and non attaining sites. Direct habitat alterations were also found to contribute to the non and partial attainment associated with North Branch Portage River RMs 25.85 and 21.96, respectively. In addition, nutrients associated with the Bowling Green WWTP were found to contribute to the non-attainment at North Branch Portage River RM 6.55 (Table 22 and Figure 52).

The Middle Portage River (HUC 10 – 0410001004) contained two HUC 12s with a total of eleven sites. Six of the seven sites within Sugar Creek (041000100401) were found to be in full attainment. Coon Creek RM 0.34 was in partial attainment from nutrient eutrophication, direct habitat alterations and sedimentation/siltation associated with channelization and non–irrigated crop production. Three of four sites within Larcarpe Creek Outlet #4 – Portage River (041000100402) were in full attainment. Direct habitat alterations through channelization activities resulted in partial attainment at Portage River RM 22.10 (Table 22 and Figure 53).

The Lower Portage River – Frontal Lake Erie (HUC 10 – 0410001005) contained two HUC 12s with a total of eleven sites. Three of the four sites within Little Portage River (041000100501) were in partial attainment due to sedimentation/siltation and often low flow alterations and direct habitat alterations from channelization and non-irrigated crop production. Little Portage River RM 1.79 was in non-attainment due to sedimentation/siltation and excess nutrients/eutrophication associated with non-irrigated crop production. Two of the seven sites within Portage River (041000100502) were in full attainment and one site was not assessed for the aquatic life use designation as it was a mix zone sample. Recent and historical discharges from Brush Wellman were found to contribute to sediment exceedence values and sedimentation/siltation which contributed to non-attainment of the WWH aquatic life use designation throughout the lower reach of the Portage River. Nutrient eutrophication from surrounding agricultural activities also contributed to non-attainment (Table 22 and Figure 54).

The Cedar Creek – Frontal Lake Erie (HUC 10 – 0410001007) contained six HUC 12s and was sampled at nineteen locations. Wolf Creek – Frontal Lake Erie (041000100704) was sampled in only one location, Wolf Creek/Williams Ditch RM 1.70, and was in full attainment. Sedimentation/siltation associated with channelization and non-irrigated crop production combined with phosphorus, ammonia and organic enrichment from on-site treatment systems were common causes and sources of impairment within Turtle Creek – Frontal Lake Erie (041000100701), Cedar Creek – Frontal Lake Erie (041000100703), and Berger Ditch (041000100705). Sedimentation/siltation from channelization and urban runoff/storm sewers resulted in impairment of two of four total sites within Crane Creek – Frontal Lake Erie (041000100702). Otter Creek – Frontal Lake Erie (041000100706) had all four sites in non-attainment due to sedimentation/siltation and exceedence values of various parameters within the sediments as a result of nearby industrial parks, landfills, channelization and impervious surface/parking lot runoff (Table 22 and Figure 55).

Grassy Creek – Maumee River (HUC 10 – 0410000909) contained three HUC 12s and a total of five sites. Grassy Creek Diversion (041000090901) had one site which was in full attainment of the WWH aquatic life use designation. Grassy Creek (041000090902) and Delaware Creek – Maumee River (041000090904) were both impaired from sedimentation/siltation associated with channelization, urban runoff and storm sewers. The Delaware Creek RM 0.38 was in non-attainment due to pesticides, aluminum and total dissolved solids from urban runoff and storm sewers. Due to the high amount of impervious surface of the watershed, it is not surprising that urban and storm sewer discharges contribute to the impairment of the streams (Table 22 and Figure 56).

Table 22. Sampling locations and associated attainment status with causes and sources of impairment organized by HUC 10s and HUC 12s for the Portage River basin, select Maumee River tributaries, and select Lake Erie Tributaries. The Site column refers to the labels on the locations depicted in Figures 3, 4, and 5 of the sampling locations.

Site	Year	Station Code	Station	River Mile	Drainage (sq.mi.)	ALU	Attain Status	Cause	Sources
HUC 10 – 0410001001 (Rocky Ford-Middle Branch Portage River)									
HUC 12 – 041000100101 (Rader Creek)									
1	2008	S01S26	RADER CREEK N OF MCCOMB @ CO. RD. 203	10.92	7.3	WWH	Partial	Ammonia (Total), Oxygen, Dissolved, Nitrate/Nitrite (Nitrite + Nitrate as N), Phosphorus (Total), pH	Municipal Point Source Discharges, Channelization, Non-irrigated Crop Production
2	2008	S01S24	RADER CREEK E OF HOYTVILLE @ NEEDLES RD.	5.20	18.1	WWH	Full	-	-
3	2008	201109	RADER CREEK NEAR MOUTH @ CYGNET RD.	0.80	32.1	WWH	Full	-	-
HUC 12 - 041000100102 (Needles Creek)									
4	2008	300511	NEEDLES CREEK @ HANCOCK/WOOD COUNTY LINE RD.	8.35	11.3	WWH	Partial	Low flow alterations, Direct Habitat Alterations	Non-irrigated Crop Production, Channelization
5	2008	S01P30	NEEDLES CREEK N OF HOYTVILLE @ ST. RT. 18	5.14	17.0	WWH	Full	-	-
6	2008	S01S48	NEEDLES CREEK NE OF HOYTVILLE @ CYGNET RD.	1.25	32.0	WWH	Partial	Direct Habitat Alterations, Low flow alterations, Sedimentation/Siltation	Channelization, Non-irrigated Crop Production
HUC 12 - 041000100103 (Rocky Ford Creek)									
7	2008	S01K12	ROCKY FORD CREEK NW OF ARCADIA @ CO. RD. 109	21.12	7.6	WWH	Non	Sedimentation/Siltation	Non-irrigated Crop Production, Channelization
8	2008	S01K11	ROCKY FORD CREEK SW OF BLOOMVILLE @ CO. RD. 18	19.53	16.2	WWH	Non	Sedimentation/Siltation	Non-irrigated Crop Production
9	2008	S01S06	ROCKY FORD CREEK DST. VAN BUREN LAKE @ CO. RD. 220	15.04	23.0	WWH	Partial	Low flow alterations	Van Buren Lake impoundment
10	2008	S01S05	ROCKY FORD CREEK UPST. NORTH BALTIMORE @ TWP. RD. 114	11.87	31.0	WWH	Partial	Sedimentation/Siltation	Non-irrigated Crop Production, Channelization
11	2008	S01S04	ROCKY FORD CREEK UPST N. BALTIMORE WWTP @ E. BROADWAY ST.	9.82	57.0	WWH	Partial	Low flow alterations	Non-irrigated Crop Production
12	2008	S01P28	ROCKY FORD CREEK W OF CYGNET @ CYGNET RD.	5.10	66.0	WWH	Partial	Sedimentation/Siltation, Direct Habitat Alterations	Non-irrigated Crop Production, Channelization
13	2008	300372	ROCKY FORD CREEK @ SOLETHER RD.	1.59	72.0	WWH	Full	-	-
14	2008	S01K13	TRIB. TO ROCKY FORD CREEK (10.75) @ TR 112	3.57	8.9	WWH	Full	-	-
15	2008	201105	TRIB. TO ROCKY FORD CREEK (10.75) @ CR 139 (DST FENBURG #2)	2.00	18.7	WWH	Full	-	-
16	2008	201106	TRIB. TO ROCKY FORD CREEK (10.75/1.99) ADJ CR 139	1.80	7.5	WWH	Full	-	-
HUC 12 – 041000100104 (Town of Rudolph-Middle Branch Portage River)									
17	2008	S01K09	M. BR. PORTAGE R. @ JERRY CITY RD.	15.32	64.0	WWH	Full	-	-

