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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER RESOURCES DIVISION
MARCH 2012

STAFF REPORT

# A BIOLOGICAL SURVEY OF MACATAWA, PIGEON RIVER, AND LITTLE PIGEON RIVER WATERSHEDS
ALLEGAN AND OTTAWA COUNTIES, MICHIGAN
AUGUST 2010

## Introduction

Biological physical habitat conditions were assessed at 13 locations and physical habitat conditions were assessed at an additional 3 locations in the Macatawa, Pigeon, and other nearby Lake Michigan coastal watersheds (Macatawa area watersheds) by Surface Water Assessment Section (SWAS) staff in August 2010. The objectives of the assessments were:

1. Assess the current status and condition of individual water bodies and determine if Michigan Water Quality Standards are being met.
2. Gather water quality data needed for the Fiscal Year 2012 Section 303(d), 305(b) and 314 Integrated Report.
3. Identify nonpoint sources (NPS) of water quality impairment.
4. Evaluate the effectiveness of the NPS Program.
5. Satisfy monitoring requests submitted by internal and external customers.

The macroinvertebrate community and physical habitat were qualitatively assessed at 13 stations and physical habitat was qualitatively assessed at an additional 3 stations (Figure 1 and Table 1) using the SWAS Procedure 51 (available upon request; MDEQ, 1990; Creal et al., 1996) for wadeable streams. The macroinvertebrate communities were assessed and scored with metrics which rate the communities on a scale from excellent to poor. Macroinvertebrate scores can range from 9 to -9. Stations with a score greater than or equal to +5 are considered excellent. Stations with a score less than or equal to -5 are classified as poor. Stations with a score of -4 through +4 are classified as acceptable (moderately impaired). Habitat evaluations are based on 10 metrics, with a possible maximum total score of 200. Stations are classified as excellent with a habitat score >154, good with a score between 105 and 154, marginal with a score between 56 and 104, and poor with a score <56.

## Watershed History

The Macatawa River area watersheds are located in Allegan and Ottawa Counties and are located between the Kalamazoo and Grand River watersheds. This area includes the Macatawa River, Little Pigeon Creek (040500020301), Pigeon River (040500020302; 040500020303) and Halfway Creek (040500020406) (Figure 1). The region is heavily dominated by agriculture and urbanization. The entire region drains low-gradient coastal watersheds in the Southern Michigan/Northern Indiana Drift Plain ecoregion (Omernik and Gallant, 1988) and is comprised of many county drains.

The Little Pigeon Creek and Halfway Creek watersheds are very small (approximately 5-10 square miles). The Pigeon River watershed is approximately 65 square miles. The Lake

Macatawa watershed is 175 square miles. Little Pigeon Creek and the lower half of the Pigeon River watershed (downstream of 120th Avenue) are designated coldwater streams. Since 2003 the Pigeon River has been stocked annually with brown trout (Michigan Department of Natural Resources stocking database). The remainder of the survey area contains designated warmwater streams.

Little Pigeon Creek and Halfway Creek have not been assessed using Procedure 51. The 2005 surveys in the Pigeon River watershed found acceptable coldwater fish communities at two locations and acceptable macroinvertebrate communities at all five monitoring locations (Walterhouse, 2007(a)). The 2005 survey in the Lake Macatawa watershed found marginally acceptable warmwater fish communities at three out of eight locations (with Procedure 51 scores one point above the 'poor' score range); poor fish communities were found in Pine Creek, Bosch & Hulst Drain, the South Branch Macatawa River, and two locations on the Macatawa River (Walterhouse, 2007(b)). The macroinvertebrate Procedure 51 scores for that survey ranged from -6 to 0, with two sites scoring poor (Macatawa River at 84th Avenue and Byron Road).

**Total Maximum Daily Load**

The Lake Macatawa Phosphorus Total Maximum Daily Load (TMDL) was developed due to the presence of nuisance plant conditions in Lake Macatawa and approved in 1999. Intensive sampling in the Macatawa River watershed to develop the Lake Macatawa TMDL and continued post-TMDL monitoring have documented that water quality in the watershed is impaired due to extreme stream flow fluctuations, which are the product of years of wetland drainage, drain construction, tiling, and ongoing drain maintenance activities. Previous surveys have shown:

- All streams have been dredged to facilitate drainage of the historic abundant wetland habitat in the watershed. Drain maintenance efforts have produced flashy flow regimes in homogenous stream channels where the unstable sand and silt substrates are slowly being transported downstream.
- Buffer strips are absent along many of the agricultural drains and streams in the watershed and row crops are currently planted to the top of the stream bank. Property owners at many locations maintain nearly all of their property along the stream channel by mowing to the waters edge.
- Adoption of best management practices in the watershed designed to reduce upland erosion and slow the rate of stream flow throughout the watershed will benefit the aquatic biota residing in the streams throughout the watershed and ultimately reduce phosphorus loading to Lake Macatawa.

