MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY WATER RESOURCES DIVISION MARCH 2014

STAFF REPORT

A BIOLOGICAL SURVEY OF THE BLACK RIVER, PINE RIVER, AND BELLE RIVER WATERSHEDS, PLUS SELECT TRIBUTARIES DRAINING TO THE ST. CLAIR RIVER LAPEER, MACOMB, SANILAC, AND ST. CLAIR COUNTIES, MICHIGAN JULY-AUGUST 2012 AND JUNE 2013

INTRODUCTION

Staff of the Michigan Department of Environmental Quality (MDEQ), Surface Water Assessment Section (SWAS), conducted biological and physical habitat surveys during the summers of 2012 and 2013 throughout the Black, Belle, and Pine Rivers watersheds, plus select tributaries to the St. Clair River (Figure 1). The goals of this monitoring were to: (1) assess the current status and condition of individual water bodies and determine whether Michigan Water Quality Standards (WQS) are being met; (2) evaluate biological integrity temporal trends; (3) satisfy monitoring requests submitted by external and internal customers; and (4) identify potential nonpoint source pollution problems.

These surveys qualitatively characterized the biotic integrity of macroinvertebrate communities with respect to existing habitat conditions at randomly selected sites throughout the Black, Belle, and Pine Rivers watersheds region. The results of the surveys are used by the SWAS's Status and Trends Program to estimate the percentage of the watersheds that is supporting the other indigenous aquatic life and wildlife designated use component of R 323.1100(1)(e) of the Part 4 rules, WQS, promulgated under Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

BACKGROUND AND HISTORICAL SAMPLING EFFORTS

Most of the Black, Pine, and Belle Rivers watersheds' region is located within the Huron/Erie Lake Plains ecoregion, while the westernmost portions of the Black and Belle Rivers watersheds are located within the Southern Michigan/Northern Indiana Till Plains ecoregion (Omernick and Gallant, 1988; United States Environmental Protection Agency [USEPA], 2011). These watersheds are part of the St. Clair watershed (United States Geological Survey Hydrologic Unit Code 04090001). The land uses in these watersheds include agriculture, forest, commercial, and residential. Many of the flowing waterways have been dredged and channelized and had their riparian vegetation removed and replaced by row crops. These actions have resulted in many water bodies having degraded habitat conditions and no canopy cover (which allows sunlight to enter unimpeded).

BLACK RIVER WATERSHED

Much of the length of tributaries in the Sanilac County portion of the Black River watershed and upper Mill Creek watershed have been maintained, at least historically, by straightening, dredging, and vegetation mowing or spraying for agricultural drainage. Lower stretches of the Black River flow through the Port Huron State Game area and the city of Port Huron. The primary land use throughout the watershed is agriculture with localized suburban development

near established towns. The following list summarizes previous survey work done in the Black River watershed.

Survey Year	Water Bodies	Report	Findings / Comments
1992	Black River watershed	Walterhouse (1994)	 Macroinvertebrate communities rated good and habitat conditions rated good to excellent at four sites. Fish communities rated good to excellent at two sites.
1999	Cork Drain, Putney Drain, and unnamed tributary to Putney Drain	Bonnette (2000)	 Macroinvertebrate communities rated poor at three sites and acceptable at one site. Habitat quality rated fair at three sites and poor at one site. All these water bodies were observed to be impacted by dredging and channelization, which altered the available habitat for aquatic life.
2002	Black River watershed	Goodwin (2007)	 Macroinvertebrate communities rated acceptable to excellent at ten sites having marginal to excellent habitat conditions. Much of this watershed has been dredged and channelized due to agricultural practices. Water and sediment chemistry analyses of nutrients and metals did not find concentrations that would cause concern for exceeding WQS. Visual observations found that a number of channelized water bodies had excessive plant growth.
1973 1989 1992 2002 2004 2005 2006	Berry Drain watershed	MDNR (1973) Masterson (1989) Morse (1993) Schmitt (2005) Schmitt (2007) Goodwin (2007)	 The entire Berry Drain watershed has been dredged and channelized due to agricultural practices. The riparian vegetation has been removed and replaced by row crops, allowing sunlight to enter the stream unimpeded. Biological communities were rated acceptable at two sites (Custer Road and Range Line Road) and poor at one site (Stringer Road) in 2004, and again in 2005, when sampling was repeated at the same sites (Schmitt, 2005). Conditions of nuisance plant growth were observed in 2002 and 2004, but not in 2005 and 2006.
2007	Black River watershed	Schmitt (2008)	 Macroinvertebrate communities rated acceptable to excellent at all 15 sites. Habitat quality rated good to excellent at 7 sites and marginal at 8 sites.

Summary of Previous	Survey Wo	rk in the Black	River Watershed
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Berry Drain was listed in the 2006 Integrated Report for WQS exceedances of dissolved oxygen and nuisance plant growth from total phosphorus (Edly and Wuycheck, 2006). It was also listed in the 2012 Integrated Report for WQS exceedances of dissolved oxygen and also for having sedimentation/siltation, direct habitat alteration, and flow regime alteration issues (Goodwin et al., 2012). A Berry Drain Total Daily Maximum Load (TMDL) for dissolved oxygen was approved by the USEPA in 2006 (Sunday, 2006).

Portions of Mill Creek and the Black River were listed in the 2012 Integrated Report for WQS exceedances of *E. coli* (Goodwin et al., 2012). TMDLs were completed in 2004 (Alexander, 2004) and 2011 (MDNRE, 2011), respectively.

PINE RIVER WATERSHED

The predominant land use in the Pine River watershed is row-crop agriculture, particularly in the headwater and tributary areas. Lower stretches of the Pine River flow through a mixture of agricultural lands, wooded areas, and eventually the city of St. Clair. The following list summarizes previous survey work done in the Pine River watershed.

	Summar	v of Previou	is Surve	v Work in	the Pine	River I	Natershed
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Survey Year	Water Bodies	Report	Findings / Comments
1997	Pine River and Smith's Creek	Synnestvedt (1998)	 Macroinvertebrate communities rated acceptable and habitat conditions rated fair to good at two sites. The fish community rated acceptable at one site. A poor macroinvertebrate community with fair habitat conditions was found at a third site (Smith Creek at Palms Road). This reach had been dredged and channelized and the stream banks were bare as there were signs of irregular flows and high flow marks.
1997	Pine River	Day and Flower (1999)	• A caged fish study was completed in the Pine River near the mouth to identify sources of bioaccumulative contaminants and spatial trends in contaminant concentrations. There were no quantifiable levels of toxaphene, aldrin, heptachlor, heptachlor-epoxide, lindane, terphenyl, octochlorostyrene, pentachlorostyrene, hexachlorostyrene, heptachlorostyrene, mirex, or polybrominated biphenyls (PBB) in any of the controls or caged fish. Dieldrin levels in the caged fish were above the quantification level, but were less than or equal to the levels found in the control fish. Mercury and hexachlorobenzene levels in the caged fish were near the quantification level, but were not significantly different from the control fish. Very low levels of net uptake of total dichlorodiphenyltrichloroethane (DDT) and total polychlorinated biphenyl (PCBs) were also measured.
2002	Pine River watershed	Goodwin (2007)	 Macroinvertebrate communities rated acceptable and habitat quality rated good at five sites. No chemicals were measured at levels above WQS. Visual observations found many tributary streams (Barringer Drain, Rattle Run, Moak Drain, Wolvin Drain, Big Creek, Moore Creek, Apply Drain, Quakenbush Drain, and the Pine River upstream of Bricker Road) were either dry or stagnant. In addition, many of the water bodies showed signs of flashiness or a lack of consistent flow.
2007	Pine River watershed	Schmitt (2008)	 Macroinvertebrate communities rated acceptable at six sites. Habitat quality rated good at one site and marginal at five sites.

Portions of Smiths Creek were listed in the 2012 Integrated Report for WQS exceedances of *E. coli* (Goodwin et al., 2012). A TMDL was completed in 2009 for this stream (Rippke, 2009).

BELLE RIVER WATERSHED

The majority of the tributaries feeding the Belle River flow through agricultural land and have historically been straightened and dredged. Land use in the headwater reaches near Imlay City is a combination of agriculture and large-lot, single-family homes. The following list summarizes previous survey work done in the Belle River watershed.

Summary of Previous Survey Work in the Belle River Watershed

Survey Year	Water Bodies	Report	Findings / Comments
1992	Belle River watershed	Walterhouse (1993)	 Macroinvertebrate communities rated fair to good at eight sites with habitat quality ranging from poor to excellent. Fish communities rated poor to excellent at four sites. Water chemistry analyses indicated that levels of nutrients were elevated due to point source impacts.
1997	Belle River watershed	Oemke (1998)	 Macroinvertebrate communities rated excellent at one site, acceptable at eight sites, and poor at three sites. Habitat quality rated excellent at one site, good at four sites, fair at four sites, and poor at three sites. Much of the watershed is channelized and flow is slow and sluggish.
1997	Belle River	Day and Flower (1999)	• A caged fish study was completed in the Belle River near the mouth to identify sources of bioaccumulative contaminants and spatial trends in contaminant concentrations. There were no quantifiable levels of toxaphene, aldrin, heptachlor, heptachlor-epoxide, lindane, terphenyl, octochlorostyrene, pentachlorostyrene, hexachlorostyrene, heptachlorostyrene, mirex, or PBB in any of the controls or caged fish. Dieldrin levels in the caged fish were above the quantification level, but were less than or equal to the levels found in the control fish. Mercury and hexachlorobenzene levels in the caged fish were near the quantification level, but were not significantly different than the control fish. Very low levels of net uptake of total DDT, total PCBs, and total chlordane were also measured.
2002	Belle River watershed	Goodwin (2007)	 Macroinvertebrate communities rated poor at two sites, acceptable at five sites, and excellent at two sites. Habitat quality rated marginal at four sites and good at five sites. Water chemistry monitoring results found that Webster Drain had excessive concentrations of boron, lithium, and vanadium.
2007	Belle River watershed	Schmitt (2008)	 Macroinvertebrate communities rated acceptable to excellent at eight sites and poor at two sites. Habitat quality rated good at four sites and marginal at six sites.

Portions of the Belle River and North Branch Belle River were listed in the 2012 Integrated Report for WQS exceedances of dissolved oxygen (Goodwin et al., 2012). A TMDL was completed in 2005 for these rivers (Sunday, 2005).

METHODS

Two site-selection methods (random and targeted) were used to select 42 stations to be assessed in the Black, Pine, and Belle Rivers watersheds (Table 1). A probabilistic monitoring approach (MDEQ, 2014; draft) was used to randomly select sites (23 wadeable and 4 nonwadeable) in 2012 to address statewide and regional questions about water quality. Of the 27 randomly selected stations, 22 were "status" sites (currently selected) and 5 were "trend" sites (previously selected sites that are revisited every 5 years). The data from these sites will be used by the SWAS's Status and Trend Program to estimate the watershed attainment status for the other indigenous aquatic life and wildlife designated use component of R 323.1100(e) of the Michigan WQS, and as a baseline to measure biointegrity temporal trends. Twelve stations were selected for targeted monitoring in 2012 and 3 stations in 2013 to fulfill specific monitoring requests, assess known or potential areas of concern, and assess attainment of WQS from areas where historic survey information was lacking.

The biological and physical habitat surveys were conducted at wadeable sites according to the SWAS Procedure 51 (MDEQ, 1990). The macroinvertebrate communities were scored with metrics that rate water bodies from excellent (+5 to +9) to poor (-9 to -5). Macroinvertebrate ratings from (-4 to +4) are considered acceptable. A site with a negative acceptable score is tending towards poor, while a site with a positive acceptable score is tending towards excellent (Creal et al., 1996). Stream habitat at wadeable sites was qualitatively evaluated at each station using a scoring system, which ranged in value from 0 to 135. Macroinvertebrate community conditions at nonwadeable sites were assessed using a qualitative biological survey procedure for nonwadeable rivers (SWAS Procedure 22 [MDEQ, 2013]). In this nonwadeable procedure, the range of scores possible for macroinvertebrate community metrics is 0-100, with scores from 26-100 representing communities meeting WQS.

Digital photographs were taken upstream and downstream at each of the sites that were surveyed during this investigation, and some representative photographs are included in this report for illustrative purposes. Other photographs are available upon request.

SAMPLING RESULTS AND DISCUSSION

BLACK RIVER WATERSHED

Wadeable Sites

The majority (19) of the 23 wadeable sites surveyed in the Black River watershed had acceptable or excellent macroinvertebrate communities, with scores ranging from -4 to 8 (Tables 1, 2A, and 2B). Of these scores, 5 had negative scores (i.e., tending towards poor) including Mill Creek at Jorden Road (Station 8), the South Branch of Mill Creek at Cade Road (Station 10), Black Creek at Todd Road (Station 12), Potts Drain downstream of Aitken Road (Station 17), and Dwight Drain at Stringer Road (Station 23). Figure 2 presents representative photographs of sites monitored in this watershed in 2012.

Four sites in this watershed rated as poor, indicative of not meeting the other indigenous aquatic life and wildlife designated use. Those sites were the Black River at Aitken Road (Station 3), Black Creek at Brown Road (Station 13), Arnot Creek north of Hall Road (Station 15), and Elk Lake Creek at M-21 (Station 22) (Tables 1, 2A, and 2B).

Overall stream habitat scores, which consider in-stream as well as the adjacent stream bank and riparian habitat, at the 23 wadeable sites in the Black River watershed ranged from 58 (marginal) to 152 (excellent) (Tables 1 and 3). Glide/pool metrics were used to evaluate habitat at 12 of the sites, while riffle/run metrics were used at the remaining 11 sites. Potts Drain downstream of Aitken Road (Station 17), which had a macroinvertebrate community score of -3 (acceptable but tending towards poor), was noted as having thick mats of aquatic plants and filamentous algae (Figure 2).

Three of the four sites (Black River at Aitken Road [Station 3], Black Creek at Brown Road [Station 13], and Arnot Creek north of Hall Road [Station 15]) in the Black River watershed having macroinvertebrate communities rated as poor were located in primarily agricultural watersheds. All three of these sites had epifaunal substrate/available cover conditions rated as marginal or poor; riparian zone widths that rated as marginal; and channels that appeared to have been dredged or relocated, at least historically. These sites showed some signs of modest improvement in vegetation conditions immediately adjacent the channel following what appeared to have been past dredging and riparian vegetation clearing activities. The factors likely limiting the health of these sites' macroinvertebrate communities are historical stream corridor modifications (e.g., channel dredging, riparian vegetation disturbance) and water coming from poorly shaded, agricultural drains in upstream watershed areas.