Site	Year	Station Code	Station	River Mile	Drainage (sq.mi.)	ALU	Attain Status	Cause	Sources
18	2008	201099	M. BR. PORTAGE R. AT RUDOLPH @ RUDOLPH RD.	10.90	73.0	WWH	Full	Comment – Though biological indicators were in full attainment of the WWH aquatic life use, organic enrichment (sewage and sewage fungus) was noted downstream from the bridge and is likely attributable to failing on-site treatment systems.	
19	2008	S01S44	M. BR. PORTAGE R. UPST. ROCKY FORD @ SOLETHER RD.	8.64	95.0	WWH	Full	-	-
HUC 10 – 0410001002 (Portage River)									
HUC 12 – 041000100201(Bull Creek)									
1	2008	S01K10	BULL CREEK NE OF BAIRDSTOWN @ EAGLEVILLE RD.	8.45	8.3	WWH	Partial	Direct Habitat Alterations, Sedimentation/Siltation	Channelization, Non-irrigated Crop Production
2	2008	S99Q05	BULL CREEK @ JERRY CITY RD.	3.90	19.0	WWH	Full	-	-
3	2008	S01S45	BULL CREEK NEAR MOUTH @ GREENSBURG PIKE	0.64	29.8	WWH	Full	-	-
HUC 12 – 041000100202 (East Branch Portage River)									
4	2008	S01K21	E. BR. PORTAGE R. S OF FOSTORIA @ TWP. RD. 214	19.17	9.4	WWH	Non	Nutrient/Eutrophication Biological Indicators, Organic Enrichment (Sewage) Biological Indicators, Low flow alterations, Sedimentation/Siltation	Manure Runoff, Non-irrigated Crop Production
5	2008	300373	E. BR. PORTAGE R. @ TWP. RD. 217	16.10	12.3	WWH	Partial	Low flow alterations, Sedimentation/Siltation	Channelization, Non-irrigated Crop Production
6	2008	S01S30	E. BR. PORTAGE R. AT FOSTORIA @ CO. RD. 226	12.47	15.3	WWH	Full	-	-
7	2008	S01P37	E. BR. PORTAGE R. AT FOSTORIA, UPST. PORTAGE PARK	10.38	18.4	WWH	Non	Organic Enrichment (Sewage) Biological Indicators	Combined Sewer Overflows
8	2008	S01P03	E. BR. PORTAGE R. @ STEARNS RD.	9.60	18.7	WWH	Non	Nitrate/Nitrite (Nitrite + Nitrate as N), Ammonia (Total)	Municipal Point Source Discharges, Combined Sewer Overflows
9	2008	S01P05	E. BR. PORTAGE R. NW OF FOSTORIA @ EAGLEVILLE RD.	6.18	23.0	WWH	Full	-	-
10	2008	S01P07	E. BR. PORTAGE R. NW OF FOSTORIA @ CYGNET RD.	3.10	26.0	WWH	Full	-	-
11	2008	S01P09	E. BR. PORTAGE R. NR MOUTH @ BAYS RD.	0.80	35.5	WWH	Full	-	-
HUC 12 – 041000100203 (Town of Bloomdale-South Branch Portage River)									
12	2008	S01K07	S. BR. PORTAGE R. NW OF ARCADIA @ CO. RD. 109	24.77	7.0	WWH	Non	Total Dissolved Solids, Direct Habitat Alterations, Sedimentation/Siltation	Unknown Source, Non-irrigated Crop Production, Channelization
13	2008	S01K06	S. BR. PORTAGE R. SE OF BLOOMDALE @ TWP. RD. 218	22.58	17.0	WWH	Partial	Sedimentation/Siltation Organic enrichment (sewage) biological indicators	Channelization, Non-irrigated Crop Production, On-site treatment systems
14	2008	S01K05	S. BR. PORTAGE R. NE OF BLOOMDALE @ STEARNS RD.	17.77	29.5	WWH	Full	-	-
15	2008	S01K04	S. BR. PORTAGE R. NE OF BLOOMVILLE @ HALL RD.	14.43	34.0	WWH	Full	-	-
16	2008	S01P10	S. BR. PORTAGE R. UPST. EAST BRANCH @ PORTAGE VIEW RD.	8.35	54.0	WWH	Full	-	-
HUC 12 – 041000100204 (Rhodes Ditch-South Branch Portage River)									
17	2008	S01P14	S. BR. PORTAGE R. @ GREENSBURG PIKE	4.78	100.0	WWH	Full	-	-

Site	Year	Station Code	Station	River Mile	Drainage (sq.mi.)	ALU	Attain Status	Cause	Sources
18	2008	S01S19	S. BR. PORTAGE R. NEAR NEW ROCHESTER @ KENNER RD.	0.50	110.0	WWH	Full	-	-
HUC 12 – 041000100205 (Cessna Ditch-Middle Branch Portage River)									
19	2008	S01K08	M. BR. PORTAGE R. @ BLOOMDALE RD.	3.45	216.0	WWH	Full	-	-
20	2008	S99Q04	M. BR. PORTAGE R. NEAR NEW ROCHESTER @ CASKIE RD.	0.50	224.0	WWH	Full	-	-
HUC 10 – 0410001003 (Upper Portage River)									
HUC 12 – 041000100301 (North Branch Portage River)									
1	2008	S01K03	N. BR. PORTAGE R. 4 MI. N OF HOYTVILLE @ JERRY CITY RD.	25.85	8.1	WWH	Non	Direct Habitat Alterations, Oxygen, Dissolved, Phosphorus (Total), Sedimentation/Siltation	Non-irrigated Crop Production, Channelization
2	2008	S01K02	N. BR. PORTAGE R. W OF RUDOLF @ MERMILL RD.	21.96	14.3	WWH	Partial	Sedimentation/Siltation, Direct Habitat Alterations	Channelization, Non-irrigated Crop Production
3	2008	S01S40	N. BR. PORTAGE R. SW OF PORTAGE @ RUDOLPH RD.	17.92	24.0	WWH	Full	-	-
4	2008	S01S11	N. BR. PORTAGE R. SE OF BOWLING GREEN @ LINWOOD RD.	13.55	34.0	WWH	Partial	Sedimentation/Siltation	Non-irrigated Crop Production, Channelization
5	2008	S01K01	N. BR. PORTAGE R. JUST UPST. POE DITCH (ADJ SR 105)	8.60	41.0	WWH	Non	Sedimentation/Siltation	Channelization, Non-irrigated Crop Production
6	2008	S01S10	N. BR. PORTAGE R. @ SILVERWOOD RD.	6.55	48.0	WWH	Partial	Nitrate/Nitrite (Nitrite + Nitrate as N), Phosphorus (Total), Sedimentation/Siltation	Channelization, Non-irrigated Crop Production, Municipal Point Source Discharges
7	2008	500520	N. BR. PORTAGE R. AT PEMBERVILLE @ RIVER RD.	0.08	59.1	WWH	Full	-	-
HUC 12 – 041000100302 (Town of Pemberville-Portage River)									
8	2008	S01S36	PORTAGE R. AT PEMBERVILLE @ BRIDGE ST.	35.28	353.0	WWH	Full	-	-
HUC 10 – 0410001004 (Middle Portage River)									
HUC 12 – 041000100401 (Sugar Creek)									
1	2008	S02K05	SUGAR CREEK E OF BRADNER @ GREENSBURG PIKE	21.31	12.0	WWH	Full	-	-
2	2008	201092	SUGAR CREEK W OF HELENA @ U.S. RT. 6	18.50	17.0	WWH	Full	-	-
3	2008	S02S26	SUGAR CREEK W OF GIBSONBURG @ ANDERSON RD.	13.38	35.0	WWH	Full	-	-
4	2008	S02S25	SUGAR CREEK SE OF WOODVILLE @ U.S. RT. 20	8.90	51.0	WWH	Full	-	-
5	2008	S02P01	SUGAR CREEK 1 MI. E OF ELMORE @ ELMORE EASTERN RD.	3.65	56.0	WWH	Full	-	-
6	2008	300371	SUGAR CREEK @ HESSVILLE RD.	0.80	58.0	WWH	Full	-	-
7	2008	S02K06	COON CREEK S OF WOODVILLE @ CO. RD. 32 (ANDERSON RD.)	0.34	7.8	WWH	Partial	Nutrient/Eutrophication Biological Indicators, Sedimentation/Siltation, Direct Habitat Alterations	Non-irrigated Crop Production, Channelization
HUC 12 – 041000100402 (Larcarpe Creek Outlet #4-Portage River)									

