

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER RESOURCES DIVISION
APRIL 2015

STAFF REPORT

BIOLOGICAL SURVEY OF THE CHERRY CREEK AND PIGEON RIVER WATERSHEDS
HURON AND SANILAC COUNTIES, MICHIGAN
JUNE-AUGUST 2013

INTRODUCTION

During summer 2013, staff of the Michigan Department of Environment Quality (MDEQ), Water Resources Division (WRD), assessed biological, chemical, and habitat conditions in watersheds in Huron and Sanilac Counties in eastern Michigan. The watershed group was comprised of the Pigeon River and Cherry Creek watersheds. The objectives of the investigation were to:

1. Assess the current status and condition of individual water bodies and determine whether Michigan Water Quality Standards (WQS) are being met, using a probabilistic sampling design.
2. Identify nonpoint sources (NPS) of water quality impairment, and evaluate the effectiveness of specific NPS water quality improvement projects.
3. Satisfy monitoring requests submitted by internal and external customers.
4. Determine if the water quality is changing over time.

Watershed Group Description

The Pigeon River and Cherry Creek watersheds are coastal watersheds located primarily in Huron and Sanilac Counties with small portions extending into Tuscola and St. Clair Counties. The Pigeon and Pinnebog Rivers are the largest systems, with both streams having main channel lengths of approximately 40 miles. In addition to these rivers there are numerous smaller systems that drain directly to Lake Huron or Saginaw Bay. The watersheds are wholly within the Huron/Erie Plains Ecoregion (Omernik and Gallant, 1988).

Soil composition within the watersheds consists mostly of soil types that are nearly level and gently undulating and either somewhat poorly drained or poorly drained (United States Department of Agriculture [USDA], 1980). The combination of these attributes yields systems with minimal groundwater influence, which are predominantly influenced by precipitation events.

Land use in the sampled watersheds is predominantly agricultural (82.5% in Huron County and 67.7% in Sanilac County) (USDA, 2007). Many of the smaller streams in the watersheds have been straightened and dredged to accelerate surface drainage. Many of the sites sampled were maintained drains with herbaceous vegetation dominating the banks, no canopy cover, and crop land a short distance from the top of the maintained bank.

Previous MDEQ sampling efforts were conducted in June 2008 (Cooper, 2009), June-August 2003 (Cooper, 2004), June-July 1998 (Walterhouse, 1999a and 1999b), 1993 and 1994 (Morse, 1994 a-d), and 1991 (Morse, 1992). Each of the sampling efforts reported varying degrees of impairment to the biological community. The high percentage of agricultural land use was cited as the chief cause of impairment. Specifically, extensive channel alteration, excessive

siltation/sedimentation, lack of stable substrate, scoured banks, and insufficient riparian habitat. Several sites also had nuisance aquatic plant/algae conditions suggesting nutrient enrichment.

METHODS

Biological (macroinvertebrate) and habitat surveys were conducted using the Surface Water Assessment Section (SWAS) Procedure 51 (MDEQ, 1990). A total of 31 sites were sampled during 2013. To develop a statistically-based estimate of attainment status in the Cherry Creek and Pigeon watersheds, 26 randomly selected stream/river sites were assessed. Four previous status sites were sampled to determine temporal trends within the watershed group. One additional site was targeted for sampling based on a request from the United States Environmental Protection Agency (USEPA) to inform a planned nutrient Total Maximum Daily Load for the watershed. Both the macroinvertebrate and habitat components of Procedure 51 were performed at all 31 sites (Figure 1 and Table 1). In addition, water samples were collected at one station, and a few locations were visited and subject to only visual observation. This study was designed to provide statistically sound conclusions on the status and condition for the entire area sampled (both watersheds) and not the individual watershed level. Assessment at the watershed level in this study may not possess sufficient statistical power, and any results and/or discussion at the individual watershed level should be considered with caution.

The biological and habitat data were analyzed using the methods outlined in Creal *et al.*, 1996. Macroinvertebrate communities were ranked from excellent to poor based on a scale from 9 to -9. A site score of +5 or greater is considered excellent, -5 or less poor, and -4 to +4 are classified as acceptable. Negative scores for acceptable sites are considered to be tending towards a poor ranking while positive acceptable scores are tending towards excellent. Ten metrics were measured to determine the habitat scores. The highest possible habitat score is 200. Sites with a score >154 are considered excellent, between 105 and 154 good, 56 to 104 marginal, and <56 poor.

RESULTS AND DISCUSSION

Current Status/Attainment of WQS

Benthic Macroinvertebrates

Of the 26 probabilistic sites, 18 (69% ± 8%) were supporting the Other Indigenous Aquatic Life designated use component of R 323.1100(1)(e) of the WQS. Percent attainment was calculated by dividing the number of random sites that met WQS by the total number of random locations (18/26 = 0.69). This value is coupled with a 95% confidence interval to provide our estimate of certainty, meaning there is 95% certainty that true proportion of attainment in sampled watersheds is within ± 8% of the 69% result. The mean Procedure 51 score for macroinvertebrates among the 26 randomly selected sites was -2.9. Total taxa numbers ranged from 12 to 29 at the probabilistic stations. The number of Ephemeroptera, Plecoptera, and Trichoptera families ranged from 0 to 9. Stoneflies were found in 6 of the 26 probabilistic sites. Eighteen sites in the watershed group supported the Other Indigenous Aquatic Life designation with macroinvertebrate scores ranging from +4 to -4, with 15 of these sites having negative scores. The remaining 8 randomly selected sites did not meet the criteria to support the Other Indigenous Aquatic Life designation. These sites and their corresponding scores were Big Creek (Site 5) score -5, Mill Creek (Site 7) score -5, Elkton Drain (Site 11) score -7, Gorke Drain (Site 12) score -6, Bird Creek (Site 15) score -6, Pigeon River (Site 18) score -7, Southworth Drain (Site 24) score -5, and County Line Creek (Site 25) score -8. Macroinvertebrate sampling results and metric evaluations for all sites sampled can be found in Table 2.

Habitat

Overall stream habitat quality was low at the probabilistic stations, with clear evidence of extensive habitat alterations at many sites. Of the 26 probabilistic sites surveyed for habitat, 2 were rated as excellent (8%), 6 were rated as good (23%), 13 were rated as marginal (50%), and 5 were rated as poor (19%). Lower habitat scores were mainly due to either poor or marginal scores in the following categories; sinuosity, pool variability, epifaunal substrate availability, flashiness, bank stability, vegetative cover, and riparian vegetative zone width. All five of the sites with poor habitat scores were channelized systems, which were highly modified to promote agricultural land use activities (Photo A). Habitat metric scores, ratings, weather, and stream conditions for all sites sampled are presented in Table 3.

Photo A: Upstream portion of Shebeon Creek (Site 13) the personification of a highly modified system. Note the slumping bank, which was rare.



Algae and Aquatic Plants

Nuisance aquatic algal/plant conditions were present at 4 sites sampled in the summer of 2013. Three of the 26 (11%) probabilistic sites (Shebeon Creek, Gorke Drain, and Baranski Drain) and one trend site (Columbia Drain) had nuisance conditions at the time of sampling with *Cladophora* coverage ranging from 60-85% (Table 4).

The presence of nuisance *Cladophora* at these sites does not necessarily indicate persistent summer-long nuisance conditions. Previous sampling of Michigan streams by SWAS staff has found that these blooms can come and go throughout the summer governed by physical and chemical conditions. Additionally, extensive riparian canopy removal and channel widening, with its resultant low flow velocities (both commonly associated with maintained agricultural drainage systems such as those sampled in the Cherry Creek/Pigeon River watersheds) results in the

stream receiving full sunlight for large portions of the day, which can promote primary production and stimulate nuisance conditions even without elevated nutrient concentrations. Additional monitoring of nutrients and expression permanence is needed to determine whether nutrient expression at these sites is a result of drain maintenance activities or likely due to increased loading of nutrients into the system.

Water Chemistry

A water grab sample was collected and analyzed for nutrients at one trend sample site during 2013. Columbia Drain (Site 1T) was sampled due to the extent of *Cladophora* growing in the sample reach (Photo B). All parameters met WQS (Table 5). The excessive algal growth is likely due to the combination of several factors, including availability of hard substrate (not common at other sample locations), lack of shade/canopy, and nutrient inputs directed from the adjacent field (Photo C).



NPS Water Quality Impairments

The majority of sites sampled in 2013 expressed some level of impairment from NPS activities associated with agriculture. Sixteen of the 31 sites were highly modified and regularly maintained to drain cropland. At these sites vegetated buffer zones were often undersized or lacking altogether (Photo D). In addition to insufficient buffer zones, outfalls from field tiles were also observed at some sites. The following sites were modified (dredged and canopy removal) to be categorized as drains; Cramp Drain (Site 4), Big Creek (Site 5), Nettle Run (Site 8), Shebeon Creek (Site 9), Elk Creek (Site 10), Elkton Drain (Site 11), Gorke Drain (Site 12), Shebeon Creek (Site 13), Bird Creek (Site 15), Baranski Drain (Site 21), Schram Branch (Site 22), Big Creek (Site 26A), Beaubien Drain (Site 28A), Wixon Drain (Site 30A), Columbia Drain (Site 1T), and Bad Axe Creek (Site 1R).

Photo D: Bird Creek (Site 15) illustrates the absence of canopy cover and agricultural activities up to the edge of the water.