The Black River upstream of Aitken Road (Station 3) parallels the roadway Old M-51, and it appears that this stretch of the channel was partly relocated and channelized many years ago in order to accommodate the road and expedite drainage. Aerial imagery appears to show old remnant river bends where the river used to exist prior to channel relocation. This site had abundant aquatic plant growth. It also had very turbid waters despite the fact that it had not rained in the region for a while (the nearest weather station with precipitation data [Bishop International Airport in Flint]) recorded approximately .75 inches of rainfall 7 days earlier *link broken, removed*). Turbidity in the water at this site is believed to be caused by suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter, and plankton and other microscopic organisms (American Public Health Association et al., 1995). This is likely a result of several factors including riverbed and riverbank erosion processes, runoff of eroded soils/sediments and nutrients from agricultural and other land uses, and possibly even bioturbation and resuspension of river sediments due to the activity of benthivorous fish such as carp (Waters, 1995; Breukelaar et al., 1994).

The fourth station that had its macroinvertebrate community rated as poor (Elk Lake Creek at M-21 [Station 22]), was located downstream of Elk Lake and was likely influenced by its proximity to the lake. A small manmade dam comprised of mud and small tree trunks was observed at the upper end of the sampling reach and appeared to have been constructed to maintain water levels in the lake and/or provide for snowmobile access in the winter. Epifaunal substrate/available cover, channel sinuosity, and channel flow status (maintained flow volume) conditions were marginal and pool variability was poor (Tables 1 and 3), apparently a result of both reduced lake levels due to a drier than normal year and from reduced flow coming out from the small dam.



Figure 2. Representative photographs taken in the Black River watershed in July/August 2012: (A) Black River at Aitken Road (Station 3); (B) Black Creek upstream of Brown Road (Station 13); (C) Arnot Creek north of Hall Road (Station 15); (D and E) Potts Drain upstream and downstream of Aitken Road (Station 17); and (F) Elk Lake Creek upstream of M-21 (Station 22).



Figure 2 cont. (G) Black River off Abbottsford Road (Station 1); (H) Mill Creek at Bricker Road (Station 6); (I) Black Creek off Cribbens Road (Station 11); (J) Black Creek at Todd Road (Station 12); (K) McDonald Drain downstream Stilson Road (Station 20); and (L) Dwight Drain at Stringer Road (Station 23).

Nonwadeable Sites

Two nonwadeable sites (Black River at Port Huron Township Park [Station NW-1] and Black River at the Charter Township of Port Huron Memorial Park [Station NW-2]) in the lower Black River watershed had marginal macroinvertebrate communities, with scores of 30 and 32, respectively, indicating the attainment of WQS at these sites (Tables 1, 4A, and 4B).

PINE RIVER WATERSHED

Wadeable Sites

The Pine River at Griswold Road (Station 26) had an acceptable macroinvertebrate community with a score of 1 (Tables 1, 2A, and 2B). Glide/pool metrics were used to evaluate habitat at this site, and its overall stream habitat score was marginal (92) (Tables 1 and 3). Visual observations at the Pine River at Fargo Road (Station A) found no perceptible flow due to pooled conditions and dry spots in many parts of the channel. Due to these conditions, an assessment of the macroinvertebrate community could not be completed at this station.

Nonwadeable Sites

Two nonwadeable sites (Pine River upstream of the Pine Shores Golf Course [Station NW-4] and Pine River at Fred Moore Highway [Station NW-5]) in the lower Pine River watershed had marginal macroinvertebrate communities, with scores of 42 and 27, respectively, indicating the attainment of WQS at these sites (Tables 1, 4A, and 4B). Figure 3 presents representative photographs of sites monitored in this watershed in 2012.

BELLE RIVER WATERSHED

Wadeable Sites

Most (7) of the 10 wadeable sites surveyed in the Belle River watershed had acceptable macroinvertebrate communities with scores ranging from 0 to 4, with one exception (Station 34), having an acceptable score of -4 (Tables 1, 2A, and 2B). Three sites in this watershed rated as poor, indicative of not meeting the other indigenous aquatic life and wildlife designated use. Those sites were the North Branch Belle River at Newark Road downstream of the Pinnacle (Vlasic) Foods outfall (Station 32), North Branch Belle River at Newark Road upstream of the outfall (Station 33), and Belle River at Sperry Road (Station 35) (Tables 1, 2A, and 2B).

Overall stream habitat scores at the 10 wadeable sites in the Belle River watershed ranged from 81 (marginal) to 168 (excellent) (Tables 1 and 3). Glide/pool metrics were used to evaluate habitat at 7 of the sites, while riffle/run metrics were used at the remaining 3 sites. Figure 4 presents representative photographs of sites monitored in this watershed during 2012.

Two of the sites in the Belle River watershed that had poor macroinvertebrate communities (North Branch Belle River downstream of Newark Road [Station 32] and upstream of Newark Road [Station 33]) were close to each other and located within a watershed comprised mostly of agricultural lands along with some forest, residential, and commercial/urban lands. The fish communities at these two sites rated acceptable (Tables 5A and 5B).



Figure 3. Representative photographs taken in the Pine River watershed in July/August 2012: (A) Pine River at Griswold Road (Station 26); (B) Pine River at Fargo Road (Station A); (C) Pine River upstream Pine Shores Golf Course (Station NW-4); and (D) Pine River upstream Fred Moore Highway (Station NW-5).



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Figure 4. Representative photographs taken in the Belle River watershed in July/August 2012: (A) Belle River at St. Clair Hwy (Station 28); (B) Belle River at Kronner Road (Station 29); (C) North Branch Belle River at Newark Road downstream of Pinnacle (Vlasic) Foods outfall (Station 32); and (D) North Branch Belle River at Newark Road upstream of Pinnacle (Vlasic) Foods outfall (Station 33).

Water chemistry samples were collected at Stations 32 and 33 (North Branch Belle River). Chloride, conductance, pH, total dissolved solids, and total kieldahl nitrogen concentrations were found to be higher at the downstream site (Station 32; Table 6). Both sites had marginal overall stream habitat scores and marginal or poor epifaunal substrate/available cover, pool substrate, pool variability, sediment deposition, channel flow status (flashiness), channel alteration, channel sinuosity, and riparian vegetation zone width scores (Table 3).

The third site in the Belle River watershed having a macroinvertebrate community rated as poor (Belle River at Sperry Road [Station 35]) (Tables 1, 2A, and 2B), was in a watershed comprised mostly of agricultural land along with some forest and residential land uses. The riparian corridor immediately upstream of this site was primarily forest; however, the remainder of its watershed upstream was mostly agricultural land and drains. Habitat at this site rated good (Tables 1 and 3).

Factors likely contributing to the poor condition of these sites' macroinvertebrate communities include historical stream corridor modifications (e.g., channel dredging, riparian vegetation disturbance), poor shading at, or upstream of, the sites, and agricultural and (to a lesser extent) urban drainage and waterways in upstream watershed areas.

Nonwadeable Site

A nonwadeable site in the lower Belle River watershed, Belle River at East China Township Park (Station NW-3), had a macroinvertebrate community rated as poor, with a score of 13, indicative of not meeting the other indigenous aquatic life and wildlife designated use (Tables 1, 4A, and 4B).

OTHER ST. CLAIR RIVER TRIBUTARIES (Minor Drainages)

Two wadeable streams that drain directly to the St. Clair River (Bunce Creek off Gratiot Avenue [Station 24] and Cuttle Creek upstream of M-29 [Station 25]), had acceptable macroinvertebrate communities, with scores of 0 and -3, respectively (Tables 1, 2A, and 2B). The negative score for Cuttle Creek indicated that its macroinvertebrate community was tending towards poor. Riffle/run metrics were used to evaluate habitat at these sites. Overall stream habitat scores for Bunce Creek and Cuttle Creek were good (123 and 110, respectively) (Tables 1 and 3). Figure 5 presents representative photographs of these sites.

For Bunce Creek, habitat scores that were marginal included epifaunal substrate/available cover, velocity depth regime, channel flow status (maintained flow volume), bank stability, and riparian vegetation on one side of the stream. Channel flow status (flashiness) was rated poor, and the channel appeared over-widened. Portions of the Bunce Creek watershed are forest or agriculture. However, it appears that the stream receives significant storm water drainage from both dense and light residential urban areas, roadways (including I-94), and some commercial areas via a network of creeks and drains, which likely explains the bank stability and flashiness scores.

Cuttle Creek's watershed land uses are similar to that of Bunce Creek, and it appeared to have been dredged historically. Habitat scores that were marginal included epifaunal substrate/available cover, channel flow status (maintained flow volume), and bank stability. Channel flow status (flashiness) was rated poor and, like Bunce Creek, the channel appeared over-widened in some locations.



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Figure 5. Representative photographs taken at Bunce Creek and Cuttle Creek in August 2012: (A and B) Bunce Creek off Gratiot Avenue (Station 24); and (C and D) Cuttle Creek upstream of M-29 (Station 25).

SUMMARY

Based on the probabilistic monitoring aspect of this watershed survey, 86 ± 15 percent of the randomly selected "status" sites supported the other indigenous aquatic life and wildlife designated use using Procedure 51 (wadeable sites) or Procedure 22 (nonwadeable sites). Percent attainment was calculated by dividing the number of random "status" sites that met WQS by the total number of random "status" sites (19 / 22 = 0.86) (Table 1). This value is coupled with a 95 percent confidence interval to provide our estimation of certainty, meaning there is 95 percent certainty that the true proportion of attainment in the St. Clair watershed (comprised of the Black, Pine, and Belle Rivers watersheds) is within \pm 15 percent of the 86 percent result.

Summary of Nonpoint Source Problems and Other Impacts

No specific projects associated with nonpoint source pollution were evaluated during the survey of these watersheds. Nevertheless, waterways in the agricultural regions of these watersheds are likely susceptible to impacts related to agricultural runoff (e.g., increased erosion and sedimentation, nutrients, warmer water temperatures, rapid rates of runoff), while those in the

more densely populated urban areas of this region are likely susceptible to impacts related to urban storm water runoff (e.g., those impacts mentioned for agricultural runoff plus pollutants such as oil, grease, and metals) if steps are not taken to minimize these stressors.

CONCLUSION

Many sites surveyed in these watersheds had altered habitat conditions; they were dredged and channelized and/or had their riparian vegetation substantially removed or changed from natural conditions (recently or historically). Agricultural drain maintenance efforts and agricultural (and urban) drainage networks, typically result in enlarged, homogenous channels with flashy flow regimes (indicative of rapid runoff and drainage rates) where unstable sand and silt substrates are slowly transported downstream. Limitations to the biological communities can be primarily attributed to habitat limitations created by these historic and current efforts to quickly drain water from the agricultural and urban portions of the watershed.

Some general recommendations for improving biological and habitat conditions in sections of streams, drains, and rivers in this watershed impacted by intensive agricultural or urban land uses include:

- 1. Where riparian buffer strips are absent (or degraded) and it is practical, property owners can allow trees and shrubs to regrow on stream banks because they will eventually provide shade, help stabilize stream banks, and serve as a source of large woody debris (i.e., habitat diversity and in-stream cover).
- 2. Adopting best management practices that are designed to minimize upland erosion and decrease stream flashiness, thus benefiting the aquatic biota residing in streams and rivers throughout the watershed.
- Field Work By: Tom Alwin, Aquatic Biologist William Keiper, Aquatic Biologist Tamara Lipsey, Aquatic Biologist Jeff Varricchione, Aquatic Biologist Surface Water Assessment Section Water Resources Division

Jeff Cooper, Aquatic Biologist Permits Section Water Resources Division

Report By: Jeff Varricchione, Aquatic Biologist Surface Water Assessment Section Water Resources Division

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Table 1. Monitoring site locations in the St. Clair River watershed, 2012 and 2013. Legend for acronyms is at the end of the table.

									Dredged,	
			Macroinvertebrate	Habitat Rating					Relocated,	
Station			Community	& Score				Site	or Bank	Other
ID	Stream	Survey Location	Rating & Score	(Riffle/Run, Glide/Pool)	County	Latitude	Longitude	Туре	Stabilization?	Comments
			BLA	CK RIVER WATERS	SHED					
1	Black River	off Abottsford (Ford) Road	Acceptable (3)	Good (149) (R/R)	St. Clair	43.04070	-82.58920	Trend	No	
2	Black River	Galbraith Line Road	Acceptable (2)	Good (138) (R/R)	Sanilac	43.19362	-82.62417	Targ.	No	
3	Black River	Aitken Road	Poor (-7)	Marginal (92) (G/P)	Sanilac	43.32190	-82.63520	Trend	Relocated & Dredged Historically	
4	Black River	Stone	Acceptable (3)	Marginal (79) (G/P)	Sanilac	43.55416	-82.79473	Targ.	Dredged	
5	Mill Creek	Kilgore Road	Excellent (8)	Good (152) (R/R)	St. Clair	43.04274	-82.69353	S	No	
6	Mill Creek	Bricker	Acceptable (4)	Good (144) (R/R)	St. Clair	43.05423	-82.73448	Targ.	No	
7	Mill Creek	Park Avenue	Acceptable (1)	Good (129) (G/P)	St. Clair	43.12997	-82.80088	S	Bnk Stbl	
8	Mill Creek	Jorden Road	Acceptable (-4)	Marginal (93) (R/R)	St. Clair	43.14861	-82.81956	S	No	
9	Sanilac & St. Clair Drain	east of Jordan Rd.	Acceptable (2)	Good (137) (R/R)	St. Clair	43.14701	-82.81809	Targ.	Dredged	
10	S. Br. Mill Creek	Cade	Acceptable (-2)	Marginal (94) (G/P)	St. Clair	43.05526	-82.98993	Targ.	Dredged	
11	Black Creek	off Cribbens Road	Acceptable (0)	Good (152) (R/R)	Sanilac	43.21334	-82.64644	Targ.	No	
12	Black Creek	Todd Road	Acceptable (-1)	Marginal (101) (G/P)	Sanilac	43.19558	-82.68476	S	Dredged	
13	Black Creek	Brown Road	Poor (-6)	Good (109) (G/P)	Sanilac	43.18086	-82.72336	S	Dredged Historically	
14	Seymour Creek	Todd Road	Acceptable (3)	Marginal (80) (R/R)	Sanilac	43.21243	-82.68585	S	Dredged	
15	Arnot Creek	north of Hall Road	Poor (-6)	Marginal (97) (G/P)	Sanilac	43.29178	-82.66717	S	Dredged Historically	
16	Elk Creek	Washington	Acceptable (2)	Marginal (69) (G/P)	Sanilac	43.39632	-82.70516	Targ.	Dredged	
17	Potts Drain	d/s of Aitken Road	Acceptable (-3)	Marginal (71) (G/P)	Sanilac	43.31863	-82.73745	S	Dredged	
18	Potts Drain	Hall Road	Acceptable (0)	Marginal (58) (G/P)	Sanilac	43.28940	-82.74750	Trend	Dredged	
19	McDonald Drain	u/s Stilson Rd	Acceptable (4)	Marginal (92) (R/R)	Sanilac	43.30150	-82.84240	S	Dredged	
20	McDonald Drain	d/s Stilson Rd	Acceptable (2)	Marginal (86) (R/R)	Sanilac	43.30124	-82.86191	S	Dredged	
21	Speaker and Maple Valley Drain	School Road	Acceptable (4)	Good (111) (R/R)	Sanilac	43.22807	-82.85454	S	Dredged	
22	Elk Lake Creek	M21	Poor (-6)	Good (125) (G/P)	Lapeer	43.04934	-83.14941	S	No	Small dam u/s
23	Dwight Drain	Stringer Road	Acceptable (-2)	Poor (48) (G/P)	Sanilac	43.44051	-82.79204	S	Dredged	