Site	Year	Station Code	Station	River Mile	Drainage (sq.mi.)	ALU	Attain Status	Cause	Sources
8	2008	S01S12	PORTAGE R. DST PEMBERVILLE @ U.S. RT. 23	32.10	420.0	WWH	Full	-	-
9	2008	500510	PORTAGE R. AT WOODVILLE @ U.S. RT. 20	28.08	428.0	WWH	Full	-	-
10	2008	S02S20	PORTAGE R. UPST ELMORE @ OHIO TURNPIKE	24.10	430.0	WWH	Full	-	-
11	2008	300581	PORTAGE R. DST. ELMORE WWTP	22.10	432.0	WWH	Partial	Direct Habitat Alterations	Channelization
HUC 10 – 0410001005 (Lower Portage River-Frontal Lake Erie)									
HUC 12 – 041000100501 (Little Portage River)									
1	2008	S02P04	L. PORTAGE R. 2 MI. S OF OAK HARBOR @ CO. RD. 169	6.20	21.2	WWH	Partial	Sedimentation/Siltation	Non-irrigated Crop Production, Channelization
2	2008	S02S23	L. PORTAGE R. S OF LACARNE @ CO. RD. 17	1.79	30.0	WWH	Non	Sedimentation/Siltation, Nutrient/Eutrophication Biological Indicators	Non-irrigated Crop Production
3	2008	S02K02	NINEMILE CREEK NW OF LINDSEY @ TR 92 (HESSVILLE RD)	5.00	7.9	WWH	Partial	Low flow alterations, Nutrient/Eutrophication Biological Indicators, Direct Habitat Alterations, Sedimentation/Siltation	Non-irrigated Crop Production, Channelization
4	2008	S02K01	NINEMILE CREEK N OF LINDSEY @ CO. RD. 141 (DUNMYER RD.)	2.93	9.6	WWH	Partial	Low flow alterations, Direct Habitat Alterations, Sedimentation/Siltation	Channelization, Non-irrigated Crop Production
HUC 12 – 041000100502 (Portage River)									
5	2008	S02P08	PORTAGE R. 4 MI. N OF LINDSEY @ ST. RT. 590	17.03	495.0	WWH	Full	-	-
6	2008	S02S03	PORTAGE R. @ HYDE RUN (BRUSH WELLMAN) MIXING ZONE	16.53	496.0	WWH		-	-
7	2008	S02S17	PORTAGE R. DST. SLEMMER-PORTAGE RD.	15.70	496.0	WWH	Full	-	-
8	2008	S02P06	PORTAGE R. AT OAK HARBOR @ ST. RT. 19	12.55	516.0	WWH	Non	Sediment Screening Value (Exceedence), Nutrient/Eutrophication Biological Indicators, Sedimentation/Siltation	Industrial Point Source Discharge, Upstream Source
9	2008	S02S14	PORTAGE R. DST. OAK HARBOR WWTP, ADJ. OAK RIDGE DRIVE	11.10	518.0	WWH	Non	Sediment Screening Value (Exceedence), Sedimentation/Siltation, Nutrient/Eutrophication Biological Indicators	Industrial Point Source Discharge, Upstream Source
10	2008	S99Q01	PORTAGE R. 0.4 MILES UPST. L. PORTAGE R.	5.90	540.0	WWH	Non	Nutrient/Eutrophication Biological Indicators, Sedimentation/Siltation	Upstream Source
11	2008	S02K04	WOLF CREEK SE OF ELMORE @ YEASTING RD.	6.51	9.2	WWH	Non	Sedimentation/Siltation, Phosphorus (Total)	Municipal Point Source Discharges, Channelization, Non-irrigated Crop Production
HUC 10 – 0410001007 (Cedar Creek-Frontal Lake Erie)									
HUC 12 – 041000100701(Turtle Creek-Frontal Lake Erie)									
1	2008	S03K05	TURTLE CREEK W OF TROWBRIDGE @ NISSEN RD.	11.62	21.4	WWH	Non	Sedimentation/Siltation, Phosphorus (Total)	Channelization, Non-irrigated Crop Production
2	2008	201124	N. BR. TURTLE CREEK SE OF WILLISTON @ OPFER-LENTZ RD.	0.80	7.8	WWH	Partial	Direct Habitat Alterations, Sedimentation/Siltation	Non-irrigated Crop Production, Channelization