Monitoring Requests

Bad Axe Creek/Drain (Site R1)

At the request of the USEPA a sample site was added to Bad Axe Creek. Previous sampling of this site in 1998 found both the macroinvertebrate community and habitat to be poor. Results from the 2013 sampling effort also ranked the macroinvertebrate community as poor (-5) but the habitat as marginal (75). The 1998 study mentioned “extreme fluctuations in stream flow” as a problem for the highly channelized systems in the watershed (Walterhouse, 1999a). This site on Bad Axe Creek provided a great example of this during 2013. The initial attempt to sample the site on July 8 was after 3.71 inches of rain had fallen in the area the day before (National Oceanic and Atmospheric Administration [NOAA], 2013). Upon reaching the site it was clear that conditions were unsafe for sample collection (Photos E and F). The second visit to the site in August found the water level greatly reduced and favorable for sample collection (Photos G and H). The dramatic increase in water volume and flow during the July 2013 (and any similar) rain event are likely to have a negative impact on the macroinvertebrate community.

Photo E: High water conditions downstream Bad Axe Creek July 2013.



Photo F: High water upstream Bad Axe Creek July 2013.

Photo G: Normal flow downstream Bad Axe Creek August 2013.



Photo H: Normal flow upstream Bad Axe Creek August 2013.

Temporal Water Quality Changes

Trend Sites

Sampling was conducted at four sites previously sampled in 2008 to elucidate temporal water quality trends within the watershed group. All four sites had acceptable macroinvertebrate scores (+2 to -2) and a range of habitat scores (188 to 99). Pinnebog River (Site 4T) scored excellent for habitat (188) and was the only trend site with a positive macroinvertebrate score (+2). The two sites with good habitat scores were Big Creek (Site 5T) and Elm Creek (Site 6T), which had macroinvertebrate scores of -2 and -1, respectively. Columbia Drain (Site 1T) had a marginal habitat score and a macroinvertebrate score of -2.

Comparing the 2013 and 2008 scores suggest a general trend of macroinvertebrate community improvement with static habitat quality (Figures 2a and 2b). However, there appears to be no correlation between changes in macroinvertebrate and habitat scores. The magnitude of change in the scores between the two sample years are minimal and may be attributable to natural variability. Additional sampling of these sites in future years should help to provide a clearer picture of the water quality trends in this watershed group.

Aquatic Invasive Species

Invasive species were observed at 6 of the 31 sampled sites with a total of 5 different species found (Table 6). Species observation was done during normal Procedure 51 survey time and neither intensive nor quantitative sampling was performed. Therefore, it is possible that additional invasive species were present but not observed at any or all of the sample sites. Overall densities observed during 2013 sampling in the watershed group were sparse.

CONCLUSIONS

The surveys performed during 2013 in the Pigeon River and Cherry River watersheds suggest that most sites (18 of 26) were rated as acceptable for macroinvertebrate community quality; many are being negatively impacted by agricultural undertakings. Stressors include; lack of suitable colonization habitat, channelization, riparian buffer loss, sedimentation, and flashy flows.

Field work by: Mike Alexander, Environmental Manager
Tom Alwin, Aquatic Biologist
Sylvia Heaton, Aquatic Biologist
Molly Rippke, Aquatic Biologist
Surface Water Assessment Section
Water Resources Division

Meredith Hartmann Bohdan, Enforcement Analyst
Water Resources Division

Report by: Tom Alwin, Aquatic Biologist
Surface Water Assessment Section
Water Resources Division

LITERATURE CITED

- Cooper, J. 2004. A Biological Survey of Southwestern Lake Huron and Eastern Saginaw Bay Coastal Streams, Huron and Sanilac Counties, Michigan. Report #MI/DEQ/WD-03/094.
- Cooper, J. 2009. A Biological Survey of Southwestern Lake Huron and Eastern Saginaw Bay Coastal Streams, Huron and Sanilac Counties, Michigan. Report #MI/DEQ/WB-09/011.
- Creal, W., Hanshue, S., Kosek, S., Oemke, M., and Walterhouse, M. 1996. Update of GLEAS Procedure 51 Metric Scoring and Interpretation. Report #MI/DEQ/SWQ-96/068.
- MDEQ. 1990. SWAS Procedure WRD-SWAS-051. Qualitative Biological and Habitat Survey Protocols for Wadable Streams and Rivers, April 24, 1990. Revised June 1991, August 1996, January 1997, May 2002, and December 2008. Reformatted May 2014.
- Morse, D. 1992. A Biological Survey of Pigeon River, Huron County, September 17-18, 1991. MDEQ Staff Report #MI/DNR/SWQ-92/105.
- Morse, D. 1994a. A Biological Survey of East Saginaw Bay Coastal Streams, Huron County, June 3-4, 1994. MDEQ Staff Report #MI/DNR/SWQ-94/024.
- Morse, D. 1994b. A Biological Survey of the Pinnebog River and Bad Axe Drain, Huron County, June 14-15, 1993. MDEQ Staff Report #MI/DNR/SWQ-94/028.
- Morse, D. 1994c. Biological Survey of State and Columbia Drains, Huron and Tuscola Counties, July 19-20, 1993. MDEQ Staff Report #MI/DNR/SWQ-94/029.
- Morse, D. 1994d. Biological Surveys of Selected Lake Huron Tributaries, Huron and Sanilac Counties, June 7-9, 1993, and June 3, 1994. MDEQ Staff Report #MI/DNR/SWQ-94/025.
- NOAA. 2013. Daily Observation Data. Retrieved from NOAA National Climatic Data Center on December 30, 2013:
(The link provided was broken and has been removed)
- Omernik, J., and Gallant, A. 1988. Ecoregions of the Upper Midwest States. EPA/600/3-88/037: United States Environmental Protection Agency, Environmental Research Laboratory.
- USDA. 1980. Soil Survey of Huron County, Michigan. USDA.
- USDA. 2007. Farms, Land in Farms, Value of Land and Buildings, and Land Use: 2007 and 2002. Retrieved from <https://www.nass.usda.gov/AgCensus/>
(The link provided was broken and has been removed)
- Walterhouse, M. 1999a. Biological Surveys of Selected East Saginaw Bay Coastal Streams, Huron County, Michigan. Report #MI/DEQ/SWQ-99/062.
- Walterhouse, M. 1999b. Biological Surveys of Selected Lake Huron Tributary Streams, Huron and Sanilac Counties, Michigan. Report #MI/DEQ/SWQ-99/063.

CHERRY / PIGEON WATERSHEDS STATUS / TREND 2013

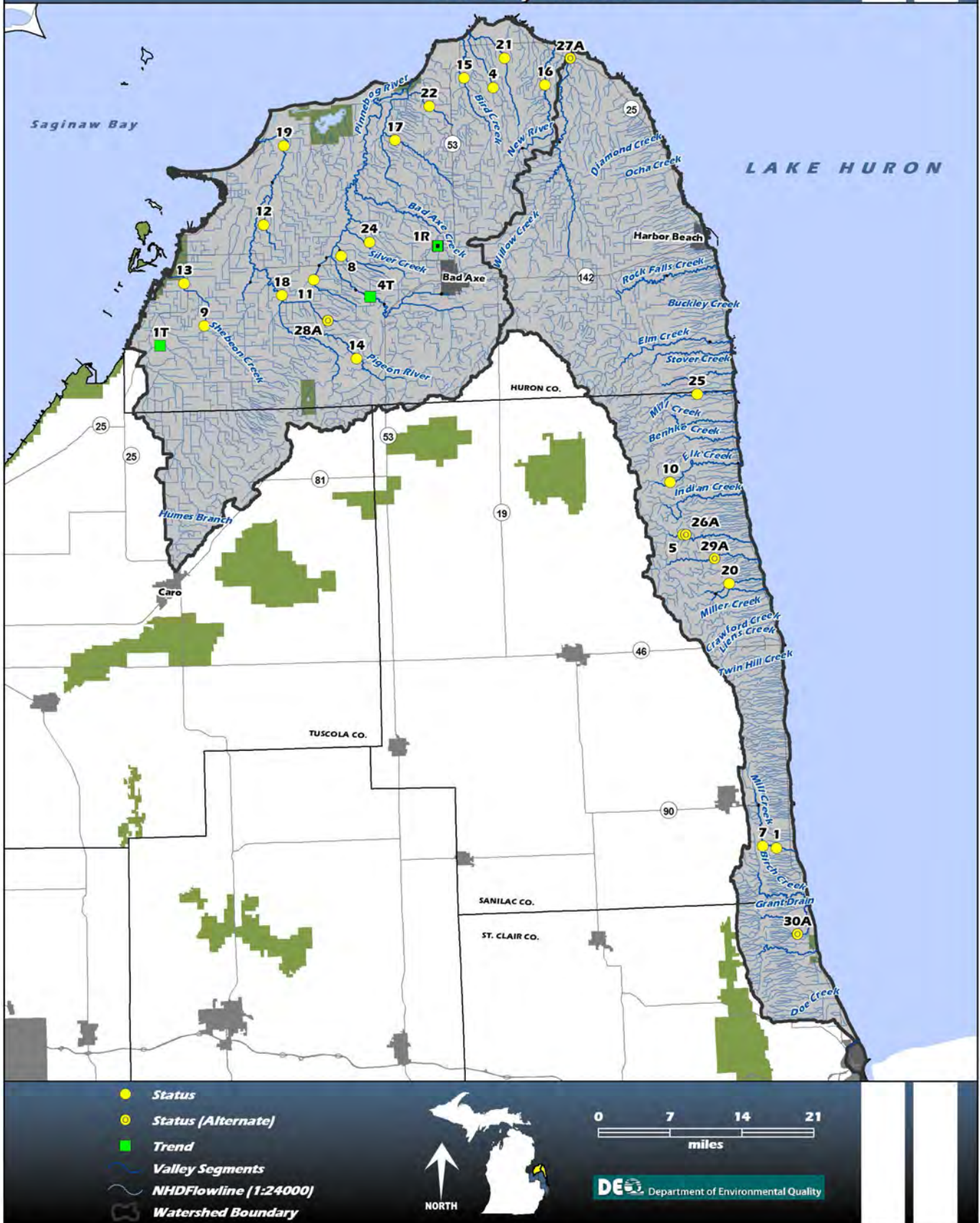


Figure 1. Watershed map with sample site locations.