 Macroinvertebrate Rating System (Wadeable Stations):

 Poor: -9 to -5
 Acceptable: -4 to +4
 Excellent: +5 to +9

 Macroinvertebrate Rating System (Non-Wadeable Stations):

 Poor: < 26</td>
 Marginal: 26 to 50
 Good: 51 to 74
 Excellent: 75 to 100

 Habitat Rating System (Wadeable Stations):

Poor: < 56 Marginal: 56 to 104 Good: 105 to 154 Excellent: > 154

Site Type and Other Comments:

Targ.: Targeted Trend: Trend S: Status WCMP: Water C

WCMP: Water Chemistry Monitoring Program AOC: Area of Concern (Program)

Other: N/A: Not Available u/s: Upstream d/s: Downstream Bnk Stbl: Bank Stabilization NW: Non-Wadeable

			Macroinvertebrate	Habitat Rating					Dredged, Relocated,	
Station ID	Stream	Survey Location	Community Rating & Score	& Score (Riffle/Run, Glide/Pool)	County	Latitude	Longitude	Site Type	or Bank Stabilization?	Other Comments
NW-1	Black River	Port Huron Township Park (u/s I94/I69)	Marginal (30 [NW])		St. Clair	42.99572	-82.44835	S		
NW-2	Black River	Charter Twp of Port Huron Memorial Park	Marginal (32 [NW])		St. Clair	43.00875	-82.48577	S		
		ОТ	HER ST. CLAIR R	VER TRIBUTARIE	S (Minor	⁻ Drainag	es)			
24	Bunce Creek	off Gratiot Ave, DTE substation	Acceptable (0)	Good (123) (R/R)	St. Clair	42.93019	-82.46172	Targ.	No	
25	Cuttle Creek	u/s of M-29	Acceptable (-3)	Good (110) (R/R)	St. Clair	42.89629	-82.48596	Targ.	Dredged Historically	
			PIN	E RIVER WATERS	HED					
26	Pine River	Griswold Road	Acceptable (1)	Marginal (92) (G/P)	St. Clair	42.96192	-82.59393	S	No	
NW-4	Pine River	u/s Pine Shores Golf Course & d/s RR tracks	Marginal (42 [NW])		St. Clair	42.81478	-82.49706	S		
NW-5	Pine River	Fred Moore Highway	Marginal (27 [NW])		St. Clair	42.81720	-82.51080	S		
А	Pine River	Fargo	n/a	n/a	St. Clair	43.02150	-82.65306	Targ.		No perceptible flow
	1	r	BEL	LE RIVER WATERS	HED					
27	Belle River	Puttygut Road	Acceptable (1)	Marginal (92) (G/P)	St. Clair	42.78564	-82.57681	S	Dredged; Bnk Stbl (d/s)	
28	Belle River	St. Clair Hwy	Acceptable (0)	Marginal (96) (G/P)	St. Clair	42.79971	-82.59502	S	Dredged	
29	Belle River	Kronner Road	Acceptable (4)	Excellent (167) (R/R)	St. Clair	42.85110	-82.72300	S	No	Some historic canopy removal; habitat improvements
30	Belle River	end of Meskill Road	Acceptable (4)	Excellent (155) (R/R)	St. Clair	42.86870	-82.73540	Trend	No	Site of former bridge
31	Belle River	Weber Road	Acceptable (3)	Good (151) (R/R)	Macomb	42.87578	-82.74164	S	Bnk Stbl (d/s)	
32	North Branch Belle River	Newark d/s of Pinnacle (Vlasic) Foods outfall	Poor (-6)	Marginal (82) (G/P)	Lapeer	43.00695	-83.05973	Targ.	Dredged	
33	North Branch Belle River	Newark u/s of Pinnacle (Vlasic) Foods outfall	Poor (-6)	Marginal (81) (G/P)	Lapeer	43.00834	-83.06056	Trend	Dredged	
34	Belle River	u/s Glover Road	Acceptable (-4)	Marginal (84) (G/P)	Lapeer	42.97442	-83.00679	Targ.	Dredged	
35	Belle River	Sperry Road	Poor (-7)	Good (112) (G/P)	St. Clair	42.96135	-82.90564	Targ.	No	Most of watershed upstream has been dredged
36	Belle River	Riley Center Road	Acceptable (1)	Good (153) (G/P)	St. Clair	42.94568	-82.84198	Targ.	No	
NW-3	Belle River	E. China Twp Park	Poor (13 [NW])		St. Clair	42.75728	-82.48906	Targ.		

Table 2A. Qualitative macroinvertebrate sampling results for

	Black River Off Abbottsford Rd 7/13/2012	Black River Galbraith Line Rd 7/24/2012	Black River u/s Aitken Rd 7/12/2012	Black River Stone Rd 7/23/2012
TAXA	STATION 1	STATION 2	STATION 3	STATION 4
PLATYHELMINTHES (flatworms)	1	4	1	£
ANNELIDA (segmented worms)	1	4	1	5
Hirudinea (leeches)			1	4
Oligochaeta (worms)	3	77		4
ARTHROPODA Crustacea				
Amphipoda (scuds)	6	7	5	30
Decapoda (crayfish)	2	2	2	1
Arachnoidea Hydracarina	11		13	6
Insecta	11		15	0
Ephemeroptera (mayflies)				
Baetidae	17	10	2	6
Laenidae Heptageniidae	15	48	3	305
Isonychiidae	1	1		Ŭ
Polymitarcyidae	14	1		
Tricorythidae	15	8		
Anisoptera (dragonflies)				
Aeshnidae	5	3	2	6
Gomphidae		1		
Libellulidae	1	2		
Zygoptera (damselflies)	1	1		
Calopterygidae	1	2		1
Coenagrionidae	2	20	90	43
Belostomatidae			5	5
Corixidae	6	93	61	5
Gerridae	1			1
Mesoveliidae	2	2		12
Notonectidae	2	1		12
Pleidae		-	1	8
Veliidae			1	
Megaloptera Sialidae (alder flies)		4	2	6
Trichoptera (caddisflies)		4	2	0
Helicopsychidae		8		79
Hydropsychidae	70	42		1
Leptoceridae	1	4		13
Limnephilidae		2		8
Molannidae				1
Polycentropodidae	3	3	1	
Lepidoptera (moths)		5		
Pyralidae				1
Coleoptera (beetles)				2
Dytiscidae (total) Gyrinidae (adults)		1	1	2
Haliplidae (adults)		1	5	2
Hydrophilidae (total)	1	5	14	7
Elmidae	30	56	13	17
Psephenidae (larvae)	5	2		
Scirtidae (larvae)	2	2		
Diptera (flies)				
Ceratopogonidae	77	1	6	15
Culicidae	1	51	1	20
Stratiomyidae		2		
Tabanidae	2	6		
MOLLUSCA	3	2		
Gastropoda (snails)				
Ancylidae (limpets)		1	3	
Physidae	2	15	15	28
Pleuroceridae		2		12
Pelecypoda (bivalves)		-		
Sphaeriidae (clams)	11	59	1	18
Unionidae (mussels)	1		1	
TOTAL INDIVIDUALS	316	543	270	691

	Black R Off Abbotts 7/13/20 STATIO	Siver Sford Rd 012 N 1	Black R Galbraith I 7/24/20 STATIO	iver Line Rd)12 DN 2	Black R u/s Aitke 7/12/20 STATIO	iver en Rd 012 DN 3	Black R Stone 7/23/20 STATIO	iver Rd)12 DN 4
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	32	1	41	1	25	0	37	1
NUMBER OF MAYFLY TAXA	6	1	6	1	1	-1	3	1
NUMBER OF CADDISFLY TAXA	3	0	5	1	1	-1	6	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	21.84	0	14.55	-1	1.11	-1	46.16	1
PERCENT CADDISFLY COMP.	23.42	1	10.87	0	0.37	-1	15.77	0
PERCENT DOMINANT TAXON	24.37	-1	17.13	0	33.33	-1	44.14	-1
PERCENT ISOPOD, SNAIL, LEECH	0.63	1	3.31	1	7.04	0	6.37	0
PERCENT SURF. AIR BREATHERS	3.48	1	19.71	0	32.96	-1	6.66	1
TOTAL SCORE		3		2		-7		3
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		POOR		ACCEPT.

Table 2A. Qualitative macroinvertebrate sampling results for

	Mill Creek Kilgore Rd	Mill Creek Bricker Rd	Mill Creek Park Ave / Yale City Park	Mill Creek Jorden Rd
TAXA	STATION 5	8/28/2012 STATION 6	7/24/2012 STATION 7	7/25/2012 STATION 8
PORIFERA (sponges)			1	
Turbellaria	4	28	2	1
ANNELIDA (segmented worms)				
Hirudinea (leeches)		1	_	
Oligochaeta (worms)		9	7	10
Crustacea				
Amphipoda (scuds)	22	16		3
Decapoda (crayfish)	1	1	15	2
Arachnoidea			4	
Hydracarina Insecta			4	
Ephemeroptera (mayflies)				
Baetidae	30	4	5	4
Caenidae	1	5	3	7
Ephemeridae Heptageniidae	44	7	18	6
Isonychiidae	3	5	10	0
Polymitarcyidae	6			
Potamanthidae		10		
Tricorythidae	38	59		
Anisoptera (dragonflies)				
Aeshnidae				1
Gomphidae		1		
Libellulidae				4
Zygoptera (damselflies)		1		
Coenagrionidae	2	22	14	б
Plecoptera (stoneflies)	-			0
Perlidae	1	1		
Hemiptera (true bugs)				_
Belostomatidae	11	75	4	1
Gerridae	1	15	4	323
Mesoveliidae	1		10	3
Nepidae		1		1
Veliidae		5		
Megaloptera Corvdalidae (dobson flies)	1			
Sialidae (alder flies)	1	2	1	
Trichoptera (caddisflies)				
Helicopsychidae			1	1
Hydropsychidae	32	10	64	1
Leptoceridae	2		1	
Limnephilidae	1		14	3
Philopotamidae	1	4		
Polycentropodidae	1			
Uenoidae Colooptara (bootlas)	1			
Dytiscidae (total)				1
Gyrinidae (adults)			1	1
Haliplidae (adults)		1		1
Hydrophilidae (total)				2
Scirtidae (adults)	13	31	25	2
Gyrinidae (larvae)	43	51	25	1
Psephenidae (larvae)	9	13		
Diptera (flies)				
Athericidae	2		-	
Chironomidae	1 20	60	5	23
Culicidae	20	00	51	23
Dixidae				1
Simuliidae	1			
Tabanidae Timulidae	1	3		
MOLLUSCA	1	1	1	
Gastropoda (snails)				
Ancylidae (limpets)				1
Physidae	1	3		9
Pleuroceridae	9			2
sphaeriidae (clams)	1	1	3	4
Unionidae (mussels)	1	1	5	
TOTAL INDIVIDUALS	295	381	250	438

	Mill Cr Kilgore 7/25/20 STATIO	reek 9 Rd 012 N 5	Mill Cr Bricker 8/28/20 STATIO	eek Rd)12 N 6	Mill C Park Ave / Ya 7/24/2 STATIO	Creek Ile City Park 2012 ON 7	Mill Cr Jorden 7/25/20 STATIO	eek Rd)12 N 8
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	33	1	30	0	22	0	31	0
NUMBER OF MAYFLY TAXA	6	1	6	1	3	0	3	0
NUMBER OF CADDISFLY TAXA	6	1	2	0	4	1	3	0
NUMBER OF STONEFLY TAXA	1	1	1	1	0	-1	0	-1
PERCENT MAYFLY COMP.	41.36	1	23.62	1	10.40	-1	3.88	-1
PERCENT CADDISFLY COMP.	12.88	0	3.67	0	32.00	1	1.14	-1
PERCENT DOMINANT TAXON	14.92	1	19.69	0	25.60	-1	74.20	-1
PERCENT ISOPOD, SNAIL, LEECH	3.39	1	1.05	1	0.00	1	2.74	1
PERCENT SURF. AIR BREATHERS	4.41	1	21.52	0	6.00	1	78.08	-1
TOTAL SCORE		8		4		1		-4
MACROINV. COMMUNITY RATING	EX	CELLENT		ACCEPT.		ACCEPT.		ACCEPT.