Site	Year	Station Code	Station	River Mile	Drainage (sq.mi.)	ALU	Attain Status	Cause	Sources
3	2008	S03K07	S. BR. TURTLE CREEK AT MARTIN @ MOLINE RD.	2.65	10.6	WWH	Non	Phosphorus (Total), Oxygen, Dissolved, Ammonia (Total)	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)
HUC 12 – 041000100702 (Crane Creek-Frontal Lake Erie)									
4	2008	S03P21	CRANE CREEK SE OF WALBRIDGE @ HANLEY RD./I-280	18.82	9.0	WWH	Non	Sedimentation/Siltation, Phosphorus (Total)	Urban Runoff/Storm Sewers, Channelization
5	2008	S03K02	CRANE CREEK AT MILLBURY @ COLLINS RD. (CHERRY ST.)	15.38	19.9	WWH	Full	-	-
6	2008	S03G21	CRANE CREEK @ MARTIN-WILLISTON RD.	8.83	34.0	WWH	Full	-	-
7	2008	201118	HENRY CREEK AT MILLBURY NR MOUTH (BRADNER RD)	0.10	7.8	WWH	Partial	Sedimentation/Siltation, Phosphorus (Total)	Urban Runoff/Storm Sewers, Channelization
HUC 12 – 041000100703 (Cedar Creek-Frontal Lake Erie)									
8	2008	S03S34	CEDAR CREEK NW OF STONY RIDGE @ OREGON RD.	20.77	12.1	WWH	Partial	Sedimentation/Siltation, Phosphorus (Total)	Non-irrigated Crop Production, Channelization
9	2008	S03S60	CEDAR CREEK SW OF WALBRIDGE @ E. BROADWAY RD.	17.32	18.5	WWH	Full	-	-
10	2008	S03S46	CEDAR CREEK E OF WALBRIDGE @ LEMOYNE RD.	14.50	23.2	WWH	Partial	Sedimentation/Siltation	Channelization, Non-irrigated Crop Production
11	2008	S03S44	CEDAR CREEK W OF CURTICE @ BILLMAN RD.	9.59	38.6	WWH	Partial	Sedimentation/Siltation	Channelization, Non-irrigated Crop Production
12	2008	S03S68	DRY CREEK S OF OREGON @ E. BROADWAY RD.	7.00	8.2	WWH	Non	Oxygen, Dissolved, Ammonia (Total), Organic Enrichment (Sewage) Biological Indicators, Phosphorus (Total), Sedimentation/Siltation	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Channelization, Non-irrigated Crop Production
13	2008	S03S48	DRY CREEK W OF CURTICE @ MOUTH	0.01	13.8	WWH	Partial	Sedimentation/Siltation	Non-irrigated Crop Production, Channelization
HUC 12 – 041000100704 (Wolf Creek-Frontal Lake Erie)									
14	2008	201144	WOLF CREEK/WILLIAMS DITCH W OF RENO BEACH @ YONDOTA RD.	1.70	7.6	LRW	Full	-	-
HUC 12 – 041000100705 (Berger Ditch)									
15	2008	201111	WOLF CREEK E OF OREGON @ STADIUM RD.	2.70	7.8	WWH	Non	Sedimentation/Siltation, Organic Enrichment (Sewage) Biological Indicators, Phosphorus (Total)	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Channelization
HUC 12 – 041000100706 (Otter Creek-Frontal Lake Erie)									
16	2006	S03P12	OTTER CREEK AT OREGON @ OAKDALE AVE.	5.92	2.8	MWH -C	Non	Sediment Screening Value (Exceedence), Sedimentation/Siltation	Commercial Districts (Industrial Parks), Channelization, Sediment Resuspension (Contaminated Sediment), Impervious Surface/Parking Lot Runoff
17	2006	S03P08	OTTER CREEK AT TOLEDO @ CONSAUL RD.	2.95	5.9	MWH -C	Non	Sediment Screening Value (Exceedence), Sedimentation/Siltation	Landfills, Channelization, Sediment Resuspension (Contaminated Sediment), Commercial Districts (Industrial Parks)
18	2006	S03P05	OTTER CREEK E OF TOLEDO @ MILLARD RD.	2.13	6.6	MWH -C	Non	Sediment Screening Value (Exceedence), Sedimentation/Siltation	Channelization, Landfills, Sediment Resuspension (Contaminated Sediment), Commercial Districts

Site	Year	Station Code	Station	River Mile	Drainage (sq.mi.)	ALU	Attain Status	Cause	Sources
									(Industrial Parks)
19	2006	S03S25	OTTER CREEK AT TOLEDO, NEAR MOUTH ADJ. CSX ROAD	0.40	7.4	MWH -C	Non	Sediment Screening Value (Exceedence), Sedimentation/Siltation	Landfills, Sediment Resuspension (Contaminated Sediment), Commercial Districts (Industrial Parks), Channelization
HUC 10 – 0410000909 (Grassy Creek-Maumee River)									
HUC 12 – 041000090901 (Grassy Creek Diversion)									
1	2006	P11K19	GRASSY CREEK DIVERSION CHANNEL @ GRAND RAPIDS RD.	0.28	14.3	WWH	Full	-	-
HUC 12 – 041000090902 (Grassy Creek)									
2	2006	P11Q07	GRASSY CREEK @ BUCK RD.	3.85	8.4	WWH	Partial	Sedimentation/Siltation	Channelization, Urban Runoff/Storm Sewers
HUC 12 – 041000090904 (Delaware Creek-Maumee River)									
3	2008	P11K22	DUCK CREEK AT TOLEDO @ CONSAUL RD.	3.10	0.6	WWH	Non	Sedimentation/Siltation	Urban Runoff/Storm Sewers, Channelization
4	2008	P11S56	DUCK CREEK AT TOLEDO @ YORK ST.	2.52	0.8	WWH	Non	Sedimentation/Siltation	Channelization, Urban Runoff/Storm Sewers
5	2006	P11A07	DELAWARE CK @ ROHR DR AT TOLEDO	0.38	2.5	WWH	Non	Nitrate/nitrite as N, Flow regime alterations, Phosphorus (Total)	Urban Runoff/Storm Sewers, Channel erosion/incision from upstream hydromodifications

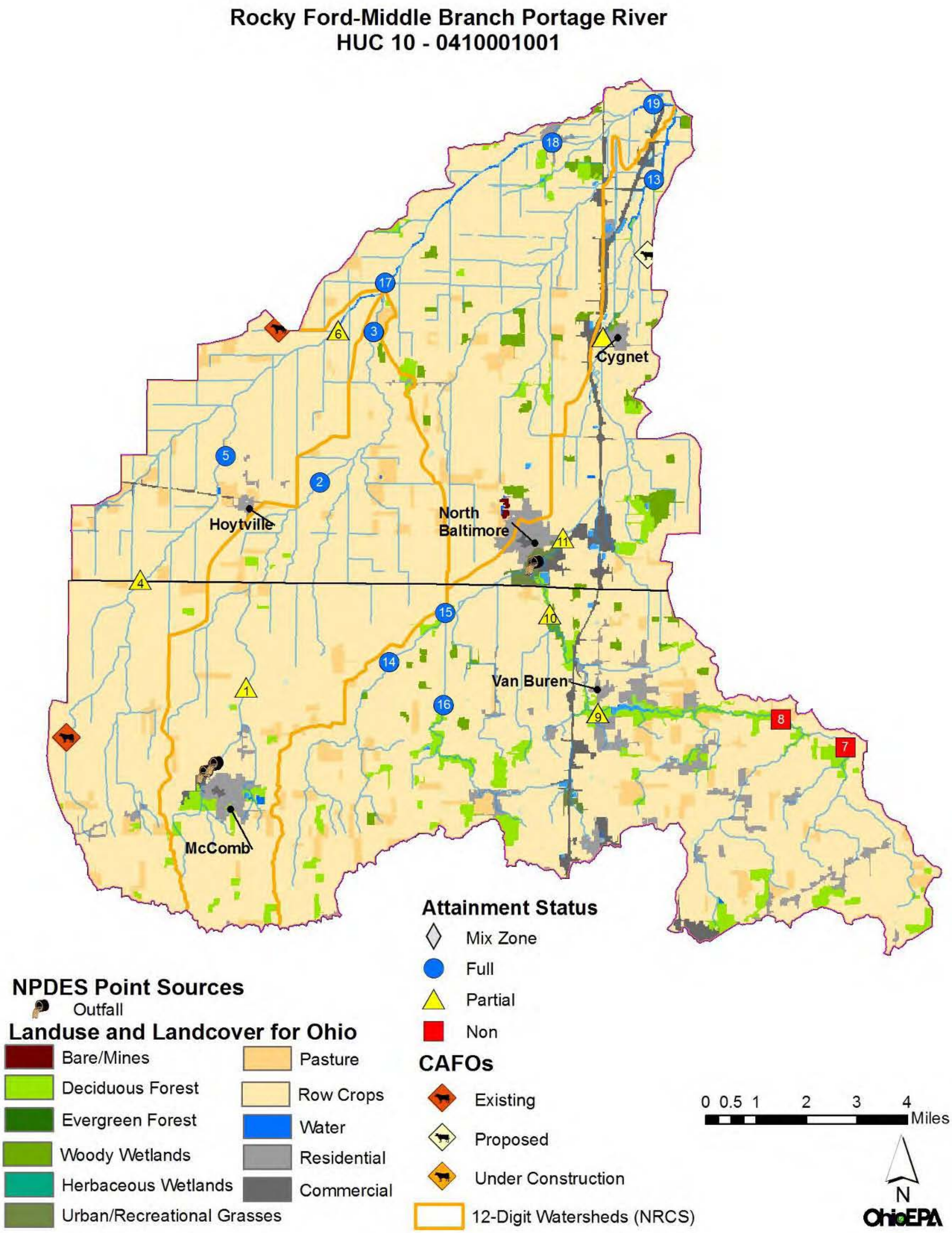

Figure 50. Land use and attainment status of sampling locations within Rocky Ford - Middle Branch Portage River (HUC 10 - 0410001001).