Figure 2a. Comparison of 2008 and 2013 macroinvertebrate scores at trend sites .

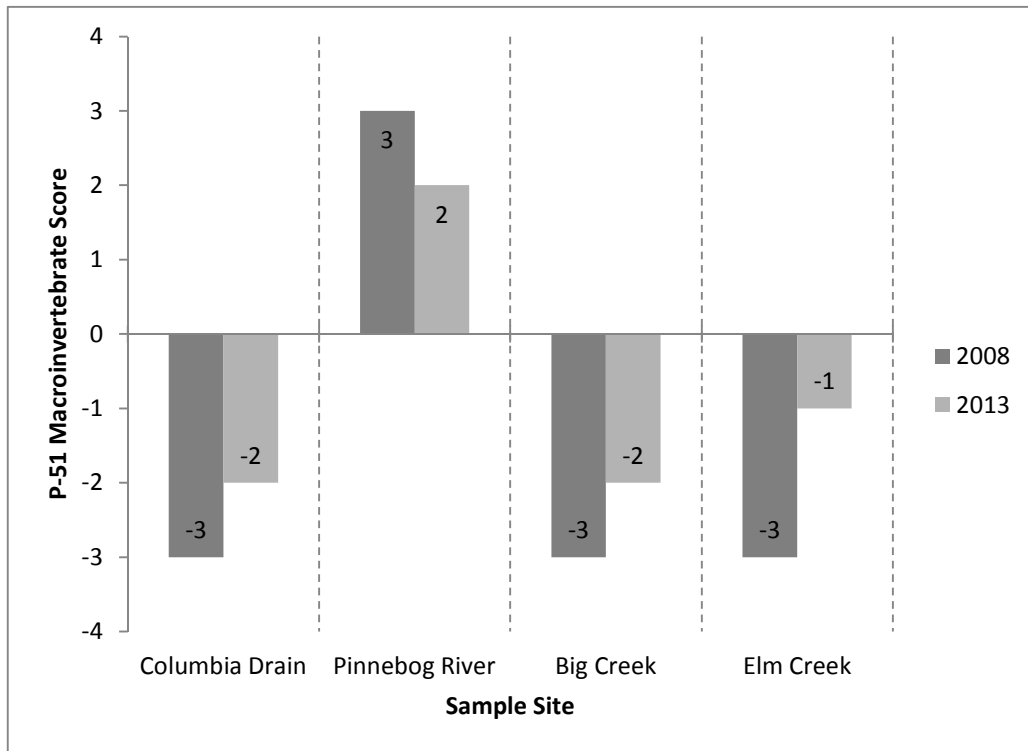


Figure 2b. Comparison of 2008 and 2013 habitat scores at trend sites.

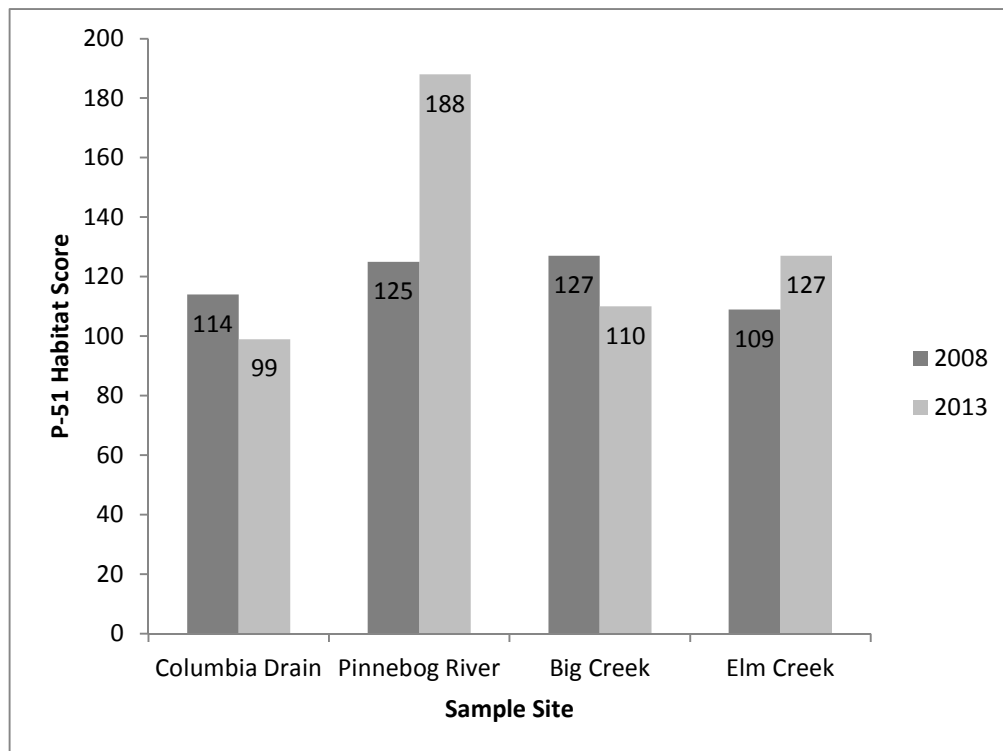


Table 1. 2013 Sample site information and Procedure 51 survey results for Cherry Creek/Pigeon River watershed group.
A=Alternative Site, T=Trend Site, R=Targeted Request Site

SITE ID	STORET	WATERBODY NAME	LOCATION	DATE	LATITUDE	LONGITUDE	COUNTY	TOWNSHIP	SURVEY SCORE	
									MACROINVERT	HABITAT
1	760271	Mill Creek	Babcock Road	6/17/2013	43.22261	-82.54803	Sanilac	Worth	4 Acceptable	189 Excellent
4	320328	Cramp Drain	Carpenter Road	6/20/2013	43.99844	-82.94711	Huron	Dwight	-1 Acceptable	84 Marginal
5	760272	Big Creek	off Shabonna Road	6/19/2013	43.54309	-82.67923	Sanilac	Marion	-5 Poor	75 Marginal
7	760273	Mill Creek	Burns Line Road	6/17/2013	43.22473	-82.56745	Sanilac	Worth	-5 Poor	153 Good
8	320329	Nettle Run	Krohn Road	8/13/2013	43.82727	-83.16107	Huron	Oliver	-2 Acceptable	47 Poor
9	320330	Shebeon Creek	Kilmanagh Road	7/10/2013	43.75622	-83.35386	Huron	Brookfield	-2 Acceptable	54 Poor
10	760274	Elk Creek	Hunt Road	7/9/2013	43.59670	-82.69744	Sanilac	Marion	-3 Acceptable	52 Poor
11	320331	Elkton Drain	Geiger Road	7/8/2013	43.80315	-83.19985	Huron	Oliver	-7 Poor	63 Marginal
12	320332	Gorke Drain	Campbell Road	7/10/2013	43.85893	-83.27042	Huron	McKinley	-6 Poor	33 Poor
13	320223	Shebeon Creek	Geiger Road	7/10/2013	43.79917	-83.38250	Huron	Fairhaven	-4 Acceptable	39 Poor
14	320333	Pigeon River	Moore Road	7/8/2013	43.72284	-83.13916	Huron	Grant	-3 Acceptable	147 Good
15	320334	Bird Creek	Crockard Road	6/20/2013	44.00810	-82.98788	Huron	Dwight	-6 Poor	67 Marginal
16	320335	New River	Stoddard Road	6/18/2013	44.00098	-82.87384	Huron	Huron	-1 Acceptable	190 Excellent
17	320276	Moore Creek	Lackie Road	6/20/2013	43.94496	-83.08517	Huron	Hume	-3 Acceptable	134 Good
18	320336	Pigeon River	Haist Road	8/13/2013	43.78731	-83.24459	Huron	Winsor	-7 Poor	65 Marginal
19	320245	Pigeon River	Kinde Road	7/10/2013	43.93940	-83.24170	Huron	Lake	-2 Acceptable	92 Marginal
20	760275	Forester Creek	State Road	6/19/2013	43.49318	-82.61446	Sanilac	Forester	-3 Acceptable	129 Good
21	320337	Baranski Drain	Hunter Road	6/20/2013	44.02838	-82.93085	Huron	Dwight	-1 Acceptable	83 Marginal
22	320338	Schram Branch	Shinevale Road	6/20/2013	43.97936	-83.03708	Huron	Hume	-1 Acceptable	70 Marginal
24	320339	Southworth Drain	Grassmere Road	7/8/2013	43.84135	-83.12143	Huron	Colfax	-5 Poor	81 Marginal
25	760276	County Line Creek	Schock Road	7/9/2013	43.68665	-82.65961	Sanilac	Delaware	-8 Poor	104 Marginal
26A	760277	Big Creek	Shabbona Road	6/19/2013	43.54313	-82.67552	Sanilac	Marion	-3 Acceptable	67 Marginal
27A	320239	Willow Creek	M25	8/13/2013	44.02810	-82.83810	Huron	Huron	2 Acceptable	150 Good
28A	320340	Beaubien Drain	Elkton Road	7/8/2013	43.76161	-83.18000	Huron	Oliver	1 Acceptable	73 Marginal
29A	760181	Cherry Creek	Geotze Road	7/9/2013	43.51870	-82.63502	Sanilac	Marion	-3 Acceptable	141 Good
30A	740467	Wixon Drain	State Road	6/17/2013	43.13436	-82.51849	St. Clair	Burtchville	-2 Acceptable	102 Marginal
1T	320319	Columbia Drain	Lange Rd	6/18/2013	43.73600	-83.41600	Huron	Sebewaing	-2 Acceptable	99 Marginal
4T	320306	Pinnebog River	Grassmere Rd	6/18/2013	43.78600	-83.12000	Huron	Colfax	2 Acceptable	188 Excellent
5T	760242	Big Creek	Loree Rd	6/17/2013	43.54100	-82.65600	Sanilac	Marion	-2 Acceptable	110 Good
6T	320302	Elm Creek	Schock Rd	6/19/2013	43.74200	-82.66200	Huron	Sherman	-1 Acceptable	127 Good
1R	320228	Bad Axe Creek	W. Richardson Rd	8/13/2013	43.83758	-83.02484	Huron	Colfax	-5 Poor	75 Marginal