Table 2A. Qualitative macroinvertebrate sampling results for

TAXM STATION 9 STATION 10 STATION 11 STATION 12 Tarbellaria 6 1 4 11 Tarbellaria 6 1 4 11 Marcellaria 2 2 9 5 ADRULDA (corrents vorms) 2 2 9 5 ADRULDA (corrents vorms) 2 2 9 5 ADRULDA (corrents vorms) 2 2 1 1 ADRULDA (corrents vorms) 40 1 2 1 ADRULDA (corrents vorms) 40 1 1 1 1 Ansolver (corrents vorms) 40 1 1 1 1 1 Ansolver (corrents vorms) 3 6 10 1 1 1 Ansolver (corrents vorms) 5 1 1 1 1 1 Adverter (corrents vorms) 1 1 1 1 1 1 Adverter (corrents vorms) 1 1 1 <th></th> <th>Sanilac and Saint Clair Drain east of Jorden Rd 8/28/2012</th> <th>S B Mill Creek Cade Rd 8/28/2012</th> <th>Black Creek off Cribbens Rd 7/24/2012</th> <th>Black Creek Todd Rd 8/30/2012</th> <th></th>		Sanilac and Saint Clair Drain east of Jorden Rd 8/28/2012	S B Mill Creek Cade Rd 8/28/2012	Black Creek off Cribbens Rd 7/24/2012	Black Creek Todd Rd 8/30/2012	
PLAT VIELS Officeres image: state of the st	TAXA	STATION 9	STATION 10	STATION 11	STATION 12	
Induction NELLDA (open advorms)6141Hunding (beck)06Oligochet (worms)229ARCHIROVDAA142Constace142Constace142Dampeda (stabl)4016Constace9116Hunding (bg)171Anschinda (bg)36104Constace36104Constace36104Constace36104Constace36104Constace36104Constace36101Anschinda36101Constace1711Constace1111Zappera (dascofficio)1111Zappera (dascofficio)1111Zappera (dascofficio)1111Zappera (dascofficio)1111Zappera (dascofficio)1111Zappera (dascofficio)1111Zappera (dascofficio)1111Zappera (dascofficio)1111Zappera (dascofficio)1111Restace24211Restace21 <t< td=""><td>PLATYHELMINTHES (flatworm</td><td>as)</td><td></td><td></td><td></td><td>_</td></t<>	PLATYHELMINTHES (flatworm	as)				_
ANNED NA (segmend source)Hundines (evens)2295Origonies (vorms)2295ACHRAPOLAI142CharlanI142Royne (avensk)I11Dorspeed (cryptsh)011Dorspeed (cryptsh)9116Incohnition9116Incohnition171Epicension311Enternition511Enternition171Incohnition511Charper (incomprise)111Acharladie111Charper (incomprise)111Charper (incomprise)111Incohnition131Charper (incomprise)111Charper (incomprise)111Nether (incomprise)111Nether (incomprise) <td< td=""><td>Turbellaria</td><td>6</td><td>1</td><td>4</td><td>11</td><td></td></td<>	Turbellaria	6	1	4	11	
Handlang (lacehas)6Objechesa (vorms)2295ACTINOVIDA121Contance121Contance121Actinovido (vorba)4021Arachnotoda9116Incore (tag) (ta	ANNELIDA (segmented worms)					
Objectional (vorms) 2 2 9 5 ARTRAPONDA I 1 42 Crustacea I I 2 1 Amphtpoki (crush) 40 I 42 1 Amphtpoki (crush) 10 I 16 1 16 Amshandka 9 1 16 1 1 Horizontra 9 1 16 1 1 Inscisa 5 1 7 1 1 Cacinita 5 1 1 1 1 1 Adisopera (figurafiles) 1 1 1 1 1 1 Cacinita 1 30 1 44 1 1 1 Cacinita 1 30 1 44 1 1 1 Cacinita 1 30 1 44 1 1 1 1 1 1 1 1 1	Hirudinea (leeches)				6	
ARTINOPODA Citalizes I4 1 42 Lappadi (coxthy) 0 2 1 Lappadi (coxthy) 0 1 1 Lappadi (coxthy) 0 1 1 Instain 0 1 1 Instain 0 1 1 Instain 3 6 10 4 Cannaka 3 6 10 4 Optimiting 3 6 10 4 Attinger 1 1 1 1 Attinger 1 1 1 1 1 Contr	Oligochaeta (worms)	2	2	9	5	
Crusteral 14 1 42 Decipada (crustria) 60 2 1 Decipada (crustria) 60 0 42 Bornola (crustria) 9 1 16 Hydrostrian 9 1 66 Inscria 3 6 10 4 Canital 5 1 7 1 Bertica 5 1 7 1 Advanta 5 1 1 1 Advanta 5 1 7 1 Advanta 1 1 1 1 Advanta 1 1 1 1 Advanta 1 30 1 44 Corvitalide 1 30 1 1 Corv	ARTHROPODA					
Ampinplication 1 1 4.2 Languadi (conclusg) - - Animotication - - Animotication (conclusg) - - Intervation (conclusg) - - Intervation (conclusg) - - Batchak 3 6 10 4 Cancidae 5 1 7 1 Heproproving (conclusg) - - 1 1 Cancidae 5 1 7 1 Heproproving (conclusg) - 1 1 1 Animotica 1 1 1 1 Action (conclusg) - 1 1 1 Action (conclusgi) - 1 1 1 Action (conclusgi) - 1 1 1 Action (conclusgi) 1 1 1 1 Canadizan (conclusgi) 1 1 1 1 1 Canop	Crustacea		14		12	
Design (Capusa) Poi 2 1 Andreams 9 1 16 Medicana 9 1 16 Inseria 9 1 16 Inseria 9 1 7 Bertiaca 3 6 10 4 Canada 5 1 7 1 Hepriagenitalia 8 3 6 1 1 Advantade 1 1 1 1 Advantade 1 1 1 1 Advantade 6 1 7 1 Calopterylighe 1 1 1 1 Calopterylighe 1 30 1 44 Geridae 10 1 4 4 Geridae 1 1 1 1 Nonectube 1 1 1 1 1 Neisone (idae 1 1 1 1 1 <td>Amphipoda (scuds)</td> <td>40</td> <td>14</td> <td>1</td> <td>42</td> <td></td>	Amphipoda (scuds)	40	14	1	42	
balancomingly - Hydramin - Hydramin - Bertment (mayflies) - Experiment (mayflies) - Ceniclate - Ceniclate - Ceniclate - Anisopera (dragonllies) - Assimption - Assimption - Assimption - Assimption - Concapation (dragonllies) - - - Assimption - Concapation (dragonllies) - - - Beloatomatidae 10 - - </td <td>Jeopoda (craynsh)</td> <td>40</td> <td>1</td> <td>2</td> <td>1</td> <td></td>	Jeopoda (craynsh)	40	1	2	1	
Hydroxana 9 1 16 Berthan 3 6 10 4 Cenniba 3 6 10 4 Cenniba 5 1 7 1 Heptagenita 8 3 6 10 4 Cenniba 5 1 7 1 1 Achinda 1 1 1 1 1 Achinda 1 1 1 1 1 Zopotery (dranofilisy) 1 1 7 1 1 Coloregry (dranofilisy) 1 1 1 1 1 Coloregry (dranofilisy) 1 1 1 1 1 Coloregry (dranofilias) 1 1 1 1 1 Coloregry (dranofilias) 1 1 1 1 1 1 Coloregry (dranofilias) 1 1 1 1 1 1 1 Notino (dr	Arachnoidea		1			
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Ephenomenon (marghiles)Bentidae36104Considae371Heptagerinication371Ausoptera (dragonfiles)111Zapotrea (dragonfiles)117Coloptergifiles117Zapotrea (dragonfiles)177Response (dragonfiles)177Response (dragonfiles)117Response (dragonfiles)117Response (dragonfiles)117Response (dragonfiles)114Response (dragonfiles)114Response (dragonfiles)2511Netrosco (dragonfiles)111Netrosco (dragonfiles)111Netrosco (dragonfiles)111Heidragonfiles521Netrosco (dragonfiles)111Heidragonfiles521Trichogrea (craditifiles)114Heidragonfiles522Coloratione (craditifiles)112Heidragonfiles111Heidragonfiles22Coloratione (craditifiles)11Heidragonfiles22Responsible112Responsible112Responsible112Responsible	Insecta		,	•	10	
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Sphaeriidae (clams) 3 1 56 1 Unionidae (mussels) 1 1	Pelecypoda (bivalves)		2			
Unionidae (mussels) 1 1	Sphaeriidae (clams)	3	1	56	1	
	Unionidae (mussels)	1	1	50	1	
TOTALINDIVIDUALS 277 242 328 403	TOTAL INDIVIDUALS	277	242	378	403	

	Sanilac and Sai east of Jo 8/28/2 STATE	nt Clair Drain orden Rd 2012 ON 9	S B Mill C Cade F 8/28/20 STATIO	Creek Rd 112 N 10	Black Cr off Cribber 7/24/20 STATIO	reek ns Rd 12 N 11	Black Cr Todd F 8/30/20 STATION	eek 3d 12 N 12
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	27	1	26	1	28	0	30	1
NUMBER OF MAYFLY TAXA	3	1	2	1	3	0	2	1
NUMBER OF CADDISFLY TAXA	4	1	1	0	5	1	3	0
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	5.78	-1	2.89	-1	6.10	-1	1.24	-1
PERCENT CADDISFLY COMP.	39.71	1	0.41	-1	20.73	0	1.49	-1
PERCENT DOMINANT TAXON	28.88	-1	28.51	-1	29.57	-1	32.01	-1
PERCENT ISOPOD, SNAIL, LEECH	1.08	1	2.89	1	1.83	1	3.47	1
PERCENT SURF. AIR BREATHERS	11.55	0	27.69	-1	3.05	1	19.11	0
TOTAL SCORE		2		-2		0		-1
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 2A. Qualitative macroinvertebrate sampling results for

	Black Creek Brown Rd 8/30/2012	Seymour Creek Todd Rd 7/23/2012	Arnot Creek north of Hall Rd 7/12/2012	Elk Creek Washington Rd 7/23/2012
TAXA	STATION 13	STATION 14	STATION 15	STATION 16
PLATYHELMINTHES (flatworms)				
Turbellaria		4	2	
ANNELIDA (segmented worms)	6	2	2	
Oligochaeta (worms)	18	2	5	2
ARTHROPODA	10	0	0	2
Crustacea				
Amphipoda (scuds)	4	12	1	2
Decapoda (crayfish)	2	1		1
Arachnoidea				
Hydracarina	6	4	9	3
Insecta				
Ephemeroptera (mayflies)				2
Baetidae		10		2
Caenidae	3	30		24
Heptageniidae	5	20		6
Tricorythidae				5
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	1		1	6
Zygoptera (damselflies)				
Calopterygidae	4	6	2	5.4
Hemiptera (true bugs)	19	0	2	34
Corixidae	106	16	11	13
Gerridae	100	1		2
Nepidae	1	1		2
Notonectidae	5			2
Pleidae			1	1
Megaloptera				
Sialidae (alder flies)	6	2	2	
Trichoptera (caddisflies)		27		
Hencopsychidae		37	2	2
Hydroptilidae		42	2	6
Leptoceridae		3		4
Limnephilidae				1
Philopotamidae				4
Uenoidae		1		
Coleoptera (beetles)				
Dytiscidae (total)	1			
Gyrinidae (adults)	7	2	0	1
Hydrophilidae (total)	3	2	8 3	5
Scirtidae (adults)	5	1	5	5
Dryopidae		1	1	
Elmidae	12	142	13	21
Psephenidae (larvae)				2
Diptera (flies)				
Ceratopogonidae	5		4	1
Chironomidae	82	17	112	52
Culicidae	5	1	4	
Tipulidae	8	1	4	
MOLLUSCA		1	1	
Gastropoda (snails)				
Ancylidae (limpets)	23	1		1
Bithyniidae				1
Physidae	56	7	53	16
Planorbidae		1	31	4
Pleuroceridae				1
Pelecypoda (bivalves)	-	1.1	2	
Sphaerhuae (Clams)	5	11	2	1
	***			1
TOTAL INDIVIDUALS	388	366	272	249

	Black Creek Brown Rd 8/30/2012 STATION 13		Seymour Creek Todd Rd 7/23/2012 STATION 14		Arnot Creek north of Hall Rd 7/12/2012 STATION 15		Elk Creek Washington Rd 7/23/2012 STATION 16	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	24	1	29	1	22	0	33	1
NUMBER OF MAYFLY TAXA	1	0	2	1	0	-1	5	1
NUMBER OF CADDISFLY TAXA	0	-1	4	1	1	-1	5	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	0.77	-1	10.93	-1	0.00	-1	15.26	0
PERCENT CADDISFLY COMP.	0.00	-1	22.68	1	0.74	-1	6.83	0
PERCENT DOMINANT TAXON	27.32	-1	38.80	-1	41.18	-1	21.69	0
PERCENT ISOPOD, SNAIL, LEECH	21.91	-1	3.01	1	31.99	-1	9.24	0
PERCENT SURF. AIR BREATHERS	32.99	-1	6.56	1	8.46	1	10.44	0
TOTAL SCORE		-6		3		-6		2
MACROINV. COMMUNITY RATING		POOR		ACCEPT.		POOR		ACCEPT.