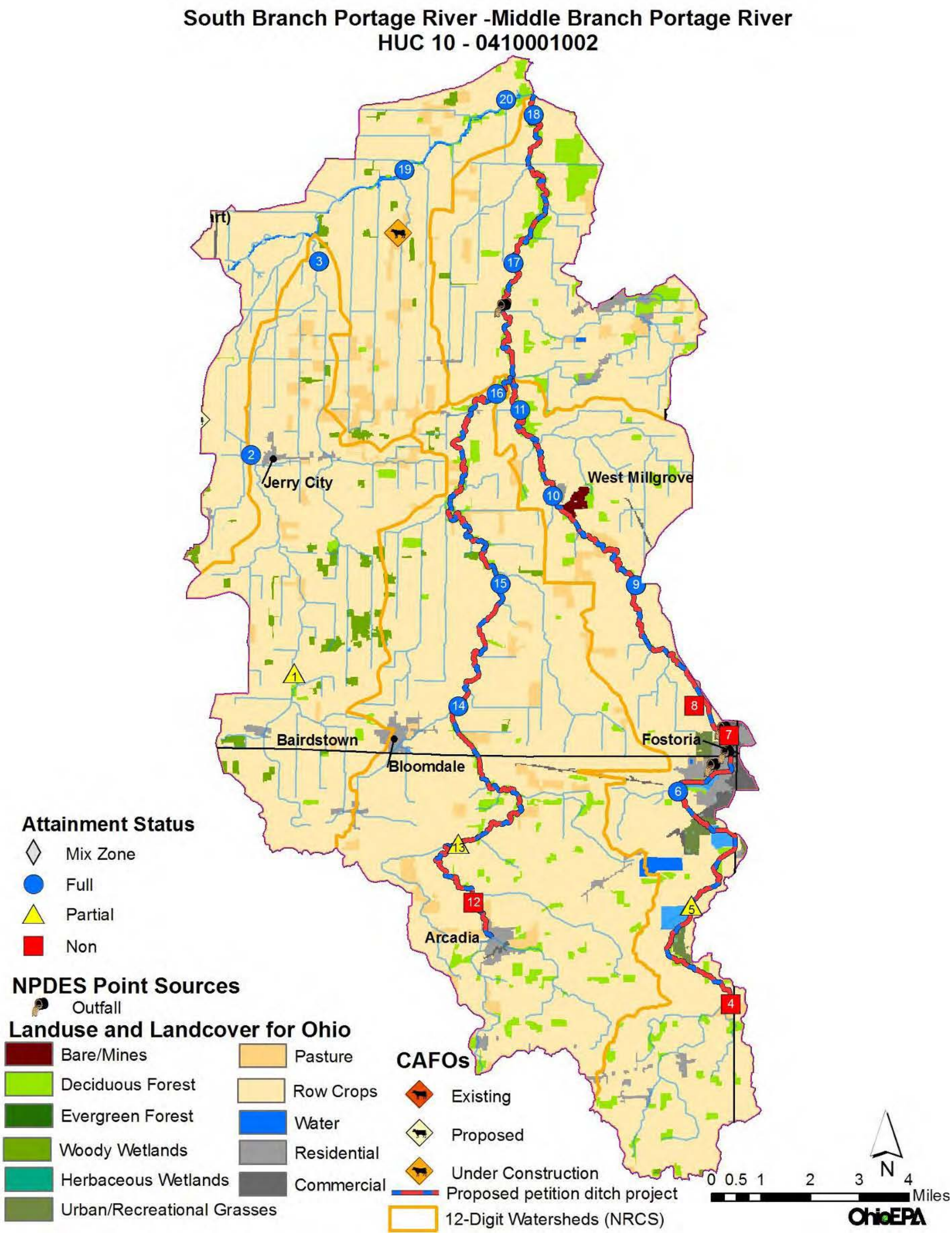

Figure 51. Land use and attainment status of sampling locations within South Branch Portage River - Middle Branch Portage River (HUC 10 - 0410001002).

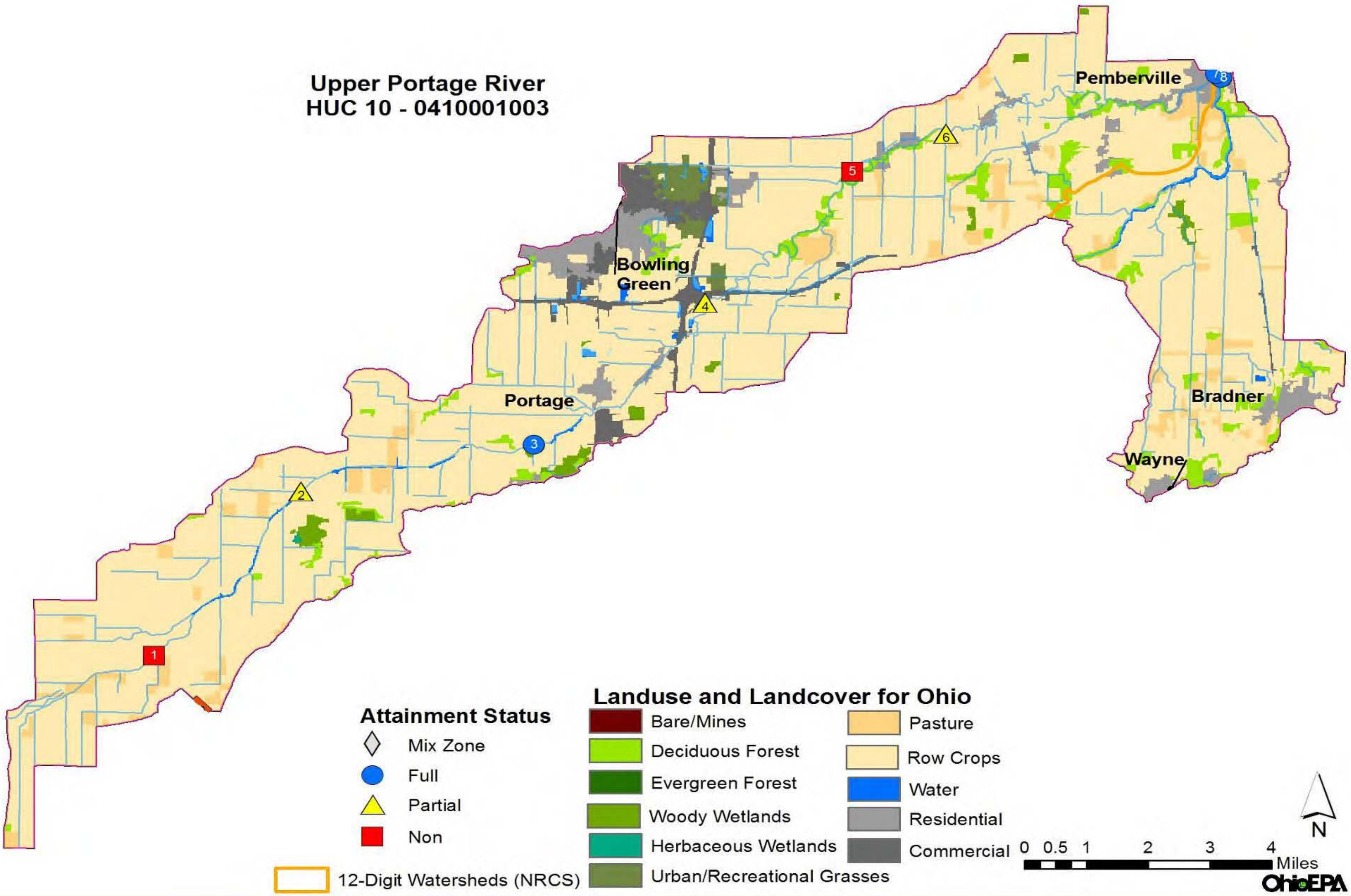

Figure 52. Land use and attainment status of sampling locations within Upper Portage River (HUC 10 - 0410001003).