Table 2. Qualitative macroinvertebrate sampling results and metric evaluation for the Cherry and Pigeon Watersheds 2013

TAXA	Mill Creek Babcock Road 6/17/2013 Site 1		Cramp Drain Carpenter Road 6/20/2013 Site 4		Big Creek off Shabonna Rd 6/19/2013 Site 5		Mill Creek Burns Line Road 6/17/2013 Site 7	
	Value	Score	Value	Score	Value	Score	Value	Score
ANNELIDA (segmented worms)								
Hirudinea (leeches)			1				1	
Oligochaeta (worms)	5		9		4		2	
ARTHROPODA								
Crustacea								
Amphipoda (scuds)	1						1	
Decapoda (crayfish)	2		8		2		2	
Isopoda (sow bugs)					1			
Arachnoidea								
Hydracarina	1				1		24	
Insecta								
Ephemeroptera (may flies)								
Baetidae	6							
Caenidae	6		2					
Leptophlebiidae	19							
Odonata								
Anisoptera (dragonflies)								
Aeshnidae	4						1	
Zygoptera (damselflies)								
Calopterygidae	1							
Coenagrionidae			15					
Plecoptera (stoneflies)								
Perlidae	1						3	
Hemiptera (true bugs)								
Corixidae			3		4		28	
Veliidae	1		1		1		1	
Trichoptera (caddisflies)								
Brachycentridae	1							
Helicopsychidae	7		1					
Hydroptilidae	1							
Limnephilidae			1					
Philopotamidae	2							
Coleoptera (beetles)								
Dytiscidae (total)	2				2		10	
Halplidae (adults)	5		1		1		1	
Hydrophilidae (total)			1					
Scirtidae (adults)	8						2	
Elmidae	110		24		1			
Haliplidae (larvae)			1				2	
Diptera (flies)								
Ceratopogonidae	7		5					
Chironomidae	93		150		37		95	
Dixidae					1			
Simuliidae	40		1		150		53	
Stratiomyidae					1			
Tipulidae	2		1					
MOLLUSCA								
Gastropoda (snails)								
Lymnaeidae					6		15	
Physidae	1		31		69		36	
Planorbidae			22		11			
Pelecypoda (bivalves)								
Sphaeriidae (clams)	1		4		3			
TOTAL INDIVIDUALS	327		282		295		277	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	25	1	19	1	17	1	16	0
NUMBER OF MAYFLY TAXA	3	1	1	1	0	-1	0	-1
NUMBER OF CADDISFLY TAXA	4	1	2	1	0	-1	0	-1
NUMBER OF STONEFLY TAXA	1	1	0	-1	0	-1	1	1
PERCENT MAYFLY COMP.	9.48	-1	0.71	-1	0.00	-1	0.00	-1
PERCENT CADDISFLY COMP.	3.36	0	0.71	-1	0.00	-1	0.00	-1
PERCENT DOMINANT TAXON	33.64	-1	53.19	-1	50.85	-1	34.30	-1
PERCENT ISOPOD, SNAIL, LEECH	0.31	1	19.15	-1	29.49	-1	18.77	-1
PERCENT SURF. AIR BREATHERS	4.89	1	2.13	1	3.05	1	15.16	0
TOTAL SCORE		4		-1		-5		-5
MACROINV. COMMUNITY RATING		ACCEPTABLE		ACCEPTABLE		POOR		POOR

Table 2 (cont.). Qualitative macroinvertebrate sampling results and metric evaluation for the Cherry and Pigeon Watersheds 2013

TAXA	Nettle Run Krohn Road 8/13/2013 Site 8		Shebeon Creek Kilmanagh Road 7/10/2013 Site 9		Elk Creek Hunt Road 7/9/2013 Site 10		Elkton Drain Geiger Road 7/8/2013 Site 11	
PLATYHELMINTHES (flatworms)								
Turbellaria			2					
ANNELIDA (segmented worms)								
Hirudinea (leeches)	3		1		3		1	
Oligochaeta (worms)	1				6		3	
ARTHROPODA								
Crustacea								
Amphipoda (scuds)			4					
Decapoda (cray fish)	2							
Isopoda (sow bugs)	1		4				7	
Arachnoidea								
Hydracarina	5						3	
Insecta								
Ephemeroptera (may flies)								
Baetidae			2					
Caenidae			1		2			
Odonata								
Anisoptera (dragonflies)								
Aeshnidae	3							
Libellulidae							1	
Zygoptera (damselflies)								
Coenagrionidae	25		5				1	
Hemiptera (true bugs)								
Belostomatidae	1		1					
Corixidae	6		1		2		9	
Trichoptera (caddisflies)								
Helicopsychidae	7		3					
Hydropsychidae	1							
Hydroptilidae			1					
Coleoptera (beetles)								
Dytiscidae (total)			1		3		1	
Haliplidae (adults)	7		3		1			
Hydrophilidae (total)	3		1		2			
Psephenidae (adults)	2							
Elmidae	18		11					
Haliplidae (larvae)			8		1			
Diptera (flies)								
Ceratopogonidae			1					
Chironomidae	64		23		34		50	
Culicidae							1	
Simuliidae	9		69		24		4	
Tipulidae							1	
MOLLUSCA								
Gastropoda (snails)								
Hydrobiidae	5							
Lymnaeidae					21		5	
Physidae	98		224		154		207	
Planorbidae			4		29		10	
Pelecypoda (bivalves)								
Sphaeriidae (clams)			2		1			
TOTAL INDIVIDUALS	261		372		283		304	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	19	1	21	1	13	1	15	-1
NUMBER OF MAYFLY TAXA	0	-1	2	1	1	1	0	-1
NUMBER OF CADDISFLY TAXA	2	1	2	0	0	-1	0	-1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	0.00	-1	0.81	-1	0.71	-1	0.00	-1
PERCENT CADDISFLY COMP.	3.07	0	1.08	-1	0.00	-1	0.00	-1
PERCENT DOMINANT TAXON	37.55	-1	60.22	-1	54.42	-1	68.09	-1
PERCENT ISOPOD, SNAIL, LEECH	41.00	-1	62.63	-1	73.14	-1	75.66	-1
PERCENT SURF. AIR BREATHERS	7.28	1	1.88	1	2.83	1	3.62	1
TOTAL SCORE		-2		-2		-3		-7
MACROINV. COMMUNITY RATING	ACCEPTABLE		ACCEPTABLE		ACCEPTABLE		POOR	

Table 2 (cont.). Qualitative macroinvertebrate sampling results and metric evaluation for the Cherry and Pigeon Watersheds 2013