Table 2A. Qualitative macroinvertebrate sampling results for

	Potts Drain d/s of Aitken Rd 7/12/2012	Potts Drain u/s Hall Rd 7/12/2012	McDonald Drain u/s Stilson Rd 7/24/2012	McDonald Drain d/s Stilson Rd 7/24/2012
TAXA	STATION 17	STATION 18	STATION 19	STATION 20
PLATYHELMINTHES (flatworms)				
Turbellaria	8	1	23	178
ANNELIDA (segmented worms)	_	_		_
Hirudinea (leeches)	3	3	1	5
Oligochaeta (worms) ARTHROPODA	3	6	1	1
Crustacea				
Amphipoda (scuds)		83	29	
Decapoda (crayfish)		2	1	1
Arachnoidea				
Hydracarina	2	10	13	2
Insecta				
Ephemeroptera (mayflies)	_	_	_	
Baetidae	5	9	5	_
Caenidae	96	83	30	1
Heptageniidae			1	
Anisontera (dragonflies)				
Anisoptera (dragonnies)	4	2	1	
Gomphidae	+	2	1	
Libellulidae	2	1	1	1
Zygontera (damselflies)	2	1	<u> </u>	1
Calonterygidae				1
Coenagrionidae	82	14	43	5
Hemiptera (true bugs)	02	11	13	5
Belostomatidae		5		
Corixidae	34	51	6	10
Gerridae	1	01	0	10
Nepidae	-	1		
Notonectidae	1	2	1	
Pleidae	2		1	
Megaloptera				
Sialidae (alder flies)	1	15	1	
Trichoptera (caddisflies)				
Helicopsychidae		1	30	47
Hydroptilidae			9	
Leptoceridae	1		9	1
Limnephilidae			5	1
Uenoidae			1	
Coleoptera (beetles)				
Gyrinidae (adults)	1	2		
Haliplidae (adults)	28	44		2
Hydrophilidae (total)	1	1	4	8
Elmidae	7	52	34	46
Haliplidae (larvae)			1	
Diptera (flies)	1	4	<i>,</i>	
Ceratopogonidae	1 54	4	6	12
Tabaridae	54	40	20	13
	1		1	
Gestropode (speils)				
Hydrobiidae	3			
Physidae	5		3	
Planorbidae	3	1	5	
Vivinaridae	1	1	1	
Pelecypoda (bivalves)	1			
Sphaeriidae (clams)		4	5	61
Unionidae (mussels)			1	<u>.</u>
TOTAL INDIVIDUALS	250	112	200	201
TOTAL INDIVIDUALS	550	443	290	384

	Potts Drain d/s of Aitken Rd 7/12/2012 STATION 17		Potts Drain u/s Hall Rd 7/12/2012 STATION 18		McDonald Drain u/s Stilson Rd 7/24/2012 STATION 19		McDonald Drain d/s Stilson Rd 7/24/2012 STATION 20	
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	26	0	25	1	32	1	18	1
NUMBER OF MAYFLY TAXA	2	-1	2	1	3	1	1	1
NUMBER OF CADDISFLY TAXA	1	-1	1	0	5	1	3	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	28.86	1	20.77	0	12.41	-1	0.26	-1
PERCENT CADDISFLY COMP.	0.29	-1	0.23	-1	18.62	0	12.76	0
PERCENT DOMINANT TAXON	27.43	-1	18.74	0	14.83	1	46.35	-1
PERCENT ISOPOD, SNAIL, LEECH	4.29	1	0.90	1	1.72	1	1.30	1
PERCENT SURF. AIR BREATHERS	19.43	0	23.93	-1	4.14	1	5.21	1
TOTAL SCORE		-3		0		4		2
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 2A. Qualitative macroinvertebrate sampling results for

	Speaker and Maple Valley Drain	
	School Rd	
	7/24/2012	
TAXA	STATION 21	
PLATYHELMINTHES (flatworms)		=
Turbellaria	1	
BRYOZOA (moss animals)	1	
ANNELIDA (segmented worms)	-	
Hirudinea (leeches)	1	
Oligochaeta (worms)	23	
ARTHROPODA		
Crustacea		
Amphipoda (scuds)	54	
Decapoda (crayfish)	4	
Arachnoidea		
Hydracarina	4	
Insecta		
Ephemeroptera (mayflies)		
Baetidae	6	
Caenidae	125	
Heptageniidae	25	
Tricorythidae	3	
Odonata		
Anisoptera (dragonflies)		
Aeshnidae	5	
Gomphidae	1	
Zygoptera (damselflies)		
Calopterygidae	3	
Coenagrionidae	31	
Hemiptera (true bugs)		
Corixidae	22	
Gerridae	1	
Nepidae	2	
Notonectidae	1	
Megaloptera		
Sialidae (alder flies)	1	
Trichoptera (caddisflies)		
Helicopsychidae	100	
Hydropsychidae	17	
Hydroptilidae	5	
Leptoceridae	22	
Limnephilidae	2	
Uenoidae	1	
Coleoptera (beetles)		
Haliplidae (adults)	2	
Hydrophilidae (total)	13	
Dryopidae	2	
Elmidae	117	
Psephenidae (larvae)	1	
Diptera (flies)	_	
Ceratopogonidae	5	
Chironomidae	/0	
	1	
Simulidae	<i>j</i>	
I abanidae	1	
I ipulidae	I	
MULLUSCA		
Gastropoda (snails)	~	
Ancylidae (limpets)	5	
Physicae	11	
relecypoda (bivalves)	0	
Spnaeriidae (ciams)	У	=
TOTAL INDIVIDUALS	702	-

	Speaker and Maple Valley Drain School Road 7/24/2012 STATION 21				
METRIC	Value	Score			
TOTAL NUMBER OF TAXA	40	1			
NUMBER OF MAYFLY TAXA	4	1			
NUMBER OF CADDISFLY TAXA	6	1			
NUMBER OF STONEFLY TAXA	0	-1			
PERCENT MAYFLY COMP.	22.65	0			
PERCENT CADDISFLY COMP.	20.94	0			
PERCENT DOMINANT TAXON	17.81	0			
PERCENT ISOPOD, SNAIL, LEECH	2.42	1			
PERCENT SURF. AIR BREATHERS	5.98	1			
TOTAL SCORE		4			
MACROINV. COMMUNITY RATING		ACCEPT.			

Table 2A. Qualitative macroinvertebrate sampling results for

	Elk Lake Creek				
	M21				
	8/28/2012				
TAXA	STATION 22				
PLATYHELMINTHES (flatworms)					
Turbellaria	15				
ANNELIDA (segmented worms)					
Oligochaeta (worms)	1				
ARTHROPODA					
Crustacea					
Isopoda (sowbugs)	17				
Arachnoidea					
Hydracarina	6				
Insecta					
Odonata					
Zygoptera (damselflies)					
Coenagrionidae	3				
Hemiptera (true bugs)					
Notonectidae	1				
Trichoptera (caddisflies)					
Limnephilidae	2				
Coleoptera (beetles)					
Haliplidae (adults)	1				
Hydrophilidae (total)	1				
Diptera (flies)					
Ceratopogonidae	1				
MOLLUSCA					
Gastropoda (snails)					
Ancylidae (limpets)	1				
Viviparidae	36				
Pelecypoda (bivalves)					
Sphaeriidae (clams)	189				
TOTAL INDIVIDUALS	274				

	Elk Lake Creek M21 8/28/2012 STATION 22			
METRIC	Value	Score		
TOTAL NUMBER OF TAXA	13	0		
NUMBER OF MAYFLY TAXA	0	-1		
NUMBER OF CADDISFLY TAXA	1	-1		
NUMBER OF STONEFLY TAXA	0	-1		
PERCENT MAYFLY COMP.	0.00	-1		
PERCENT CADDISFLY COMP.	0.73	-1		
PERCENT DOMINANT TAXON	68.98	-1		
PERCENT ISOPOD, SNAIL, LEECH	19.71	-1		
PERCENT SURF. AIR BREATHERS	1.09	1		
TOTAL SCORE		-6		
MACROINV. COMMUNITY RATING		POOR		

Table 2A. Qualitative macroinvertebrate sampling results for

	Dwight Drain Stringer Rd 7/23/2012	Bunce Creek off Gratiot Ave, DTE substation 8/29/2012	Cuttle Creek M29 8/29/2012	Pine River Griswold Rd 7/25/2012
TAXA	STATION 23	STATION 24	STATION 25	STATION 26
PLATYHELMINTHES (flatworms)				
Turbellaria	8	11	60	
ANNELIDA (segmented worms)	0		1	
Oligochaeta (worms)	8	1	1	10
	162	19	15	19
Crustacea				
Amphipoda (scuds)		9	2	
Decapoda (crayfish)	1	2	1	
Isopoda (sowbugs)		2	4	
Arachnoidea				
Hydracarina	53		2	
Insecta				
Reatidae	4	7		8
Caenidae	4 32	, 1		8
Odonata	52	1		5
Anisoptera (dragonflies)				
Aeshnidae	6	1	3	6
Gomphidae				1
Libellulidae	1			1
Zygoptera (damselflies)				
Calopterygidae	10	2	26	3
Coenagrionidae Placenters (stopoflice)	49		/6	2
Perlidae				1
Hemiptera (true bugs)				1
Belostomatidae	3			
Corixidae	1		1	123
Gerridae		1	1	1
Mesoveliidae		1		1
Nepidae	1			
Pleidae	1			1
Megaloptera Sielidea (alder flice)				1
Trichoptera (caddisflies)				1
Hydropsychidae		4		11
Hydroptilidae				2
Leptoceridae				3
Limnephilidae				1
Polycentropodidae				19
Coleoptera (beetles)				
Dytiscidae (total)	1			2
Haliplidae (adults)	20			3
Dryonidae	28			0
Elmidae	9	30	8	36
Scirtidae (larvae)	·		-	1
Diptera (flies)				
Athericidae				6
Ceratopogonidae				1
Chironomidae	5	189	117	73
Simuliidae		1		
Stratiomyidae		1	2	1
Tipulidae		8	2	1
MOLLUSCA		0		
Gastropoda (snails)				
Ancylidae (limpets)	1			
Hydrobiidae				1
Physidae				7
Planorbidae		1		
Viviparidae			1	
Pelecypoda (bivalves)	10	20	01	10
spnaeridae (clams)	10	28	81	10
TOTAL INDIVIDUALS	404	319	399	355

	Dwight String 7/23/2 STATIO	Drain er Rd 2012 ON 23	Bunce off Gratiot Ave, 8/29/ STATI	Creek DTE substation 2012 ON 24	Cuttle Cr M29 8/29/20 STATION	reek 12 N 25	Pine Riv Griswold 7/25/20 STATION	ver Rd 12 V 26
METRIC	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	20	0	20	1	17	1	32	1
NUMBER OF MAYFLY TAXA	2	1	2	1	0	-1	2	0
NUMBER OF CADDISFLY TAXA	0	-1	1	0	0	-1	5	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	1	1
PERCENT MAYFLY COMP.	8.91	-1	2.51	-1	0.00	-1	3.10	-1
PERCENT CADDISFLY COMP.	0.00	-1	1.25	-1	0.00	-1	10.14	0
PERCENT DOMINANT TAXON	45.05	-1	59.25	-1	29.32	-1	34.65	-1
PERCENT ISOPOD, SNAIL, LEECH	2.23	1	1.25	1	1.50	1	2.25	1
PERCENT SURF. AIR BREATHERS	8.66	1	0.94	1	0.50	1	38.31	-1
TOTAL SCORE		-2		0		-3		1
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 2A. Qualitative macroinvertebrate sampling results for

	Belle River Puttygut Rd 8/29/2012	Belle River Saint Clair Hwy 8/29/2012	Belle River Kronner Rd 8/29/2012	Belle River End of Meskill Rd 7/13/2012
TAXA	STATION 27	STATION 28	STATION 29	STATION 30
PLATYHELMINTHES (flatworms)			2	
Turbellaria	1		3	6
Hirudinea (leeches)	1			
Oligochaeta (worms)	17	10	25	1
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	1	1	24	1
Arachnoidea	1	1	1	6
Hydracarina	6	18	28	4
Insecta				
Ephemeroptera (mayflies)				
Baetidae	13	14	44	10
Caenidae	9	20	9	10
Ephemendae Heptageniidae	16	1	3	5
Isonvchiidae	10	1	1	8
Potamanthidae	1			
Tricorythidae	18	28	19	30
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	2	1	1	1
Libellulidae		1	1	1
Macromiidae	1	5	1	
Zygoptera (damselflies)				
Calopterygidae	9	1	16	8
Coenagrionidae	7	6	23	6
Plecoptera (stoneflies)				
Perlidae			1	
Corividae	7	1		
Gerridae	1	11	1	
Mesoveliidae	4	8	1	
Nepidae			1	
Veliidae			1	
Megaloptera				
Corydalidae (dobson flies)			1	1
Trichoptera (caddisflies)			1	
Helicopsychidae				1
Hydropsychidae	33	3	1	89
Hydroptilidae			2	
Leptoceridae			3	3
Limnephilidae	1			1
Philopotamidae			1	2
Psychomyiidae				1
Coleoptera (beetles)				-
Gyrinidae (adults)			1	
Haliplidae (adults)		1	2	1
Hydrophilidae (total)			_	1
Psephenidae (adults)	1		5	2
Elmidae	1	10	1	2
Gvrinidae (larvae)	17	10	15	2
Haliplidae (larvae)			7	
Psephenidae (larvae)				4
Scirtidae (larvae)				1
Diptera (flies)				
Chiranamidae	2	102	126	1
Simuliidae	2	102	120	6
Tabanidae	2	5		U U
Tipulidae	4	1	1	12
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	1	2		-
Physidae	1		12	5
Pelecypoda (biyalves)	1			
Sphaeriidae (clams)	1		3	1
Unionidae (mussels)	1	1		
TOTAL INDIVIDUALS	274	253	384	296

METRIC	Belle Ri Puttygut 8/29/20 STATIOI	ver Rd 12 N 27	Belle Ri Saint Clair 8/29/20 STATION	ver Hwy 12 N 28	Belle Ri Kronner 8/29/20 STATION	ver Rd 12 N 29	Belle Ri End of Mes 7/13/20 STATION	ver kill Rd 12 N 30
METRIC	value	Score	value	score	value	Score	value	Score
TOTAL NUMBER OF TAXA	30	0	25	0	35	1	36	1
NUMBER OF MAYFLY TAXA	5	1	4	1	5	1	6	1
NUMBER OF CADDISFLY TAXA	2	0	1	-1	4	1	7	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	1	1	0	-1
PERCENT MAYFLY COMP.	20.80	0	24.90	1	19.79	0	21.96	0
PERCENT CADDISFLY COMP.	12.41	0	1.19	-1	1.82	-1	35.47	1
PERCENT DOMINANT TAXON	33.94	-1	40.32	-1	32.81	-1	30.07	-1
PERCENT ISOPOD, SNAIL, LEECH	1.09	1	0.79	1	3.13	1	1.69	1
PERCENT SURF. AIR BREATHERS	4.38	1	8.30	1	3.13	1	0.68	1
TOTAL SCORE		1		0		4		4
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 2A. Qualitative macroinvertebrate	sampling results for		
Belle River N B Belle River Weber Rd Newark d/s of Pinnacle (Vlasic) Foods outfall 8/29/2012 7/11/2012		N B Belle River Newark u/s of Pinnacle (Vlasic) Foods outfall 7/11/2012	
	STATION 31	STATION 32	STATION 55
PLATYHELMINTHES (flatworms) Turbellaria ANNELIDA (segmented worms)		9	19
Hirudinea (leeches) Oligochaeta (worms) ARTHROPODA	5	6 25	10 3
Crustacea			
Amphipoda (scuds)	7	113	108
Decapoda (crayfish) Isopoda (sowbugs) Arachnoidea	1	3 2	1 27
Hydracarina	5	2	1
Insecta			
Ephemeroptera (mayflies)			
Baetidae	24		
Caenidae	10	1	
Heptageniidae	2		
Tricorythidae	49		
Odonata			
Anisoptera (dragonnies)	1	4	2
Gomphidae	1	+	2
Libellulidae	3		•
Zygoptera (damselflies)	-		
Calopterygidae	3		4
Coenagrionidae	21	35	16
Hemiptera (true bugs)			
Belostomatidae		1	3
Corixidae	1	5	
Mesoveliidae	2		1
Megaloptera	1		
Corydalidae (dobson flies)	1		
Helioonguchidaa	2		
Hydropsychidae	2		
Leptoceridae	2		3
Limnephilidae	- 1		
Coleoptera (beetles)			
Dytiscidae (total)		1	1
Gyrinidae (adults)	1		
Haliplidae (adults)		7	1
Hydrophilidae (total)	1	3	1
Elmidae	1		
Psephenidae (larvae)	2		
Corretenegenidee	2		
Chironomidae	100	44	59
Simuliidae	2		57
Tabanidae	11		1
Tipulidae	1		
MOLLUSCA			
Gastropoda (snails)			
Hydrobiidae		1	
Lymnaeidae			1
Physidae	1	30	2
Planorbidae		6	1
Pleuroceridae	1		
Sphaariidaa (alama)	2	2	1
Unionidae (mussels)	5	0 1	1
	270	1	A/7
I UI AL INDIVIDUALS	270	305	267