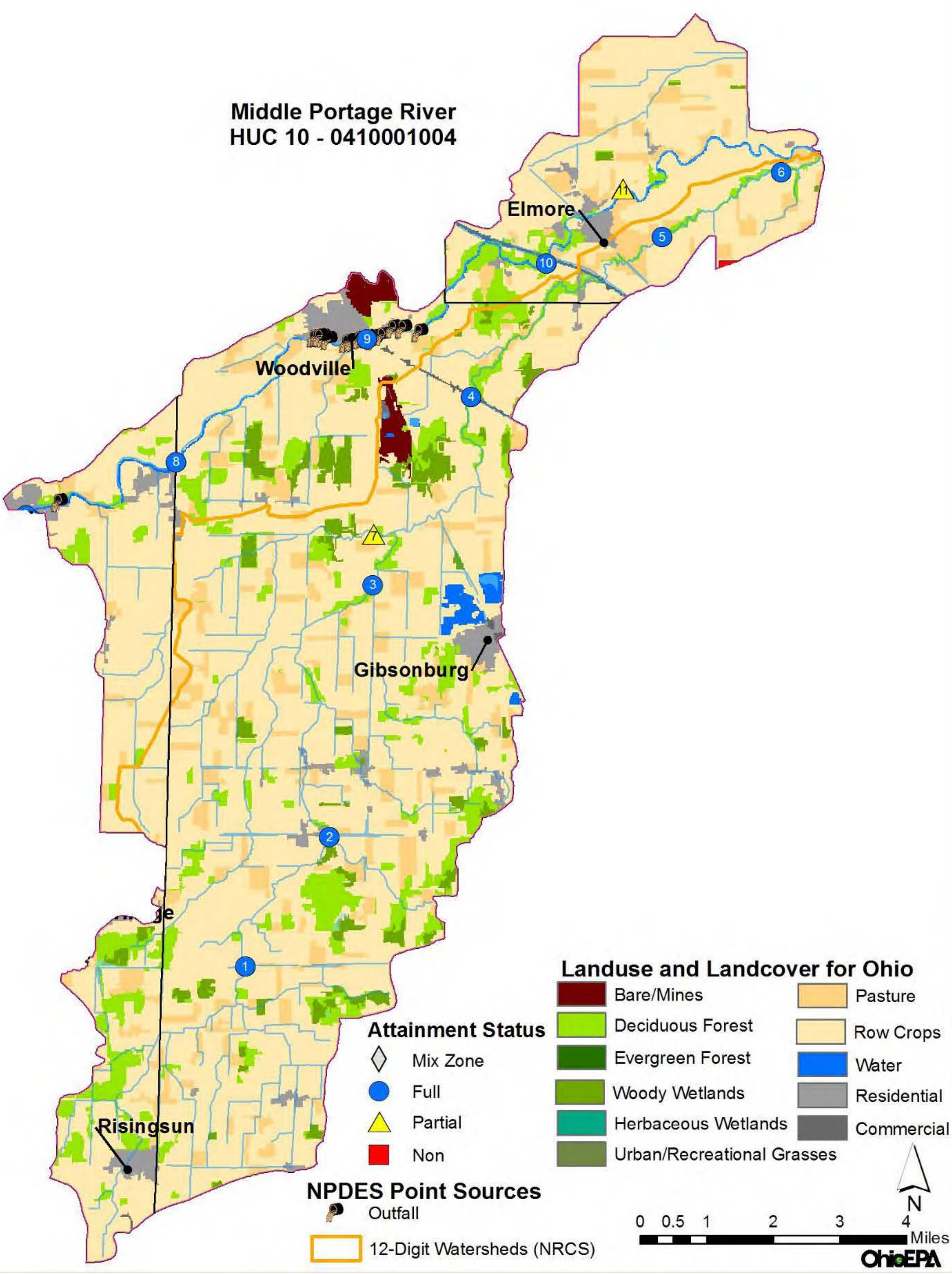

Figure 53. Land use and attainment status of sampling locations within Middle Portage River (HUC 10 - 0410001004).