TAXA	Gorke Drain Campbell Road 7/10/2013 Site 12		Shebeon Creek Geiger Rd 7/10/2013 Site 13		Pigeon River Moore Road 7/8/2013 Site 14		Bird Creek Crockard Road 6/20/2013 Site 15	
	Value	Score	Value	Score	Value	Score	Value	Score
PLATYHELMINTHES (flatworms)								
Turbellaria			1					
ANNELIDA (segmented worms)								
Hirudinea (leeches)	2							
Oligochaeta (worms)	6		4		16		2	
ARTHROPODA								
Crustacea								
Amphipoda (scuds)	2		12					
Decapoda (cray fish)	1							
Isopoda (sow bugs)	4							
Arachnoidea								
Hydracarina	6		3				3	
Insecta								
Ephemeroptera (mayflies)								
Caenidae			2					
Heptageniidae			1					
Odonata								
Anisoptera (dragonflies)								
Aeshnidae	2				2		1	
Libellulidae	1							
Zygoptera (damselflies)								
Calopterygidae					4			
Coenagrionidae	1		19		1		4	
Hemiptera (true bugs)								
Belostomatidae	2		8					
Corixidae	16		1		6		12	
Gerridae			1		1			
Trichoptera (caddisflies)								
Helicopsychidae			1		4			
Hydropsychidae					2		1	
Limnephilidae			1		3			
Coleoptera (beetles)								
Dytiscidae (total)	5		1		1		1	
Haliplidae (adults)	2		49				4	
Hydrophilidae (total)	4		1					
Scirtidae (adults)								1
Dryopidae			1					
Elmidae			60		40			
Haliplidae (larvae)	1		2					
Diptera (flies)								
Ceratopogonidae	1		9				1	
Chironomidae	31		24		59		30	
Culicidae	4		1					
Simuliidae	29		5		19		1	
Tipulidae					1			
MOLLUSCA								
Gastropoda (snails)								
Hydrobiidae	3				5			
Lymnaeidae	2				3		37	
Physidae	158		74		14		173	
Planorbidae	2		2		1		28	
Pelecypoda (bivalves)								
Sphaeriidae (clams)					6			
TOTAL INDIVIDUALS	285		283		188		299	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	22	1	23	0	19	0	15	0
NUMBER OF MAYFLY TAXA	0	-1	2	1	0	-1	0	-1
NUMBER OF CADDISFLY TAXA	0	-1	2	0	3	0	1	-1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	0.00	-1	1.06	-1	0.00	-1	0.00	-1
PERCENT CADDISFLY COMP.	0.00	-1	0.71	-1	4.79	0	0.33	-1
PERCENT DOMINANT TAXON	55.44	-1	26.15	-1	31.38	-1	57.86	-1
PERCENT ISOPOD, SNAIL, LEECH	60.00	-1	26.86	-1	12.23	0	79.60	-1
PERCENT SURF. AIR BREATHERS	11.58	0	21.91	0	4.26	1	6.02	1
TOTAL SCORE		-6		-4		-3		-6
MACROINV. COMMUNITY RATING		POOR		ACCEPTABLE		ACCEPTABLE		POOR

Table 2 (cont.). Qualitative macroinvertebrate sampling results and metric evaluation for the Cherry and Pigeon Watersheds 2013

TAXA	New River Stoddard Road 6/18/2013 Site 16		Moore Creek Lackie Road 6/20/2013 Site 17		Pigeon River Haist Rd 8/13/2013 Site 18		Pigeon River Kinde Rd 7/10/2013 Site 19	
	Value	Score	Value	Score	Value	Score	Value	Score
ANNELIDA (segmented worms)								
Hirudinea (leeches)			2					
Oligochaeta (worms)	3		1		21		9	
ARTHROPODA								
Crustacea								
Amphipoda (scuds)	3		2		1			
Decapoda (cray fish)	4						1	
Isopoda (sow bugs)	1		12		7		19	
Arachnoidea								
Hydracarina	7		11		5			
Insecta								
Ephemeroptera (may flies)								
Baetidae	3						5	
Caenidae							1	
Heptageniidae	1						1	
Leptophlebiidae	1							
Tricorythidae							1	
Odonata								
Anisoptera (dragonflies)								
Aeshnidae							3	
Zygoptera (damselflies)								
Calopterygidae	1		1		1			
Coenagrionidae	1		2		8			
Plecoptera (stoneflies)								
Perlidae	4		2					
Hemiptera (true bugs)								
Corixidae	30		18		11			
Pleidae	2							
Veliidae	2							
Megaloptera								
Sialidae (alder flies)	2							
Trichoptera (caddisflies)								
Hydropsychidae	1						4	
Hydroptilidae	1							
Leptoceridae					1		1	
Coleoptera (beetles)								
Dytiscidae (total)	13		6		2			
Halipidae (adults)	1		1				1	
Hydrophilidae (total)			1					
Scirtidae (adults)	1		2					
Dryopidae					2		2	
Elmidae	5		24		2		2	
Diptera (flies)								
Ceratopogonidae	1							
Chironomidae	197		160		36		20	
Culicidae	1		1					
Simuliidae	47		37				193	
Tipulidae			1					
MOLLUSCA								
Gastropoda (snails)								
Hydrobiidae							3	
Lymnaeidae	1		3				2	
Physidae	31		2				10	
Planorbidae	7		2					
Pelecypoda (bivalves)								
Sphaeriidae (clams)	1		1				2	
TOTAL INDIVIDUALS	373		292		97		280	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	29	0	22	0	12	-1	19	0
NUMBER OF MAYFLY TAXA	3	1	0	-1	0	-1	4	1
NUMBER OF CADDISFLY TAXA	2	0	0	-1	1	-1	2	0
NUMBER OF STONEFLY TAXA	1	1	1	1	0	-1	0	-1
PERCENT MAYFLY COMP.	1.34	-1	0.00	-1	0.00	-1	2.86	-1
PERCENT CADDISFLY COMP.	0.54	-1	0.00	-1	1.03	-1	1.79	-1
PERCENT DOMINANT TAXON	52.82	-1	54.79	-1	37.11	-1	68.93	-1
PERCENT ISOPOD, SNAIL, LEECH	10.72	0	7.19	0	7.22	0	12.14	0
PERCENT SURF. AIR BREATHERS	13.40	0	9.93	1	13.40	0	0.36	1
TOTAL SCORE		-1		-3		-7		-2
MACROINV. COMMUNITY RATING	ACCEPTABLE		ACCEPTABLE		POOR		ACCEPTABLE	

Table 2 (cont.). Qualitative macroinvertebrate sampling results and metric evaluation for the Cherry and Pigeon Watersheds 2013

TAXA	Forester Creek State Road 6/19/2013 Site 20		Baranski Drain Hunter Road 6/20/2013 Site 21		Schram Branch Shinevale Road 6/20/2013 Site 22		Southworth Drain Grassmere Road 7/8/2013 Site 24	
	Value	Score	Value	Score	Value	Score	Value	Score
ANNELIDA (segmented worms)								
Hirudinea (leeches)	1		1					
Oligochaeta (worms)	2				15		45	
ARTHROPODA								
Crustacea								
Amphipoda (scuds)					1			
Decapoda (cray fish)	3				3			
Isopoda (sow bugs)			6		20		1	
Arachnoidea								
Hydracarina	17				2			
Insecta								
Ephemeroptera (mayflies)								
Baetidae			1		1			
Odonata								
Anisoptera (dragonflies)								
Aeshnidae	1				1			
Zygoptera (damselflies)								
Coenagrionidae					5			
Plecoptera (stoneflies)								
Perlidae	1							
Hemiptera (true bugs)								
Corixidae	29		1				1	
Veliidae	1				1			
Trichoptera (caddisflies)								
Glossosomatidae					1			
Helicopsychidae			1					
Hydropsychidae							1	
Coleoptera (beetles)								
Dytiscidae (total)	4		3		5			
Halplidae (adults)	3						1	
Hydrophilidae (total)	3		1					
Scirtidae (adults)	2				1			
Elmidae	4		25		5		1	
Halplidae (larvae)			1					
Diptera (flies)								
Ceratopogonidae	3				10			
Chironomidae	49		31		141		148	
Culicidae	2				2			
Dixidae	2							
Simuliidae	125		5		1		18	
MOLLUSCA								
Gastropoda (snails)								
Lymnaeidae	1		27				1	
Physidae	3		129		35		69	
Planorbidae			47		34		2	
Pelecypoda (bivalves)								
Sphaeriidae (clams)	1		2		1		1	
TOTAL INDIVIDUALS	257		281		285		289	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	21	0	15	1	20	1	12	0
NUMBER OF MAYFLY TAXA	0	-1	1	1	1	1	0	-1
NUMBER OF CADDISFLY TAXA	0	-1	1	1	1	1	1	0
NUMBER OF STONEFLY TAXA	1	1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	0.00	-1	0.36	-1	0.35	-1	0.00	-1
PERCENT CADDISFLY COMP.	0.00	-1	0.36	-1	0.35	-1	0.35	-1
PERCENT DOMINANT TAXON	48.64	-1	45.91	-1	49.47	-1	51.21	-1
PERCENT ISOPOD, SNAIL, LEECH	1.95	1	74.73	-1	31.23	-1	25.26	-1
PERCENT SURF. AIR BREATHERS	17.12	0	1.78	1	3.16	1	0.69	1
TOTAL SCORE		-3		-1		-1		-5
MACROINV. COMMUNITY RATING		ACCEPTABLE		ACCEPTABLE		ACCEPTABLE		POOR

Table 2 (cont.). Qualitative macroinvertebrate sampling results and metric evaluation for the Cherry and Pigeon Watersheds 2013