METRIC	Be W 8/ STA Value	elle River /eber Rd /29/2012 .TION 31 Score	North Newark d/s of P ST Value	Branch Belle River innacle (Vlasic) Foods outfall 7/11/2012 FATION 32 Score	North Branch Belle I Newark u/s of Pinnacle (Vlasic 7/11/2012 STATION 33 Value	River) Foods outfall Score
	Vulue	besie	Vulue	Beole	Vinice	Beole
TOTAL NUMBER OF TAXA	32	1	21	0	23	0
NUMBER OF MAYFLY TAXA	4	1	1	-1	0	-1
NUMBER OF CADDISFLY TAXA	4	1	0	-1	1	-1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	31.48	1	0.33	-1	0.00	-1
PERCENT CADDISFLY COMP.	2.96	-1	0.00	-1	1.12	-1
PERCENT DOMINANT TAXON	37.04	-1	37.05	-1	40.45	-1
PERCENT ISOPOD, SNAIL, LEECH	0.74	1	14.75	-1	15.36	-1
PERCENT SURF. AIR BREATHERS	1.85	1	5.57	1	2.62	1
TOTAL SCORE		3		-6		-6
MACROINV. COMMUNITY RATING		ACCEPT.		POOR		POOR

Table 2A. Qualitative macroinver	tebrate sampling results for		
TAXA	Belle River Upstream Glover Road 6/5/2013 STATION 34	Belle River Sperry Rd 6/5/2013 STATION 35	Belle River Riley Center Rd 6/5/2013 STATION 36
ANNELIDA (segmented worms)			
Hirudinea (leeches)			1
Oligochaeta (worms)	3	6	22
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	285	110	82
Decapoda (crayfish)			1
Isopoda (sowbugs)	1	36	8
Arachnoidea			
Hydracarina		3	1
Insecta			
Ephemeroptera (mayflies)			22
Baetidae	1	2	33
	1	3	1
Odonata			1
Anisoptera (dragonflies)			
Aeshnidae			1
Zygoptera (damselflies)			Ĩ
Coenagrionidae	8	17	2
Plecoptera (stoneflies)			
Perlidae			2
Hemiptera (true bugs)			
Corixidae	6	109	5
Trichoptera (caddisflies)			
Helicopsychidae			1
Hydropsychidae			18
Leptoceridae		1	
Limnephilidae		1	3
Coleoptera (beetles)			
Dytiscidae (total)	1	_	
Gyrinidae (adults)		1	
Haliplidae (adults)	1	3	
Hydrophilidae (total)	1	12	40
Elmidae	7	13	49
Ceratopogonidae			1
Chironomidae	6	33	1
Simuliidae	3	55	44
Tabanidae	1	1	
Tipulidae	-	1	4
MOLLUSCA			
Gastropoda (snails)			
Hydrobiidae			2
Physidae	10	2	
Planorbidae	1		
Pleuroceridae	2		
Viviparidae	1		
Pelecypoda (bivalves)			
Sphaeriidae (clams)	2		3
Unionidae (mussels)			1
TOTAL INDIVIDUALS	240	220	200
I OTAL INDIVIDUALS	340	339	289

	Belle River		Belle River		Belle River	
	Upstream Glover Road		Sperry Rd		Riley Center Rd	
	6/5/201	13	6/5/20	13	6/5/2013	
	STATION	N 34	STATIO	N 35	STATION 36	
METRIC	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	18	0	15	-1	23	0
NUMBER OF MAYFLY TAXA	1	-1	1	-1	2	0
NUMBER OF CADDISFLY TAXA	0	-1	2	0	3	0
NUMBER OF STONEFLY TAXA	0	-1	0	-1	1	1
PERCENT MAYFLY COMP.	0.29	-1	0.88	-1	11.76	-1
PERCENT CADDISFLY COMP.	0.00	-1	0.59	-1	7.61	0
PERCENT DOMINANT TAXON	83.82	-1	32.45	-1	28.37	-1
PERCENT ISOPOD, SNAIL, LEECH	4.41	1	11.21	0	3.81	1
PERCENT SURF. AIR BREATHERS	2.65	1	33.33	-1	1.73	1
TOTAL SCORE		-4		-7		1
MACROINV. COMMUNITY RATING		ACCEPT.	1	POOR	1	ACCEPT.

HADITAT METDIC	Black River Off Abbottsford Rd RIFFLE/RUN STATION 1	Black River Galbraith Line Rd RIFFLE/RUN STATION 2	Black River u/s Aitken Rd GLIDE/POOL STATION 3	Black River Stone Rd GLIDE/POOL STATION 4	Mill Creek Kilgore Rd RIFFLE/RUN STATION 5
Rabitat metric					
Substrate and Instream Cover	10	10	2	0	12
Epilaunai Substrate/ Avail Cover (20)	12	10	3	9	12
Embeddedness (20)*	10	14			14
Velocity/Depth Regime (20)*	10	14	0	10	16
Pool Substrate Characterization (20)**			8	12	
Pool Variability (20)**			4	8	
Channel Morphology					
Sediment Deposition (20)	14	9	8	10	15
Flow Status - Maint. Flow Volume (10)	5	8	9	8	9
Flow Status - Flashiness (10)	9	8	7	9	9
Channel Alteration (20)	18	15	12	3	15
Frequency of Riffles/Bends (20)*	13	12			16
Channel Sinuosity (20)**			10	2	
Riparian and Bank Structure					
Bank Stability (L) (10)	8	9	5	4	8
Bank Stability (R) (10)	8	9	5	4	8
Vegetative Protection (L) (10)	9	8	6	4	9
Vegetative Protection (R) (10)	7	8	6	4	8
Riparian Veg. Zone Width (L) (10)	10	7	5	1	7
Riparian Veg. Zone Width (R) (10)	10	7	4	1	6
TOTAL SCORE (200):	149	138	92	79	152
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

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).

Date:	7/13/2012	7/24/2012	7/12/2012	7/23/2012	7/25/2012
Weather:	Sunny	Sunny	Sunny	Partly Cloudy	Partly Cloudy
Air Temperature:	77 Deg. 1	F. 73 Deg. F.	84 Deg. F.	75 Deg. F.	73 Deg. F.
Water Temperature:	75 Deg. 1	F. 84 Deg. F.	82 Deg. F.	78 Deg. F.	72 Deg. F.
Ave. Stream Width:	65 Feet	120 Feet	75 Feet	11 Feet	55 Feet
Ave. Stream Depth:	1.0 Feet	0.4 Feet	3.2 Feet	0.5 Feet	1.5 Feet
Surface Velocity:	0.8 Ft./Se	c. 1.0 Ft./Sec.	0.2 Ft./Sec.	0.3 Ft./Sec.	0.5 Ft./Sec.
Estimated Flow:	52.0 CFS	48.0 CFS	48.0 CFS	1.7 CFS	41.3 CFS
Stream Modifications:	None	None	Relocated	Dredged	None
Nuisance Plants (Y/N):	Ν	Ν	Ν	N	Ν
Report Number:					
STORET No.:	740441	760058	760009	760267	740457
Stream Name:	Black River	Black River	Black River	Black River	Mill Creek
Road Crossing/Location:	Off Abbottsford Rd	Galbraith Line Rd	u/s Aitken Rd	Stone Rd	Kilgore Rd
County Code:	74	76	76	76	74
TRS:	07N16E17	09N16E20	10N16E06	13N14E14	07N15E15
Latitude (dd):	43.04015	43.193615	43.3219	43.55416	43.04274
Longitude (dd):	-82.59195	-82.624171	-82.6354	-82.79473	-82.69353
Ecoregion:	HELP	HELP	HELP	HELP	HELP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4090001	4090001	4090001	4090001	4090001

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3. Habitat evaluation for

	Mill Creek Bricker Rd RIFFLE/RUN STATION 6	Mill Creek Park Ave / Yale City Park GLIDE/POOL STATION 7	Mill Creek Jorden Rd RIFFLE/RUN STATION 8	Sanilac and St Clair Drain east of Jorden Rd RIFFLE/RUN STATION 9	S B Mill Creek Cade Rd GLIDE/POOL STATION 10
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	15	15	5	15	9
Embeddedness (20)*	13		11	15	
Velocity/Depth Regime (20)*	12		4	15	
Pool Substrate Characterization (20)**		13			6
Pool Variability (20)**		8			3
Channel Morphology					
Sediment Deposition (20)	13	16	6	16	16
Flow Status - Maint. Flow Volume (10)) 9	6	8	8	9
Flow Status - Flashiness (10)	4	8	1	9	4
Channel Alteration (20)	18	14	17	11	10
Frequency of Riffles/Bends (20)*	10		4	16	
Channel Sinuosity (20)**		11			1
Riparian and Bank Structure					
Bank Stability (L) (10)	9	8	3	6	8
Bank Stability (R) (10)	8	8	3	6	8
Vegetative Protection (L) (10)	8	8	7	5	6
Vegetative Protection (R) (10)	9	8	7	5	6
Riparian Veg. Zone Width (L) (10)	10	5	9	5	5
Riparian Veg. Zone Width (R) (10)	6	1	8	5	3
TOTAL SCORE (200):	144	129	93	137	94
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)

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).

Date:	8/28/2012	7/24/2012	7/25/2012	8/28/2012	8/28/2012
Weather:	Partly Cloudy	Partly Cloudy	Sunny	Partly Cloudy	Partly Cloudy
Air Temperature:	72 D	eg. F. 73 Deg.	F. 50	Deg. F.	Deg. F. 70 Deg. F.
Water Temperature:	78 D	eg. F. 80 Deg.	F. 72	Deg. F. 76	Deg. F. 70 Deg. F.
Ave. Stream Width:	50 Fe	eet 50 Feet	40	Feet 10	Feet 6 Feet
Ave. Stream Depth:	0.8 Fe	eet 1.5 Feet	1.0	Feet 0.5	Feet 0.5 Feet
Surface Velocity:	0.5 Ft	./Sec. 0.2 Ft./S	ec. 0.2	Ft./Sec. 0.3	Ft./Sec. 0.1 Ft./Sec.
Estimated Flow:	18.8 C	FS 15.0 CFS	8.0	CFS 1.5	CFS 0.3 CFS
Stream Modifications:	None	Bank Stabilization	None	Dredged	Dredged
Nuisance Plants (Y/N):	Ν	N	Ν	Ν	Ν
Report Number:					
STORET No.:	740235	740459	740458	740464	740465
Stream Name:	Mill Creek	Mill Creek	Mill Creek	Sanilac and St Clair Drain	S B Mill Creek
Road Crossing/Location:	Bricker Rd	Park Ave / Yale City Park	Jorden Rd	east of Jorden Rd	Cade Rd
County Code:	74	74	74	74	74
TRS:	07N15E07	08N14E10	08N14E04	08N14E03	07N12E01
Latitude (dd):	43.05423	43.12997	43.14861	43.14701	43.05526
Longitude (dd):	-82.73448	-82.80088	-82.81956	-82.81809	-82.98993
Ecoregion:	HELP	HELP	HELP	HELP	HELP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4090001	4090001	4090001	4090001	4090001

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3. Habitat evaluation for

	Black Creek off Cribbens Rd RIFFLE/RUN STATION 11	Black Creek Todd Rd GLIDE/POOL STATION 12	Black Creek Brown Rd GLIDE/POOL STATION 13	Seymour Creek Todd Rd RIFFLE/RUN STATION 14	Arnot Creek north of Hall Rd GLIDE/POOL STATION 15
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	12	10	10	7	8
Embeddedness (20)*	12			5	
Velocity/Depth Regime (20)*	10			12	
Pool Substrate Characterization (20)**		12	7		10
Pool Variability (20)**		10	3		3
Channel Morphology					
Sediment Deposition (20)	13	10	16	6	4
Flow Status - Maint. Flow Volume (10)	7	4	9	8	9
Flow Status - Flashiness (10)	8	8	8	9	9
Channel Alteration (20)	18	6	12	4	13
Frequency of Riffles/Bends (20)*	18			7	
Channel Sinuosity (20)**		8	8		7
Riparian and Bank Structure					
Bank Stability (L) (10)	9	6	7	5	6
Bank Stability (R) (10)	9	6	7	5	6
Vegetative Protection (L) (10)	9	6	7	5	7
Vegetative Protection (R) (10)	9	6	7	5	7
Riparian Veg. Zone Width (L) (10)	10	3	4	1	4
Riparian Veg. Zone Width (R) (10)	8	6	4	1	4
TOTAL SCORE (200):	152	101	109	80	97
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)

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).