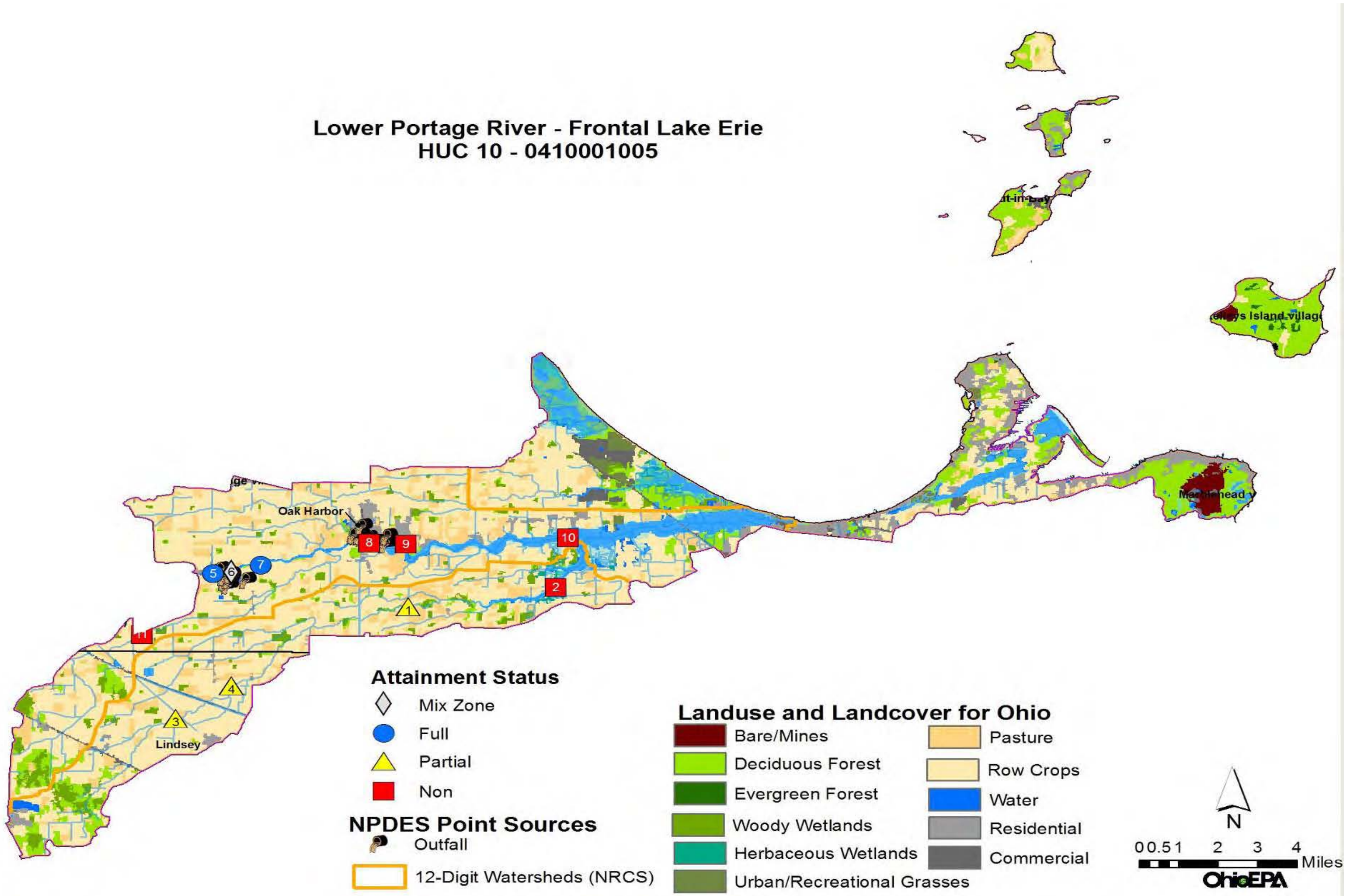

Figure 54. Land use and attainment status of sampling locations within Lower Portage River - Frontal Lake Erie (HUC 10 - 0410001005).

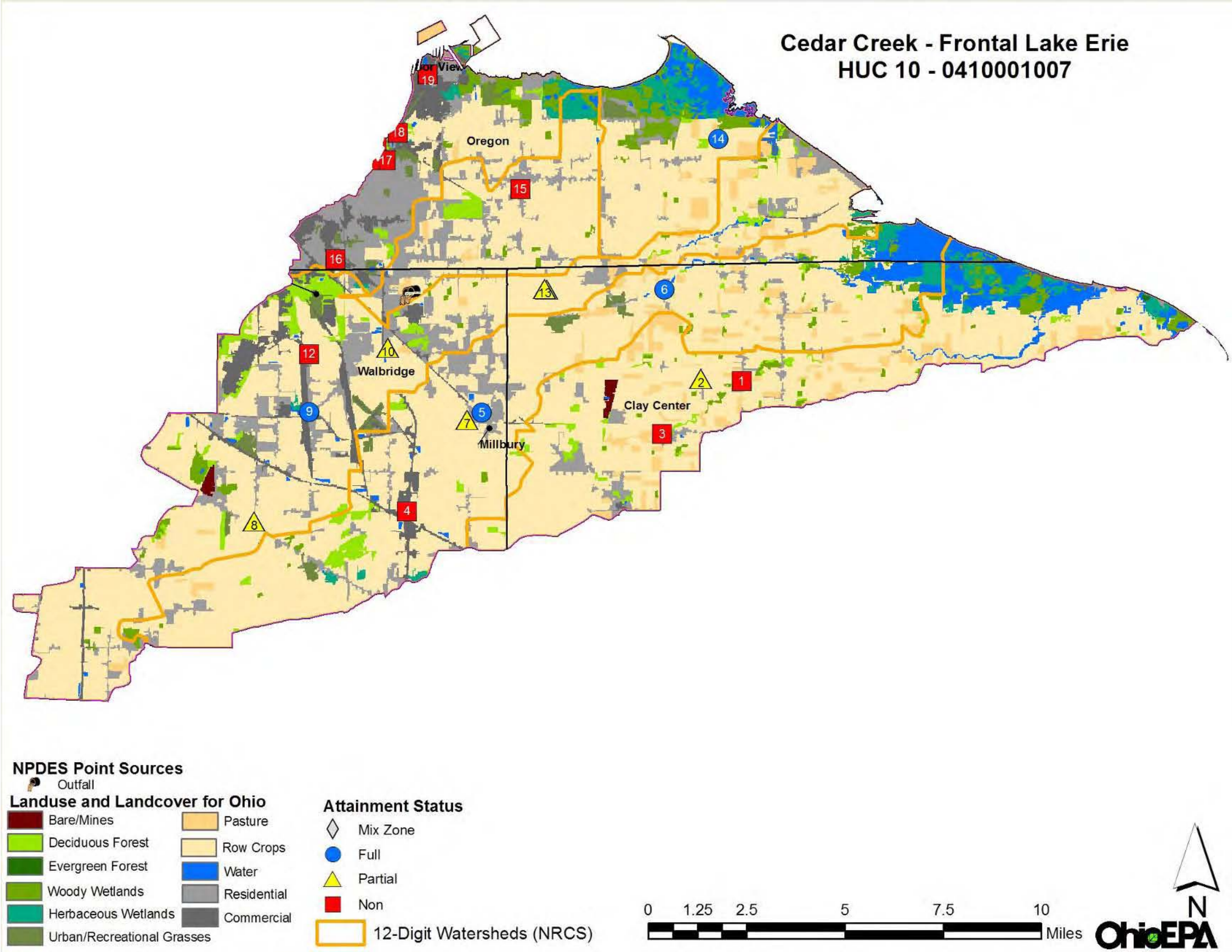

Figure 55. Land use and attainment status of sampling locations within Cedar Creek - Frontal Lake Erie (HUC 10 - 0410001007).