TAXA	County Line Creek Schock Road 7/9/2013 Site 25		Big Creek Shabbona Road 6/19/2013 Site 26A		Willow Creek M-25 8/13/2013 Site 27A		Beaudien Drain Elkton Road 7/8/2013 Site 28A	
	Value	Score	Value	Score	Value	Score	Value	Score
PLATYHELMINTHES (flatworms)								
Turbellaria					1			
ANNELIDA (segmented worms)								
Hirudinea (leeches)					1		4	
Oligochaeta (worms)			7		2			
ARTHROPODA								
Crustacea								
Amphipoda (scuds)			6				10	
Decapoda (cray fish)	38		11					
Isopoda (sow bugs)	4						1	
Arachnoidea								
Hydracarina					4		4	
Insecta								
Ephemeroptera (may flies)								
Baetidae	2				30			
Caenidae							1	
Heptageniidae			1		27		4	
Tricorythidae					10			
Odonata								
Anisoptera (dragonflies)								
Aeshnidae	3		1				1	
Zygoptera (damselflies)								
Calopterygidae					1		1	
Coenagrionidae			1		1			
Lestidae	1							
Hemiptera (true bugs)								
Corixidae	110		6				1	
Gerridae	1				1		1	
Pleidae					1			
Veliidae			1					
Trichoptera (caddisflies)								
Helicopsychidae					20		1	
Hydropsychidae					80		13	
Hydroptilidae					1		2	
Leptoceridae					1			
Limnephilidae					5			
Philopotamidae					1			
Coleoptera (beetles)								
Dytiscidae (total)			5		1			
Halplidae (adults)	1		6		2			
Psephenidae (adults)					1			
Scirtidae (adults)					1		1	
Elmidae	4				12		156	
Halplidae (larvae)	2				1			
Diptera (flies)								
Ceratopogonidae					4		1	
Chironomidae	82		34		43		57	
Simuliidae			48		3		17	
Stratiomyidae			2					
Tipulidae							2	
MOLLUSCA								
Gastropoda (snails)								
Ancylidae (limpets)					1			
Lymnaeidae			32		16			
Physidae	16		48		11		27	
Planorbidae	3		4					
Pelecypoda (bivalves)								
Sphaeriidae (clams)					1			
TOTAL INDIVIDUALS	267		213		284		305	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	12	-1	16	1	29	0	20	1
NUMBER OF MAYFLY TAXA	1	-1	1	1	3	0	2	1
NUMBER OF CADDISFLY TAXA	0	-1	0	-1	6	1	3	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	0.75	-1	0.47	-1	23.59	1	1.64	-1
PERCENT CADDISFLY COMP.	0.00	-1	0.00	-1	38.03	1	5.25	0
PERCENT DOMINANT TAXON	41.20	-1	22.54	-1	28.17	-1	51.15	-1
PERCENT ISOPOD, SNAIL, LEECH	8.61	0	39.44	-1	10.21	0	10.49	0
PERCENT SURF. AIR BREATHERS	41.95	-1	9.39	1	2.46	1	0.98	1
TOTAL SCORE		-8		-3		2		1
MACROINV. COMMUNITY RATING		POOR		ACCEPTABLE		ACCEPTABLE		ACCEPTABLE

Table 2 (cont.). Qualitative macroinvertebrate sampling results and metric evaluation for the Cherry and Pigeon Watersheds 2013

	Cherry Creek Goetz Rd 7/9/2013 Site 29A		Wixon Drain State Road 6/17/2013 Site 30A		Columbia Drain Lange Road 6/18/2013 Site 11		Pinnebog River D/S Grassmere Rd 6/18/2013 Site 41	
TAXA								
PLATYHELMINTHES (flatworms)								
Turbellaria	1				1			
ANNELIDA (segmented worms)								
Hirudinea (leeches)	3							
Oligochaeta (worms)	6		9				1	
ARTHROPODA								
Crustacea								
Amphipoda (scuds)					34		5	
Decapoda (cray fish)	1		1		1		3	
Isopoda (sow bugs)							7	
Arachnoidea								
Hydracarina	1		13		6		4	
Insecta								
Ephemeroptera (mayflies)								
Baetidae			1				12	
Caenidae					6		11	
Heptageniidae					5		7	
Odonata								
Anisoptera (dragonflies)								
Aeshnidae	1						3	
Zygoptera (damselflies)								
Calopterygidae					3		5	
Coenagrionidae					25			
Plecoptera (stoneflies)								
Perlidae			1				13	
Hemiptera (true bugs)								
Corixidae	18		1		2			
Gerridae	1							
Mesoveliidae			1					
Pleidae					1			
Veliidae							1	
Megaloptera								
Corydalidae (dobson flies)							1	
Trichoptera (caddisflies)								
Brachycentridae							1	
Helicopsychidae					2		1	
Hydropsychidae	1						18	
Leptoceridae	1							
Limnephilidae							1	
Molannidae							1	
Phryganeidae					1		3	
Coleoptera (beetles)								
Dytiscidae (total)			22		1			
Halplidae (adults)	1		6		5			
Hydrophilidae (total)					1			
Scirtidae (adults)	1		1					
Dryopidae	2							
Elmidae	21		1		26		19	
Halplidae (larvae)					1			
Diptera (flies)								
Athericidae							1	
Ceratopogonidae					8			
Chironomidae	190		114		64		149	
Culicidae			9		1		1	
Simuliidae	2		29		48		1	
Lipulidae	2		1					
MOLLUSCA								
Gastropoda (snails)								
Lymnaeidae					3			
Physidae	7		75		55			
Planorbidae					2			
Pelecypoda (bivalves)								
Pisidiidae			3					
Sphaeriidae (clams)	4						3	
TOTAL INDIVIDUALS	264		288		302		272	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	19	0	17	1	23	0	25	0
NUMBER OF MAYFLY TAXA	0	-1	1	1	2	1	3	0
NUMBER OF CADDISFLY TAXA	2	0	0	-1	2	0	6	1
NUMBER OF STONEFLY TAXA	0	-1	1	1	0	-1	1	1
PERCENT MAYFLY COMP.	0.00	-1	0.35	-1	3.64	-1	11.03	-1
PERCENT CADDISFLY COMP.	0.76	-1	0.00	-1	0.99	-1	9.19	0
PERCENT DOMINANT TAXON	71.97	-1	39.58	-1	21.19	0	54.78	-1
PERCENT ISOPOD, SNAIL, LEECH	3.79	1	26.04	-1	19.87	-1	2.57	1
PERCENT SURF. AIR BREATHERS	7.95	1	13.89	0	3.64	1	0.74	1
TOTAL SCORE		-3		-2		-2		2
MACROINV. COMMUNITY RATING		ACCEPTABLE		ACCEPTABLE		ACCEPTABLE		ACCEPTABLE

Table 2 (cont.). Qualitative macroinvertebrate sampling results and metric evaluation for the Cherry and Pigeon Watersheds 2013

TAXA	Big Creek Loree Road 6/17/2013 Site 5T		Elm Creek Schock Road 6/19/2013 Site 6T		Bad Axe Creek Richardson Road 8/13/2013 Site 1R	
	Value	Score	Value	Score	Value	Score
PLATYHELMINTHES (flatworms)						
Turbellaria					5	
ANNELIDA (segmented worms)						
Hirudinea (leeches)	1				2	
Oligochaeta (worms)	10		4		2	
ARTHROPODA						
Crustacea						
Amphipoda (scuds)	2					
Isopoda (sow bugs)			2		4	
Arachnoidea						
Hydracarina	15		2		6	
Insecta						
Ephemeroptera (mayflies)						
Baetidae	4		4			
Caenidae			6			
Heptageniidae			14			
Odonata						
Anisoptera (dragonflies)						
Aeshnidae	1				1	
Zygoptera (damselflies)						
Coenagrionidae	1		3		9	
Hemiptera (true bugs)						
Corixidae	41		7		5	
Saldidae	1					
Veliidae	12		1			
Trichoptera (caddisflies)						
Helicopsychidae			1			
Hydropsychidae			6		3	
Limnephilidae	1					
Coleoptera (beetles)						
Dytiscidae (total)	10				1	
Halplidae (adults)	1				6	
Scirtidae (adults)	3					
Elmidae			42		5	
Diptera (flies)						
Ceratopogonidae	6		6			
Chironomidae	135		76		139	
Culicidae			5			
Dixidae			1			
Simuliidae	21		80		173	
Tabanidae			9			
Tipulidae	3		47			
MOLLUSCA						
Gastropoda (snails)						
Lymnaeidae	2		1			
Physidae	5					
Planorbidae	1					
Pelecypoda (bivalves)						
Sphaeriidae (clams)	1					
TOTAL INDIVIDUALS	277		317		361	
METRIC	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	22	1	20	0	14	-1
NUMBER OF MAYFLY TAXA	1	1	3	1	0	-1
NUMBER OF CADDISFLY TAXA	1	0	2	0	1	-1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	1.44	-1	7.57	-1	0.00	-1
PERCENT CADDISFLY COMP.	0.36	-1	2.21	-1	0.83	-1
PERCENT DOMINANT TAXON	48.74	-1	25.24	-1	47.92	-1
PERCENT ISOPOD, SNAIL, LEECH	3.25	1	0.95	1	1.66	1
PERCENT SURF. AIR BREATHERS	24.55	-1	4.10	1	3.32	1
TOTAL SCORE		-2		-1		-5
MACROINV. COMMUNITY RATING	ACCEPTABLE		ACCEPTABLE		POOR	