Date:	7/24/2012	8/30/2012	8/30/2012	7/23/2012	7/12/2012
Weather:	Partly Cloudy	Sunny	Sunny	Sunny	Sunny
Air Temperature:	84 Deg. F.	66 Deg. F.	55 Deg. F.	93 Deg. F.	84 Deg. F.
Water Temperature:	78 Deg. F.	67 Deg. F.	63 Deg. F.	85 Deg. F.	69 Deg. F.
Ave. Stream Width:	25 Feet	12 Feet	9 Feet	4.5 Feet	11 Feet
Ave. Stream Depth:	1.0 Feet	1.0 Feet	0.6 Feet	0.5 Feet	0.5 Feet
Surface Velocity:	0.8 Ft./Sec.	0.2 Ft./Sec.	0.3 Ft./Sec.	0.3 Ft./Sec.	0.3 Ft./Sec.
Estimated Flow:	20.0 CFS	2.4 CFS	1.6 CFS	0.7 CFS	1.7 CFS
Stream Modifications:	None	Dredged	Dredged	Dredged	Dredged
Nuisance Plants (Y/N):	Ν	N	N	N	N
Report Number:					
STORET No.:	760194	760268	760269	760265	760262
Stream Name:	Black Creek	Black Creek	Black Creek	Seymour Creek	Arnot Creek
Road Crossing/Location:	off Cribbens Rd	Todd Rd	Brown Rd	Todd Rd	north of Hall Rd
County Code:	76	76	76	76	76
TRS:	09N15E13	09N15E22	09N15E29	09N15E15	10N15E13
Latitude (dd):	43.2171	43.19558	43.18086	43.21243	43.29178
Longitude (dd):	-82.6466	-82.68476	-82.72336	-82.68585	-82.66717
Ecoregion:	HELP	HELP	HELP	HELP	HELP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4090001	4090001	4090001	4090001	4090001

* Applies only to Riffle/Run stream Surveys ** Applies only to Glide/Pool stream Surveys

HABITAT METRIC	Elk Creek Washington Rd GLIDE/POOL STATION 16	Potts Drain d/s of Aitken Rd GLIDE/POOL STATION 17	Potts Drain u/s Hall Rd GLIDE/POOL STATION 18	McDonald Drain u/s Stilson Rd RIFFLE/RUN STATION 19	McDonald Drain d/s Stilson Rd RIFFLE/RUN STATION 20
Substrate and Instream Cover					
Enifaunal Substrate/ Avail Cover (20)	8	5	3	7	6
Embeddedness (20)*	0	5	5	14	13
Velocity/Denth Regime (20)*				14	10
Pool Substrate Characterization (20)**	5	6	6	11	10
Pool Variability (20)**	11	3	1		
Channel Mornhology	11	5	1		
Sediment Deposition (20)	10	5	3	9	11
Flow Status - Maint Flow Volume (10)	9	8	4	9	5
Flow Status - Flashiness (10)	2	7	6	6	9
Channel Alteration (20)	2	6	1	1	5
Frequency of Riffles/Bends (20)*	-	0	1	13	5
Channel Sinuosity (20)**	1	1	2	15	5
Rinarian and Bank Structure	1	1	-		
Bank Stability (L) (10)	4	8	8	5	5
Bank Stability (R) (10)	4	6	8	5	5
Vegetative Protection (L) (10)	5	6	6	5	5
Vegetative Protection (R) (10)	5	6	6	5	5
Riparian Veg. Zone Width (L) (10)	2	2	2	1	1
Riparian Veg. Zone Width (R) (10)	1	2	2	1	1
TOTAL SCORE (200):	69	71	58	92	86
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)

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).

Date:	7/23/2012	7/12/201	2	7/12/2012		7/24/2012		7/24/2012	
Weather:	Sunny	Sunn	у	Sunny		Partly Cloudy		Partly Cloudy	
Air Temperature:	90	Deg. F. 81	Deg. F.	72	Deg. F.	75	Deg. F.	73	Deg. F.
Water Temperature:	84	Deg. F. 65	Deg. F.	61	Deg. F.	76	Deg. F.	76	Deg. F.
Ave. Stream Width:	35	Feet 24	Feet	5	Feet	10	Feet	5	Feet
Ave. Stream Depth:	2.0	Feet 1.	2 Feet	0.5	Feet	1.0	Feet	0.3	Feet
Surface Velocity:	0.4	Ft./Sec. 0.	3 Ft./Sec.	0.3	Ft./Sec.	0.5	Ft./Sec.	0.4	Ft./Sec.
Estimated Flow:	28.0	CFS 8.	6 CFS	0.8	CFS	5.0	CFS	0.7	CFS
Stream Modifications:	Dredged	Dredge	d	Dredged		Dredged		Dredged	
Nuisance Plants (Y/N):	N		Y	N		N		N	
Report Number:									
STORET No.:	760266	760261		760240		760238		760263	
Stream Name:	Elk Creek	Potts Drai	n	Potts Drain	Ν	IcDonald Drain		McDonald Drain	
Road Crossing/Location:	Washington Rd	d/s of Aitken R	d	u/s Hall Rd		u/s Stilson Rd		d/s Stilson Rd	
County Code:	76	7	6	76		76		76	
TRS:	11N15E16	10N15E0	5	10N15E20		10N14E16		10N14E8	
Latitude (dd):	43.39632	43.31863		43.2894		43.3015		43.30124	
Longitude (dd):	-82.70516	-82.73745		-82.7475		-82.8424		-82.86191	
Ecoregion:	HELP	HEL	Р	HELP		HELP		HELP	
Stream Type:	Warmwater	Warmwate	er	Warmwater		Warmwater		Warmwater	
USGS Basin Code:	4090001	4090001		4090001		4090001		4090001	

* Applies only to Riffle/Run stream Surveys ** Applies only to Glide/Pool stream Surveys

	Speaker and Maple Valley Drain School Rd RIFFLE/RUN STATION 21	Elk Lake Creek M21 GLIDE/POOL STATION 22	Dwight Drain Stinger Rd GLIDE/POOL STATION 23	Bunce Creek off Gratiot Ave, DTE substation RIFFLE/RUN STATION 24	Cuttle Creek M29 RIFFLE/RUN STATION 25
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	11	6	1	10	7
Embeddedness (20)*	15			15	11
Velocity/Depth Regime (20)*	16			8	11
Pool Substrate Characterization (20)**		11	0		
Pool Variability (20)**		4	0		
Channel Morphology					
Sediment Deposition (20)	14	15	1	16	15
Flow Status - Maint. Flow Volume (10)	9	5	9	4	3
Flow Status - Flashiness (10)	9	9	9	1	1
Channel Alteration (20)	1	13	1	18	11
Frequency of Riffles/Bends (20)*	10			12	13
Channel Sinuosity (20)**		8	1		
Riparian and Bank Structure					
Bank Stability (L) (10)	6	9	6	5	3
Bank Stability (R) (10)	6	9	6	5	3
Vegetative Protection (L) (10)	6	9	6	8	9
Vegetative Protection (R) (10)	6	9	6	8	9
Riparian Veg. Zone Width (L) (10)	1	9	1	5	7
Riparian Veg. Zone Width (R) (10)	1	9	1	8	7
TOTAL SCORE (200):	111	125	48	123	110
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	POOR (SEVERELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

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).

Date:	7/24/2012	8/28/2012	7/23/2012	8/29/2012	8/29/2012
Weather:	Cloudy	Sunny	Sunny	Partly Cloudy	Sunny
Air Temperature:	70 Deg. F.	66 Deg. I	. 85 De	eg. F. 73	Deg. F. 75 Deg. F.
Water Temperature:	69 Deg. F.	65 Deg. H	. 84 De	eg. F. 69	Deg. F. 72 Deg. F.
Ave. Stream Width:	8 Feet	5 Feet	11 Fe	eet 6	Feet 5 Feet
Ave. Stream Depth:	0.6 Feet	0.2 Feet	0.3 Fe	eet 0.3	Feet 0.5 Feet
Surface Velocity:	0.3 Ft./Sec.	0.2 Ft./Sec	c. 0.8 Ft.	./Sec. 0.3	Ft./Sec. 0.2 Ft./Sec.
Estimated Flow:	1.4 CFS	0.2 CFS	2.9 CH	FS 0.5	CFS 0.5 CFS
Stream Modifications:	Dredged	None	Dredged	None	Dredged
Nuisance Plants (Y/N):	Ν	Ν	Ν	Ν	Ν
Report Number:					
STORET No.:	760264	440242	760206	740461	740460
Stream Name:	Speaker and Maple Valley Drain	Elk Lake Creek	Dwight Drain	Bunce Creek	Cuttle Creek
Road Crossing/Location:	School Rd	M21	Stinger Rd of	ff Gratiot Ave, DTE substation	M29
County Code:	76	44	76	74	74
TRS:	09N14E08	07N11E03	12N14E27	06N17E29	05N17E6
Latitude (dd):	43.22807	43.04934	43.44051	42.93019	42.89629
Longitude (dd):	-82.85454	-83.14941	-82.79204	-82.46172	-82.48596
Ecoregion:	HELP	SMNITP	HELP	HELP	HELP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4090001	4090001	4090001	4090001	4090001

* Applies only to Riffle/Run stream Surveys ** Applies only to Glide/Pool stream Surveys

HABITAT METRIC	Pine River Griswold Rd GLIDE/POOL STATION 26	Belle River Puttygut Rd GLIDE/POOL STATION 27	Belle River Saint Clair Hwy GLIDE/POOL STATION 28	Belle River Kroner Rd RIFFLE/RUN STATION 29	Belle River End of Meskill Rd RIFFLE/RUN STATION 30
Substrate and Instream Cover					
Eniformal Substrate/ Avail Cover (20)	2	6	10	16	16
Ephadian Substrate/ Avail Cover (20)	2	0	10	10	10
Valacity/Danth Pacima (20)*				17	14
P 16 1 (20)**	(((18	10
Pool Substrate Characterization (20)**	6	6	6		
Pool variability (20)**	11	9	8		
Channel Morphology	2			1.5	
Sediment Deposition (20)	2	11	11	15	14
Flow Status - Maint. Flow Volume (10)) 8	9	9	9	7
Flow Status - Flashiness (10)	2	2	1	8	4
Channel Alteration (20)	18	10	10	18	19
Frequency of Riffles/Bends (20)*				18	11
Channel Sinuosity (20)**	9	3	3		
Riparian and Bank Structure					
Bank Stability (L) (10)	3	6	8	9	8
Bank Stability (R) (10)	5	6	8	8	6
Vegetative Protection (L) (10)	7	6	7	7	10
Vegetative Protection (R) (10)	7	6	7	8	10
Riparian Veg. Zone Width (L) (10)	6	4	4	8	10
Riparian Veg. Zone Width (R) (10)	6	8	4	8	10
TOTAL SCORE (200):	92	92	96	167	155
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)

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).

Date:	7/25/2012	8/29/2012	8/29/2012	8/29/2012	7/13/2012
Weather:	Partly Cloudy	Sunny	Sunny	Partly Cloudy	Sunny
Air Temperature:	79 Deg. F.	55 Deg. F.	64 Deg.	F. 68 Deg. F	. 88 Deg. F.
Water Temperature:	74 Deg. F.	70 Deg. F.	69 Deg.	F. 70 Deg. F	. 79 Deg. F.
Ave. Stream Width:	50 Feet	50 Feet	50 Feet	50 Feet	55 Feet
Ave. Stream Depth:	2.0 Feet	0.4 Feet	1.0 Feet	1.0 Feet	0.3 Feet
Surface Velocity:	0.1 Ft./Sec.	0.2 Ft./Sec.	0.2 Ft./Se	ec. 0.6 Ft./Sec	. 1.0 Ft./Sec.
Estimated Flow:	10.0 CFS	4.0 CFS	10.0 CFS	30.0 CFS	16.5 CFS
Stream Modifications:	None	Dredged	Dredged	Canopy Removal	None
Nuisance Plants (Y/N):	Ν	Ν	Ν	Ν	Ν
Report Number:					
STORET No.:	740456	740463	740462	740217	740216
Stream Name:	Pine River	Belle River	Belle River	Belle River	Belle River
Road Crossing/Location:	Griswold Rd	Puttygut Rd	Saint Clair Hwy	Kroner Rd	End of Meskill Rd
County Code:	74	74	74	74	74
TRS:	06N16E08	04N16E08	04N16E06	05N15E19	05N15E07
Latitude (dd):	42.96192	42.78564	42.79971	42.8511	42.8687
Longitude (dd):	-82.59393	-82.57681	-82.59502	-82.723	-82.7354
Ecoregion:	HELP	HELP	HELP	HELP	HELP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4090001	4090001	4090001	4090001	4090001

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 3. Habitat evaluation for

	Belle River Weber Rd RIFFLE/RUN STATION 31	N B Belle River Newark d/s of Pinnacle (Vlasic) Foods outfall GLIDE/POOL STATION 32	N B Belle River Newark u/s of Pinnacle (Vlasic) Foods outfall GLIDE/POOL STATION 33	
HABITAT METRIC				
Substrate and Instream Cover				
Epifaunal Substrate/ Avail Cover (20)	13	5	4	
Embeddedness (20)*	14			
Velocity/Depth Regime (20)*	15			
Pool Substrate Characterization (20)**		10	10	
Pool Variability (20)**		8	4	
Channel Morphology				
Sediment Deposition (20)	10	5	5	
Flow Status - Maint. Flow Volume (10)) 9	7	7	
Flow Status - Flashiness (10)	9	5	5	
Channel Alteration (20)	19	9	9	
Frequency of Riffles/Bends (20)*	10			
Channel Sinuosity (20)**		1	1	
Riparian and Bank Structure				
Bank Stability (L) (10)	9	7	8	
Bank Stability (R) (10)	9	7	8	
Vegetative Protection (L) (10)	9	6	6	
Vegetative Protection (R) (10)	9	6	6	
Riparian Veg. Zone Width (L) (10)	9	3	4	
Riparian Veg. Zone Width (R) (10)	/	3	4	
TOTAL SCORE (200):	151	82	81	
HABITAT RATING:	GOOD	MARGINAL	MARGINAL	
	(SLIGHTLY	(MODERATELY	(MODERATELY	
	IMPAIRED)	IMPAIRED)	IMPAIRED)	
Note: Individual metrics may better descrides describes the general riverine environment	ibe conditions directly affe nt at the site(s).	cting the biological community while the Habitat R	ating	
Date:	8/29/2012	7/11/2012	7/11/2012	
Weather:	Partly Cloudy	Partly Cloudy	Partly Cloudy	
Air Temperature:	72 Deg. F	. 79 Deg.	F. 81 Deg. F.	
Water Temperature:	73 Deg. F	. 81 Deg.	F. 78 Deg. F.	
Ave. Stream Width:	60 Feet	22 Feet	19 Feet	
Ave. Stream Depth:	1.0 Feet	0.8 Feet	0.8 Feet	
Surface Velocity:	0.6 Ft./Sec	e. 0.6 Ft./S	ec. 0.6 Ft./Sec.	
Estimated Flow: Stream Modifications:	30.0 CFS	10.6 CFS	8.6 CFS	
Sucan Would autors:	Sank Staumzation	Dreaged	Dreaged	
nuisance riants (1/in).	1N	1N	IN	