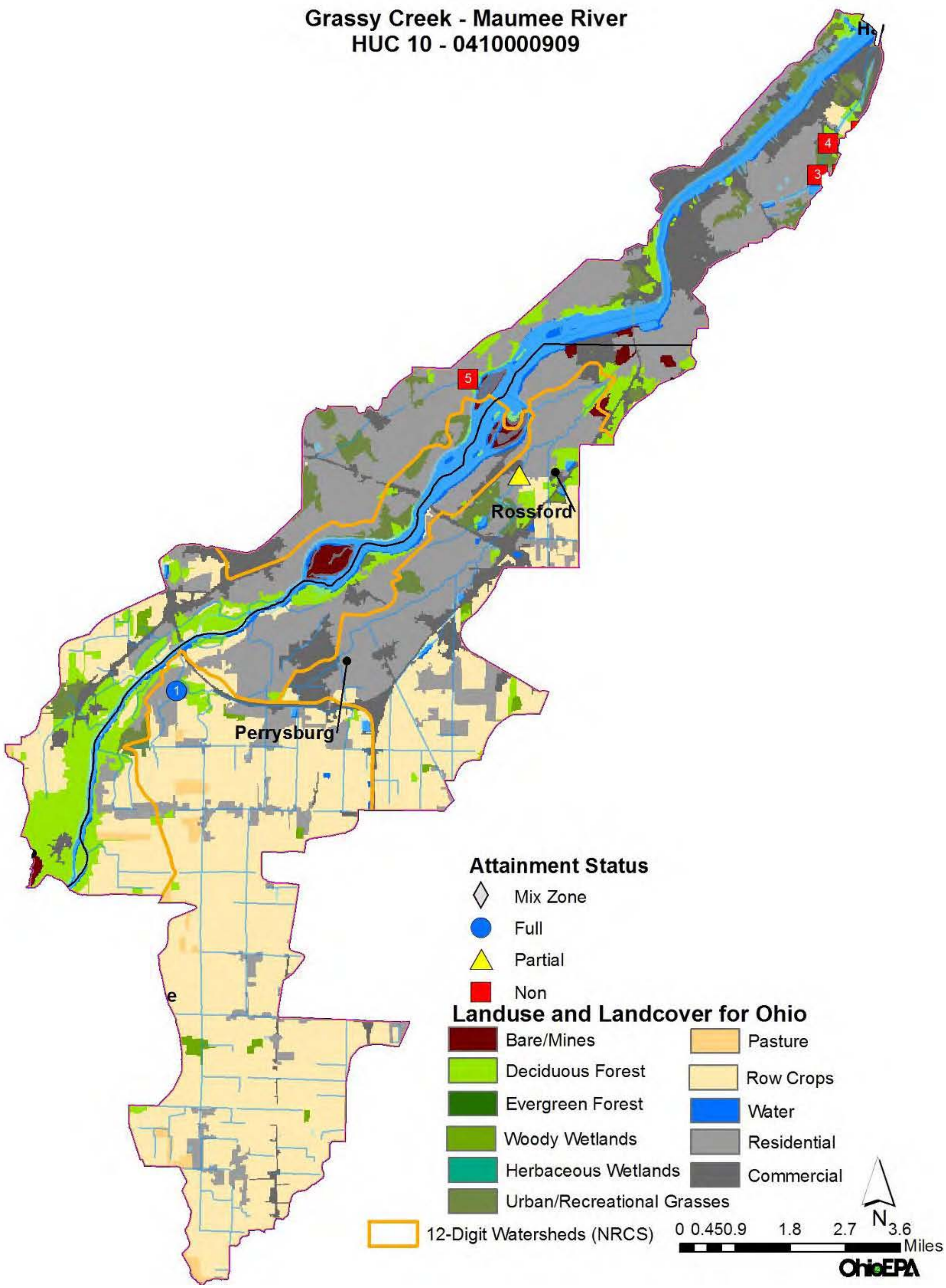

Figure 56. Land use and attainment status for sampling locations within Grassy Creek - Maumee River (HUC 10 - 0410000909).

RECOMMENDATIONS

The majority of the streams listed in the Ohio Water Quality Standards for the study area are assigned the WWH aquatic life use designation (Table 23). These streams were originally designated for aquatic life uses in the 1978 Ohio WQS. The techniques used then did not include standardized approaches to the collection of instream biological data or numerical biological criteria. This study used biological data to evaluate and establish aquatic life uses for a number of streams in the study area.

Thirty streams were evaluated for aquatic life and recreational use potential between 2006-2008 (Tables 2, 8, 9, 10, 11 and 23). Significant findings include the following:

- Four undesignated streams were evaluated for the first time and received the WWH aquatic life use designation. Grassy Creek Diversion had fish and macroinvertebrate communities in full attainment of the WWH aquatic life use designation. The fish communities of Wolf Creek/Berger Ditch, Rader Creek, and Coon Creek were within WWH expectations.

- Three streams previously designated as LRW should have their aquatic life use designation switched to WWH. Fish and macroinvertebrate communities for two of the streams fully met WWH expectations. These two streams were tributary to Rocky Ford Creek at RM 10.75 (Fenburg tributary 1), and tributary to Fenburg Tributary 1 at RM 1.99 (Fenburg Tributary 2). The fish community of Williams Ditch (tributary to Cedar Creek at RM 0.5) was found to represent a WWH community and therefore should also receive the WWH aquatic life use designation.

- The existing Secondary Contact Recreation use for Fenburg Tributary 1 and Fenburg Tributary 2 should be changed to Primary Contact Recreation.

- Biological sampling confirmed the appropriateness of the WWH aquatic life use designation for nine streams in the study area. These streams included Cedar Creek, Dry Creek, Crane Creek, Henry Creek, Turtle Creek, North Branch Turtle Creek, South Branch Turtle Creek, Ninemile Creek, and Wolf Creek. The remaining streams sampled within the study area should retain the associated designated aquatic life use.

The remaining streams in this study should retain the Primary Contact Recreation use, or Secondary Contact Recreation use, along with the Agricultural Water Supply and Industrial Water Supply uses.

Table 23. Waterbody use designation recommendations for the Portage River basin, select Lake Erie tributaries, and select Maumee River tributaries. Designations based on the 1978 and 1985 water quality standards appear as asterisks (*). A plus sign (+) indicates a new recommendation or confirmation of an existing use based on the findings of this report.

Water Body Segment	Use Designations													Comments
		Aquatic Life Habitat						Water Supply			Recreation			
	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR	
Chapter 3745-1-11														
Duck Creek		+							*+	*+		*+		
Delaware Creek		+							+	+		+		
Grassy Creek		+							+	+		+		
Grassy Creek Diversion		Δ+							Δ+	Δ+		Δ+		
Chapter 3745-1-23														
Otter creek – headwaters to 0.2 miles downstream of E. Broadway (RM 7.0)							+		+*	+*		+*		Small drainageway maintenance
- RM 7.0 to mouth				+					+*	+*		+*		HELP ecoregion - channel modification
Driftmeyer ditch							+		+	+			+	Small drainageway maintenance
Amlosch ditch							+		+	+			+	Small drainageway maintenance
Wolf ditch/Berger ditch		Δ+							Δ+	Δ+		Δ+		
Cedar creek		+*							+*	+*		+*		
Williams ditch (Cedar creek RM 0.5)		Δ+					+		+	+		Δ+	+	Small drainageway maintenance
Wolf creek (Williams ditch RM 4.0)		*							*	*		*		
Dry creek		+*							+*	+*		+*		
Little Cedar creek		*							*	*		*		
Crane creek		+*							+*	+*		+*		
Ayers creek		*							*	*		*		
Little Crane creek		*							*	*		*		
Henry creek		+*							+*	+*		+*		
Two Root creek		*							*	*		*		

Water Body Segment	Use Designations													Comments
		Aquatic Life Habitat						Water Supply			Recreation			
	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR	
Turtle creek		+*							+*	+*		+*		
North branch		+*							+*	+*		+*		
South branch		+*							+*	+*		+*		
Toussaint river		+							+	+		+		
Rushaw creek		*							*	*		*		
Toussaint creek		+							+	+		+		
Packer creek		+							+	+		+		
Lacarpe creek - headwaters to Tettau rd. (RM 2.6)							+		*	*			+	Small drainageway maintenance
- Tettau rd. to the mouth		*							*	*		*		
Portage river		+							+	+		+		
Little Portage river		+							+	+		+		
Ninemile creek		+*							+*	+*		+*		
Lacarpe creek		*							*	*		*		
Wolf creek		+*							+*	+*		+*		
Sugar creek		+							+	+		+		
Coon Creek		Δ+							Δ+	Δ+		Δ+		
North branch		+							+	+		+		
Poe Ditch (North branch RM 8.55)							+		+	+			+	Small drainageway maintenance
Middle branch		+							+	+		+		
Bull creek		+							+	+		+		

Water Body Segment	Use Designations													Comments
		Aquatic Life Habitat						Water Supply			Recreation			
	SRW	WWH	EWH	MWH	SSH	CWH	LRW	PWS	AWS	IWS	BW	PCR	SCR	
Rocky ford - at RMs 10.66 and 11.10		+						+	+	+		+		PWS intakes - North Baltimore
- all other segments		+							+	+		+		
Fenburg tributary 1 (Rocky ford RM 10.75)		Δ+					+		+	+		Δ+	+	Small drainageway maintenance
Fenburg tributary 2 (Fenburg tributary 1 RM 1.99)		Δ+					+		+	+		Δ+	+	Small drainageway maintenance
Rader creek – at RM 13.57		Δ+						o	Δ+	Δ+		Δ+		PWS intake - McComb
-all other segments		Δ+							Δ+	Δ+		Δ+		
Needles Creek														
South branch		+							+	+		+		
East branch - at RMs 13.84 and 16.15		+						o	+	+		+		PWS intakes - Fostoria
- all other segments		+							+	+		+		

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