Table 3. Habitat evaluation for Cherry and Pigeon watersheds 2013

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

	Mill Creek Babcock Road Site 1 RIFLE/RUN	Cramp Drain Carpenter Road Site 4 GLIDE/POOL	Big Creek off Shabonna Road Site 5 GLIDE/POOL	Mill Creek Burns Line Road Site 7 GLIDE/POOL	Nettle Run Krohn Road Site 8 GLIDE/POOL	Shebeon Creek Kilmanagh Road Site 9 GLIDE/POOL	Elk Creek Hunt Road Site 10 GLIDE/POOL
HABITAT METRIC (max. score)							
Substrate and Instream Cover							
Epifaunal Substrate/ Avail Cover (20)	17	10	7	10	1	2	4
Embeddedness (20)*	18						
Velocity/Depth Regime (20)*	19						
Pool Substrate Characterization (20)**		11	11	16	4	1	0
Pool Variability (20)**		2	0	10	0	0	0
Channel Morphology							
Sediment Deposition (20)	18	11	5	17	9	8	3
Flow Status - Maint. Flow Volume (10)	10	9	5	7	4	10	10
Flow Status - Flashiness (10)	10	6	4	8	0	4	4
Channel Alteration (20)	20	5	7	20	1	5	1
Frequency of Riffles/Bends (20)*	17						
Channel Sinuosity (20)**		0	10	10	0	0	0
Riparian and Bank Structure							
Bank Stability (L) (10)	10	7	4	9	7	6	9
Bank Stability (R) (10)	10	8	4	8	7	6	9
Vegetative Protection (L) (10)	10	4	6	9	5	4	5
Vegetative Protection (R) (10)	10	4	6	9	5	4	5
Riparian Veg. Zone Width (L) (10)	10	4	3	10	1	0	1
Riparian Veg. Zone Width (R) (10)	10	3	3	10	3	4	1
TOTAL SCORE (200):	189	84	75	153	47	54	52
HABITAT RATING:	EXCELLENT (NON IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	POOR (SEVERELY IMPAIRED)	POOR (SEVERELY IMPAIRED)	POOR (SEVERELY IMPAIRED)
Date:	6/17/2013	6/20/2013	6/19/2013	6/17/2013	8/13/2013	7/10/2013	7/9/2013
Weather:	Partly Cloudy	Sunny	Sunny	Sunny	Partly Cloudy	Sunny	Partly Cloudy
Air Temperature (°F):	75	60	70	75	63	83	79
Water Temperature(°F):	58	55	58	65	56	78	65
Ave. Stream Width(ft):	6	3	5	9	6	8	4
Ave. Stream Depth(ft):	1	1	0.75	1	1	2	1.5
Surface Velocity (ft/sec):	1.2	1.5	1.25	0.75	0.5	0.75	2
Estimated Flow (CFS):	7.2	4.5	4.6875	6.75	3	12	12
Stream Modifications:	None	Dredged	Dredged	None	Dredged	Dredged	Dredged
Nuisance Plants (Y/N):	N	N	N	N	N	N	N
STORET No.:	760271	320328	760272	760273	320329	320330	760274
Stream Name:	Mill Creek	Cramp Drain	Big Creek	Mill Creek	Nettle Run	Shebeon Creek	Elk Creek
Road Crossing/Location:	Babcock Road	Carpenter Road	off Shabonna Road	Burns Line Road	Krohn Road	Kilmanagh Road	Hunt Road
TRS:	09N16E14	18N13E15	13N15E22	09N16E11	16N11E11	15N10E06	13N15E04
Latitude (dd):	43.22261	43.99844	43.54309	43.22473	43.82727	43.75622	43.59669
Longitude (dd):	-82.54803	-82.94711	-82.67923	-82.56745	-83.16107	-83.35386	-82.69742
Ecoregion:	HELP	HELP	HELP	HELP	HELP	HELP	HELP
USGS Basin Code:	4080104	4080103	4080104	4080104	4080103	4080103	4080104

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3 (cont.). Habitat evaluation for Cherry and Pigeon watersheds 2013

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

	Elkton Drain Geiger Road Site 11	Gorke Drain Campbell Road Site 12	Shebeon Creek Geiger Rd Site 13	Pigeon River Moore Road Site 14	Bird Creek Crockard Road Site 15	New River Stoddard Road Site 16	Moore Creek Lackie Road Site 17
HABITAT METRIC (max. score)	GLIDE/POOL	GLIDE/POOL	GLIDE/POOL	RIFFLE/RUN	GLIDE/POOL	RIFFLE/RUN	RIFFLE/RUN
Substrate and Instream Cover							
Epifaunal Substrate/ Avail Cover (20)	2	3	3	11	2	19	12
Embeddedness (20)*				17		18	15
Velocity/Depth Regime (20)*				10		20	19
Pool Substrate Characterization (20)**	8	6	6		11		
Pool Variability (20)**	0	0	0		4		
Channel Morphology							
Sediment Deposition (20)	3	1	8	14	6	19	13
Flow Status - Maint. Flow Volume (10)	9	3	10	10	9	10	9
Flow Status - Flashiness (10)	6	4	3	5	4	8	1
Channel Alteration (20)	3	2	0	15	5	20	15
Frequency of Riffles/Bends (20)*				11		20	14
Channel Sinuosity (20)**	1	0	0		0		
Riparian and Bank Structure							
Bank Stability (L) (10)	9	4	7	7	6	10	5
Bank Stability (R) (10)	9	4	0	7	5	9	4
Vegetative Protection (L) (10)	4	2	0	10	5	10	9
Vegetative Protection (R) (10)	4	2	2	10	5	10	6
Riparian Veg. Zone Width (L) (10)	3	1	0	10	3	7	4
Riparian Veg. Zone Width (R) (10)	2	1	0	10	2	10	8
TOTAL SCORE (200):	63	33	39	147	67	190	134
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	POOR (SEVERELY IMPAIRED)	POOR (SEVERELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	EXCELLENT (NON-IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
Date:	7/8/2013	7/10/2013	7/10/2013	7/8/2013	6/20/2013	6/18/2013	6/20/2013
Weather:	Cloudy	Sunny	Sunny	Cloudy	Sunny	Sunny	Sunny
Air Temperature (°F):	81	80	77	76	61	58	70
Water Temperature(°F):	71	69	78	70	56	60	63
Ave. Stream Width(ft):	15	5	10	16	8	15	20
Ave. Stream Depth(ft):	1.5	1.5	2	2	2	1	2
Surface Velocity (ft/sec):	0.75	0.75	1	1.5	1.5	1.7	1.5
Estimated Flow (CFS):	16.875	5.625	20	48	24	25.5	60
Stream Modifications:	Dredged	Dredged	Dredged	None	Dredged	None	Canopy Removal
Nuisance Plants (Y/N):	N	Y	N	N	N	N	N
STORET No.:	320331	320332	320223	320333	320334	320335	320276
Stream Name:	Elkton Drain	Gorke Drain	Shebeon Creek	Pigeon River	Bird Creek	New River	Moore Creek
Road Crossing/Location:	Geiger Road	Campbell Road	Geiger Rd	Moore Road	Crockard Road	Stoddard Road	Lackie Road
TRS:	16N11E21	17N10E35	16N09E23	15N11E13	18N13E08	18N14E18	18N12E33
Latitude (dd):	43.80313	43.85893	43.799167	43.72283	44.00809	44.00097	43.94494
Longitude (dd):	-83.19983	-83.2704	-83.3825	-83.13915	-82.98788	-82.87382	-83.08516
Ecoregion:	HELP	HELP	HELP	HELP	HELP	HELP	HELP
USGS Basin Code:	4080103	4080103	4080103	4080103	4080103	4080103	4080103

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3 (cont.). Habitat evaluation for Cherry and Pigeon watersheds 2013

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

	Pigeon River Haist Rd Site 18	Pigeon River Kinde Rd Site 19	Forester Creek State Road Site 20	Baranski Drain Hunter Road Site 21	Schram Branch Shinevale Road Site 22	Southworth Drain Grassmere Road Site 24	County Line Creek Schock Road Site 25
HABITAT METRIC (max. score)	GLIDE/POOL	GLIDE/POOL	GLIDE/POOL	GLIDE/POOL	GLIDE/POOL	GLIDE/POOL	GLIDE/POOL
Substrate and Instream Cover							
Epifaunal Substrate/ Avail Cover (20)	6	9	12	8	8	6	12
Embeddedness (20)*							
Velocity/Depth Regime (20)*							
Pool Substrate Characterization (20)**	2	8	12	9	9	3	7
Pool Variability (20)**	1	6	11	2	0	1	13
Channel Morphology							
Sediment Deposition (20)	2	6	11	10	11	8	8
Flow Status - Maint. Flow Volume (10)	6	10	9	9	9	10	9
Flow Status - Flashiness (10)	0	2	6	8	7	8	4
Channel Alteration (20)	17	15	20	5	2	2	13
Frequency of Riffles/Bends (20)*							
Channel Sinuosity (20)**	8	11	12	1	0	2	7
Riparian and Bank Structure							
Bank Stability (L) (10)	0	6	4	9	7	6	8
Bank Stability (R) (10)	1	3	4	9	7	9	7
Vegetative Protection (L) (10)	5	3	4	3	5	6	5
Vegetative Protection (R) (10)	5	1	4	3	5	7	5
Riparian Veg. Zone Width (L) (10)	7	5	10	3	0	7	3
Riparian Veg. Zone Width (R) (10)	5	7	10	4	0	6	3
TOTAL SCORE (200):	65	92	129	83	70	81	104
HABITAT RATING:	MARGINAL	MARGINAL	GOOD	MARGINAL	MARGINAL	MARGINAL	MARGINAL
	(MODERATELY IMPAIRED)	(MODERATELY IMPAIRED)	(SLIGHTLY IMPAIRED)	(MODERATELY IMPAIRED)	(MODERATELY IMPAIRED)	(MODERATELY IMPAIRED)	(MODERATELY IMPAIRED)
Date:	8/13/2013	7/10/2013	6/19/2013	6/20/2013	6/20/2013	7/8/2013	7/9/2013
Weather:	Partly Cloudy	Sunny	Sunny	Sunny	Sunny	Rainy	Partly Cloudy
Air Temperature (°F):	65	75	65	58	70	71	80
Water Temperature(°F):	59	73	50	50	60	70	71
Ave. Stream Width(ft):	40	35	14	2.5	3	6	16
Ave. Stream Depth(ft):	4.5	2.5	2	1	0.75	2	2.5
Surface Velocity (ft/sec):	0.25	1.7	1.25	2	1.5	1.5	0.1
Estimated Flow (CFS):	45	148.75	35	5	3.375	18	4
Stream Modifications:	None	None	None	Dredged	Dredged	None	Dredged
Nuisance Plants (Y/N):	N	N	N	Y	N	N	N
STORET No.:	320336	320245	760275	320337	320338	320339	760276
Stream Name:	Pigeon River	Pigeon River	Forester Creek	Baranski Drain	Schram Branch	Southworth Drain	County Line Creek
Road Crossing/Location:	Haist Rd	Kinde Rd	State Road	Hunter Road	Shinevale Road	Grassmere Road	Schock Road
TRS:	16N10E25	17N10E03	12N16E07	18N13E03	18N12E23	16N12E06	14N15E02
Latitude (dd):	43.7873	43.9394	43.49318	44.02837	43.97934	43.84134	43.68665
Longitude (dd):	-83.24459	-83.2417	-82.61445	-82.93085	-83.03707	-83.12142	-82.65961
Ecoregion:	HELP	HELP	HELP	HELP	HELP	HELP	HELP
USGS Basin Code:	4080103	4080103	4080104	4080103	4080103	4080103	4080104