STORET No.: Stream Name: Road Crossing/Location: County Code:	500581 Belle River Weber Road 74	440165 North Branch Belle River Newark d/s of Pinnacle (Vlasic) Foods outfall 44	440169 North Branch Belle River Newark u/s of Pinnacle (Vlasic) Foods outfall 44
TRS:	05N15E07	07N12E 21	07N12E 21
Latitude (dd): Longitude (dd): Ecoregion:	42.87578 -82.74164 HELP	43.006948 -83.059726 HELP	43.008337 -83.060559 HELP
Stream Type:	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4090001	4090001	4090001

* Applies only to Riffle/Run stream Surveys ** Applies only to Glide/Pool stream Surveys

COMMENTS:

Report Number:

Table 3. Habitat evaluation for	Belle River Upstream Glover Road GLIDE/POOL STATION 34	Belle River Sperry Rd GLIDE/POOL STATION 35	Belle River Riley Center Rd GLIDE/POOL STATION 36
HABITAT METRIC			
Substrate and Instream Cover			
Epifaunal Substrate/ Avail Cover (20)	7	5	16
Embeddedness (20)*			
Velocity/Depth Regime (20)*			
Pool Substrate Characterization (20)**	11	7	12
Pool Variability (20)**	3	11	10
Channel Morphology			
Sediment Deposition (20)	11	8	14
Flow Status - Maint. Flow Volume (10)	9	9	10
Flow Status - Flashiness (10)	3	5	6
Channel Alteration (20)	5	16	19
Frequency of Riffles/Bends (20)*			
Channel Sinuosity (20)**	1	12	12
Riparian and Bank Structure			
Bank Stability (L) (10)	8	6	9
Bank Stability (R) (10)	8	6	9
Vegetative Protection (L) (10)	6	5	9
Vegetative Protection (R) (10)	6	5	9
Riparian Veg. Zone Width (L) (10)	3	8	10
Riparian Veg. Zone Width (R) (10)	3	9	8
TOTAL SCORE (200):	84	112	153
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

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).

Date:	6/5/2013		6/5/2013		6/5/2013	
Weather:	Sunny	,	Partly Cloudy		Sunny	
Air Temperature:	57	Deg. F.	68	Deg. F.	64	Deg. F.
Water Temperature:	62	Deg. F.	70	Deg. F.	62	Deg. F.
Ave. Stream Width:	40	Feet	35	Feet	40	Feet
Ave. Stream Depth:	3	Feet	4	Feet	2.5	Feet
Surface Velocity:	0.5	Ft./Sec.	0.1	Ft./Sec.	0.7	Ft./Sec.
Estimated Flow:	60	CFS	14	CFS	70	CFS
Stream Modifications:	Dredged		None		None	
Nuisance Plants (Y/N):	Ν		Ν		Ν	
Report Number:						
STORET No.:	440224		740379		740388	
Stream Name:	Belle River		Belle River		Belle River	
Road Crossing/Location:	Upstream Glove	r Road	Sperry Rd		Riley Center Rd	
County Code:	44		74		74	
TRS:	06N12E02		06N13E10		06N14E18	
Latitude (dd):	42.9744		42.9611		42.9454	
Longitude (dd):	-83.0067		-82.9054		-82.8421	
Ecoregion:	HELP		HELP		HELP	
Stream Type:	Warmwater		Warmwater		Warmwater	
USGS Basin Code:	4090001		4090001		4090001	

* Applies only to Riffle/Run stream Surveys ** Applies only to Glide/Pool stream Surveys

Table 4A. Qualitative macroinvertebrate sampling results for the following nonwadeable sites:

ТАХА	Black R. 8/14/2012 Port Huron Twp Park	Black R. 8/14/2012 Charter Twp Port Huron Mem. Park	Belle R. 9/14/2012 East China Twp Park
DI ATVHEI MINTHES (flatworms)	STATION NW-1	STATION NW-2	STATION NW-5
Turbellaria	2		
$\Delta NNEL IDA (segmented worms)$	2		
Oligochaeta (worms)	6	2	3
ARTHROPODA	0	2	5
Crustacea			
Amphipoda (scuds)	14	9	3
Arachnoidea		,	C C
Hydracarina	159	5	12
Insecta			
Ephemeroptera (mayflies)			
Caenidae	3		
Ephemeridae			1
Leptohyphidae (Trico.)			87
Odonata			
Anisoptera (dragonflies)			
Macromiidae	1		
Zygoptera (damselflies)			
Coenagrionidae	66	6	78
Hemiptera (true bugs)			
Corixidae		1	
Mesoveliidae		2	5
Nepidae		4	1
Coleoptera (beetles)			
Haliplidae (adults)			7
Elmidae (total)		1	2
Diptera (flies)			
Ceratopogonidae	1	2	
Chironomidae	59	15	75
MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)	3		
Physidae	12	1	4
Planorbidae	6		
Pelecypoda (bivalves)			
Dreissenidae (zebra)	14	1	
Sphaeriidae (fingernail clams)			1

Table 4B. Macroinvertebrate community metric evaluation for the following nonwadeable sites:

	Black R.	Black R.	Belle R.
	8/14/2012	8/14/2012	9/14/2012
	Port Huron Twp Park	Charter Twp Port Huron Mem. Park	East China Twp Park
METRIC	STATION NW-1	STATION NW-2	STATION NW-3
TOTAL ABUNDANCETOTAL ABUNDANCE	346	49	279
TOTAL RICHNESS	13	12	13
NUMBER OF EPHEMEROPTERA FAMILIES	1	0	2
NUMBER OF PLECOPTERA FAMILIES	0	0	0
NUMBER OF TRICHOPTERA FAMILIES	0	0	0
NUMBER OF DIPTERA TAXA	2	2	1
TRICHOPTERA ABUNDANCE	0	0	0
ABUNDANCE OF DOMINANT TAXON	159	15	87
SHREDDER ABUNDANCE	14	9	10
SCRAPER ABUNDANCE	21	1	4
COLL-FILTERER ABUNDANCE	14	1	1
COLL-GATH ABUNDANCE	70	19	168
PREDATOR ABUNDANCE	227	19	96

Metric Calculations (possible points)		Metric Score	
FFG Diversity (25)	16	25	8
Habitat Stability FFG Surrogate (25)	8	0	0
% Trichoptera (20)	0	0	0
EPT Richness (8)	0	0	0
Total Richness (7)	0	0	0
Diptera Richness (5)	2	2	0
Plecoptera Richness (5)	0	0	0
% Dominance (5)	4	5	5
TOTAL SCORE:	30	32	13
Rating:	MARGINAL	MARGINAL	POOR

ТАХА	8/13/2012 U/S Golf Course STATION NW-4	8/15/2012 Fred Moore Hwy STATION NW-5	
PLATYHEI MINTHES (flatworms)	SIMIONIU	STATION 1100	
Turbellaria	5	5	
ANNELIDA (segmented worms)	5	5	
Oligochaeta (worms)	1	1	
	1	1	
Crustacea			
Amphinoda (scude)	740	313	
Decanoda (crayfish)	740	1	
Isopoda (sowbugs)	1	1	
Areabnoidee	1	0	
Hudrocorino	129	40	
Involacarilla	128	40	
Insecta			
Destides	10		
Baendae	10	(0)	
Caenidae	91	09	
Anisoptera (dragonflies)	1	1	
Aeshnidae	1	1	
Corduliidae		2	
Macromidae		3	
Zygoptera (damselflies)	205	202	
Coenagrionidae	205	293	
Hemiptera (true bugs)	2		
Corixidae	3		
Mesoveliidae	5	4	
Trichoptera (caddisflies)			
Leptoceridae	12	2	
Coleoptera (beetles)			
Haliplidae (adults)	23	41	
Hydrophilidae (total)		3	
Elmidae (total)	2	13	
Diptera (flies)			
Ceratopogonidae	1	4	
Chironomidae	11	36	
MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)		3	
Hydrobiidae	44	1	
Physidae	27	11	
Planorbidae	24	7	
Pelecypoda (bivalves)			
Dreissenidae (zebra)	73	3	

Table 4A. Qualitative macroinvertebrate sampling results for the following nonwadeable sites:

Pine R.

Pine R.

Table 4B. Macroinvertebrate community metric evaluation for the following nonwadeable sites:

	Pine R.	Pine R.	
	8/13/2012	8/15/2012	
	U/S Golf Course	Fred Moore Hwy	
METRIC	STATION NW-4	STATION NW-5	
TOTAL ABUNDANCE	1407	862	
TOTAL RICHNESS	20	23	
NUMBER OF EPHEMEROPTERA FAMILIES	2	1	
NUMBER OF PLECOPTERA FAMILIES	0	0	
NUMBER OF TRICHOPTERA FAMILIES	1	1	
NUMBER OF DIPTERA TAXA	2	2	
TRICHOPTERA ABUNDANCE	12	2	
ABUNDANCE OF DOMINANT TAXON	740	313	
SHREDDER ABUNDANCE	776	362	
SCRAPER ABUNDANCE	95	22	
COLL-FILTERER ABUNDANCE	73	3	
COLL-GATH ABUNDANCE	123	125	
PREDATOR ABUNDANCE	340	350	

Metric Calculations (possible points)	Met	ric Score
FFG Diversity (25)	25	16
Habitat Stability FFG Surrogate (25)	8	0
% Trichoptera (20)	0	0
EPT Richness (8)	0	0
Total Richness (7)	5	5
Diptera Richness (5)	2	2
Plecoptera Richness (5)	0	0
% Dominance (5)	2	4
TOTAL SCORE:	42	27
Rating:	MARGINAL	MARGINAL

Table 5A. Qualitative fish sampling results for

New	North Branch Belle Riv ark d/s of Pinnacle (Vlasic) F 7/11/2012 STATION 22	er 'oods outfall N	North Branch Belle River ewark u/s of Pinnacle (Vlasic) For 7/11/2012 STATION 22	ods outfall	
ΙΑΛΑ	STATION 52		STATION 55		
Umbridae (mudminnows)					
Umbra limi (Central mudminnow)	38		12		
Cyprinidae (minnows and carps)					
Semotilus atromaculatus (Creek chub)	2		3	3	
Notemigonus crysoleucas (Golden shiner)	1				
Catostomidae (suckers)					
Catostomus commersoni (White sucker)	2				
Ictaluridae (Bullhead, Catfish)					
Ameiurus melas (Black bullhead)	24		4	4	
Noturus gyrinus (Tadpole madtom)	7		9	9	
Centrarchidae (sunfish)	2		2		
Ambloplites rupestris (Rock bass)	2		2		
Lepomis cyanellus (Green sunfish)	0		3		
Lepomis gibbosus (Pumpkinseed sf)	1		41		
Lepomis macrochirus (Bluegili sj) Miarontarus salmoidas (Largamouth bass)	/0		41		
Parcidae (perch)	2				
Etheostoma evile (Iowa darter)	4				
Etheostoma nigrum (Johnny darter)	4		12		
Eneosionia nigrum (Johnny aurier)	5		12		
TOTAL INDIVIDUALS	170		86		
Number of hybrid sunfish	0		0	0	
Number of anomalies	0		0	0	
Percent anomalies	0.000		0.000	0.000	
Percent salmonids	0.000	0.000		0.000	
Reach sampled (ft)	125	125		125	
Area sampled (sq ft)	2,750	2,750		2,375	
Density (# fish/sq ft)	0.062	0.062		0.036	
Gear	bps		bps		
Table 5B. Fish metric evaluation of					
	North Branch Belle River		North Branch	Belle River	
	Newark d/s of Pinnac	Newark d/s of Pinnacle (Vlasic) Foods outfall		Newark u/s of Pinnacle (Vlasic) Foods outfall	
	//1	1/2012 TION 22	//11/2	2012	
METRIC	Valua	TION 32	Value	Soore	
METRIC	value	Score	value	Score	
TOTAL NUMBER OF TAXA	13	0	8	-1	
NO. OF DARTER, SCULPIN, MADTOM TA	XA 3	0	2	0	
NUMBER OF SUNFISH TAXA	4	1	3	0	
NUMBER OF SUCKER TAXA	1	-1	0	-1	
NUMBER OF INTOLERANT TAXA	2	-1	1	-1	
PERCENT IOLEKANI DEDCENT OMNIVODOLIS TAYA	31.70	1	34.88	1	
PERCENT INSECTIVODOUS TAXA	59.41 59.24	0	22.09	1	
DEDCENT DISCIVODOUS TAXA	2 25	0	2 22	1	
% SIMDLE LITHODUILIC SDAWNED TAV	Δ 1 19	0	2.33	1	
70 SIMILE LITIOF HILL SPAWNER TAX	n 1.10	U	0.00	-1	
TOTAL SCORE		0		-1	
FISH COMMUNITY RATING		ACCEPT.		ACCEPT.	

Comments: Redear sunfish x6 Comments: Redear sunfish x2 Table 6. Water chemistry results for selected locations in the Belle River watershed located in Lapeer County, July 2013.

		<u>N B Belle River</u> Newark Rd. d/s of Pinnacle (Vlasic) Foods outfall	<u>N B Belle River</u> Newark Rd. u/s of Pinnacle (Vlasic) Foods outfall
PARAMETER	UNITS	RESULTS	
Station ID #		32	33
STORET #		440165	440169
Date		7/11/2012	7/11/2012
Alkalinity (as CaCO3)	mg/L	290	310
Chloride	mg/L	720 (D)	110
Conductance	umhos/cm	3030	1034
рН	рН	7.86 (H)	7.77 (H)
Solids - Suspended	mg/L	4	5
Solids - Total Dissolved	mg/L	1600	630
Sulfate	mg/L	84	96
Total Kjeldahl Nitrogen	mg N/L	0.94	0.83
Total Phosphorus	mg P/L	0.103	0.121

Legend

D = Analyte value quantified from a dilution(s); reporting limit (RL) raised.

H = Recommended laboratory holding time was exceeded.

STORET = United States Environmental Protection Agency STOrage and RETrieval database.