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3 (cont.). Habitat evaluation for Cherry and Pigeon watersheds 2013

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

	Big Creek Shabbona Road Site 26A GLIDE/POOL	Willow Creek M-25 Site 27A RIFLE/RUN	Beaudien Drain Elkton Road Site 28A GLIDE/POOL	Cherry Creek Goetz Rd Site 29A RIFLE/RUN	Wixon Drain State Road Site 30A GLIDE/POOL	Columbia Drain Lange Road Site 1T GLIDE/POOL	Pinnebog River D/S Grassmere Road Site 2T RIFLE/RUN
HABITAT METRIC (max. score)							
Substrate and Instream Cover							
Epifaunal Substrate/ Avail Cover (20)	2	15	7	13	6	10	18
Embeddedness (20)*		18		16			15
Velocity/Depth Regime (20)*		9		10			19
Pool Substrate Characterization (20)**	6		3		11	19	
Pool Variability (20)**	0		1		5	13	
Channel Morphology							
Sediment Deposition (20)	1	18	8	13	13	13	19
Flow Status - Maint. Flow Volume (10)	10	6	10	9	5	10	10
Flow Status - Flashiness (10)	8	1	10	4	7	4	9
Channel Alteration (20)	6	20	2	17	13	2	20
Frequency of Riffles/Bends (20)*		11		11			19
Channel Sinuosity (20)**	0		0		4	0	
Riparian and Bank Structure							
Bank Stability (L) (10)	7	8	9	6	6	5	9
Bank Stability (R) (10)	7	6	9	6	6	5	10
Vegetative Protection (L) (10)	7	9	6	8	9	5	10
Vegetative Protection (R) (10)	7	9	6	8	9	5	10
Riparian Veg. Zone Width (L) (10)	3	10	1	10	4	4	10
Riparian Veg. Zone Width (R) (10)	3	10	1	10	4	4	10
TOTAL SCORE (200):	67	150	73	141	102	99	188
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	EXCELLENT (NON-IMPAIRED)
Date:	6/19/2013	8/13/2013	7/8/2013	7/9/2013	6/17/2013	6/18/2013	6/18/2013
Weather:	Sunny	Cloudy	Rainy	Sunny	Partly Cloudy	Partly Cloudy	Sunny
Air Temperature (°F):	70	58	71	72	72	57	58
Water Temperature(°F):	58	57	71	71	55	55	57
Ave. Stream Width(ft):	3	35	3	14	4	12	24
Ave. Stream Depth(ft):	1.25	1	1	1.5	0.75	2	1.5
Surface Velocity (ft/sec):	1.5	0.75	1.25	1	0.5	1.5	1.5
Estimated Flow (CFS):	5.625	26.25	3.75	21	1.5	36	54
Stream Modifications:	Dredged	Bank Stabilization	Dredged	None	Dredged	Dredged	None
Nuisance Plants (Y/N):	N	N	N	N	N	Y	N
STORET No.:	760277	320239	320340	760181	740467	320319	320306
Stream Name:	Big Creek	Willow Creek	Beaudien Drain	Cherry Creek	Wixon Drain	Columbia Drain	Pinnebog River
Road Crossing/Location:	Shabbona Road	M-25	Elkton Road	Goetz Rd	State Road	Lange Road	D/S Grassmere Road
TRS:	13N15E26	17N14E17	16N11E04	13N16E33	08N17E18	15N09E10	0
Latitude (dd):	43.54312	44.0281	43.76161	43.5186	43.13436	43.7364	43.786
Longitude (dd):	-82.67551	-82.8381	-83.18	-82.6358	-82.51847	-83.41616	-83.12
Ecoregion:	HELP	HELP	HELP	HELP	HELP	HELP	HELP
USGS Basin Code:	4080104	4080104	4080103	4080104	4080104	4080103	4080103

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3 (cont.). Habitat evaluation for Cherry and Pigeon watersheds 2013

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s).

	Big Creek Loree Road Site 5T GLIDE/POOL	Elm Creek Schock Road Site 6T RIFLE/RUN	Bad Axe Creek Richardson Road Site 1R GLIDE/POOL
HABITAT METRIC (max. score)			
Substrate and Instream Cover			
Epifaunal Substrate/ Avail Cover (20)	2	11	4
Embeddedness (20)*		15	
Velocity/Depth Regime (20)*		20	
Pool Substrate Characterization (20)**	9		11
Pool Variability (20)**	6		4
Channel Morphology			
Sediment Deposition (20)	8	8	1
Flow Status - Maint. Flow Volume (10)	4	7	1
Flow Status - Flashiness (10)	4	5	0
Channel Alteration (20)	20	20	8
Frequency of Riffles/Bends (20)*		14	
Channel Sinuosity (20)**	19		2
Riparian and Bank Structure			
Bank Stability (L) (10)	6	2	8
Bank Stability (R) (10)	6	1	8
Vegetative Protection (L) (10)	7	2	4
Vegetative Protection (R) (10)	7	2	4
Riparian Veg. Zone Width (L) (10)	5	10	10
Riparian Veg. Zone Width (R) (10)	7	10	10
TOTAL SCORE (200):	110	127	75
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)
Date:	6/17/2013	6/19/2013	8/13/2013
Weather:	Sunny	Sunny	Partly Cloudy
Air Temperature (°F):	63	55	60
Water Temperature(°F):	55	55	56
Ave. Stream Width(ft):	7	20	15
Ave. Stream Depth(ft):	1	1.5	0.75
Surface Velocity (ft/sec):	1	1	0.5
Estimated Flow (CFS):	7	30	5.625
Stream Modifications:	None	None	Dredged
Nuisance Plants (Y/N):	N	N	N
STORET No.:	760242	320302	320228
Stream Name:	Big Creek	Elm Creek	Bad Axe Creek
Road Crossing/Location:	Loree Road	Schock Road	Richardson Road
TRS:	13N15E26	15N15E14	16N12E11
Latitude (dd):	43.541	43.742	43.8372
Longitude (dd):	-82.656	-82.662	-83.0247
Ecoregion:	HELP	HELP	HELP
USGS Basin Code:	4080104	4080104	4080103

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 4. Nuisance Cladophora cover observed during 2013 sampling.

SITE NAME	SITE #	% COVER
Shebeon Creek	9	80
Gorke Drain	12	70
Baranski Drain	21	60
Columbia Drain	1T	85

Table 5. Results of water chemistry grab sample for Columbia Drain (Site 1T).

Inorganics-General Chemistry

7664-41-7	Ammonia	0.01	0.01	mg/L	1	06/24/13
	Chemical Oxygen Demand	28	5.0	mg/L	1	07/02/13
7727-37-9	Kjeldahl Nitrogen	0.67	0.10	mg/L	1	06/27/13
	Nitrate/Nitrite	0.71	0.010	mg/L	1	06/26/13
	Nitrate-Calculated	0.71	0.010	mg/L	1	06/26/13
14797-65-0	Nitrite	ND	0.010	mg/L	1	06/21/13
7723-14-0	Ortho Phosphate	ND	0.010	mg/L	1	06/21/13
TDS	Total Dissolved Solids	370	20	mg/L	1	06/21/13
7440-44-0	Total Organic Carbon	7.5	0.5	mg/L	1	07/11/13
7723-14-0	Total Phosphorus	0.013	0.010	mg/L	1	06/27/13
TSS	Total Suspended Solids	4	4	mg/L	1	06/21/13

Table 6. Aquatic invasive species observed during sampling.

SITE NAME	SITE #	SPECIES OBSERVED
Mill Creek	7	Phragmites and Narrow-leaf Cattail
Shebeon Creek	9 and 13	Chinese Mystery Snail
Bird Creek	15	Curly-leaf Pondweed and Phragmites
Moore Creek	17	Phragmites
Elm River	6T	Japanese Barberry