**2010 Macroinvertebrate and Habitat Survey Sampling Results**

The monitoring conducted during this 2010 survey was focused on evaluating the condition of the streams that drain to either Lake Macatawa or nearby Lake Michigan drainages. Twelve of the stations in this survey were selected randomly to include in state-wide estimates of the status and trend in macroinvertebrate community condition. Stations 8, 14, 15, and 16 were selected based on outside requests related to nonpoint source projects. A summary of the 2010 survey results is presented below and in Table 1.

<u>Little Pigeon River (040500020301)</u>

The Little Pigeon River is a small coldwater stream draining a small watershed north of the Pigeon River watershed. Little Pigeon River was sampled at 158th Avenue (Station 1). The riffle/run habitat scored 'good' (116; Table 2), but had lower scores for metrics that relate to the amount and quality of substrate and in-stream cover for macroinvertebrates. The substrate was

dominated by sand and the channel at this location was approximately 4 feet wide. The water level was low, but seemed to have consistent flow. Macroinvertebrate densities were low and the community scored in the bottom of the acceptable range (-4; Table 3). The macroinvertebrate community was dominated by fly larvae in the families *Chironomidae* and *Tipulidae* (midges and craneflies).

Ten Hagen Creek (040500020303)

Ten Hagen Creek was the only stream sampled in the Pigeon River watershed, which is north of the Macatawa River watershed. Ten Hagen Creek is a small coldwater stream and was sampled at Butternut Drive (Station 2). The glide/pool habitat scored 'good' (139; Table 2). The substrate was dominated by sand. There was heavy shrub growth across the channel. The channel had an extensive amount of woody debris and moderate amount of undercut banks. The macroinvertebrate community scored in the low end of the acceptable range (-3, Table 3) and was dominated with isopods and amphipods which are tolerant to many instream stressors.

Pine Creek (040500020407)

Pine Creek is a tributary to Lake Macatawa on the north side of the lake. Pine Creek was sampled at Quincy Road (Station 3) and Riley Street (Station 4). At Station 3, Pine Creek's glide/pool habitat scored 'marginal' (104; Table 2) and was dominated by sand substrate. There was some woody debris in the channel and one small riffle trying to form on the upstream end of the sampling area. The impacts of historic dredging were apparent, but there were some pools and moderately stable banks. The macroinvertebrate community scored at the bottom of the acceptable range (-4; Table 3) and was dominated by *Chironomidae* larvae and amphipods, which are both tolerant taxa. There was only one individual mayfly and two taxa of caddisfly found during the survey.

At Station 4, Pine Creek's glide/pool habitat also scored 'marginal' (92; Table 2) and was dominated by sand. There were many areas where the banks were slumping and there were some old riprap piles near a house on the left bank. The habitat scores relating to riparian and bank structure generally rated in the poor range. The macroinvertebrate community scored in the lower half of the acceptable range (-2; Table 3) and was dominated by *Chironomidae* larvae, amphipods, and a family of damselflies (*Calopterygidae*), which are all relatively tolerant taxa.

Bosch & Hulst Drain (also known as Noordeloos Creek) (040500020405)

Bosch & Hulst Drain is a tributary to the Macatawa River that drains agricultural land and urban area around Zeeland. The stream was sampled in the headwaters at New Holland Street (Station 5) where the land use was all row crops. The glide/pool habitat scored 'poor' (53; Table 2). The substrate was dominated by sand with significant amount of clay. There was a small amount of riparian buffer near the bridge and then no cover further upstream. The vertical clay banks showed evidence of flows regularly going up at least 3 feet during wet weather. The channel was full of Cladophora, a filamentous algae, which is common in streams without canopy cover and with higher concentrations of nutrients. During this survey the Cladophora was present at nuisance levels. The tributaries to Lake Macatawa are included in the Macatawa Total Phosphorus TMDL so this will not result in a new non-attaining listing in the 303(d) report. The macroinvertebrate community scored at the bottom of the acceptable range (-4, Table 3). There were no caddisflies found, but 3 mayfly taxa were collected in relatively high numbers. Over one third of the organisms counted were isopods, which are very tolerant to environmental stressors.

Upper Macatawa River (040500020401)

The Macatawa River was sampled at Riley Street (between I196 and Chicago Avenue) (Station 6) in the upper portion of the watershed. The riffle/run habitat scored 'marginal' (64; Table 2). The substrate was dominated by sand over clay. The channel had clay banks and there was not much instream habitat. There were row crops on both banks with a small amount of grass buffer. There was very little epifaunal substrate or available cover. The macroinvertebrate community scored in the low end of the acceptable range (-3, Table 3) and was dominated by *Chironomidae* larvae and damselfly nymphs.

Peters Creek (040500020403)

Peters Creek is a tributary to the Macatawa River on the southeastern side of the watershed. Peters Creek was sampled in the headwaters at 144th Avenue (Station 7) and at the base of the watershed at 84th Avenue (Station 8). The glide/pool habitat at Station 7 scored 'marginal' (97; Table 2), was dominated by sand, and had a marginal amount of epifaunal substrate or available cover for macroinvertebrate communities. There was a riparian vegetated area containing trees and shrubs, but both banks had large areas of bank erosion. The stream appeared to be relatively flashy. The macroinvertebrate community scored in the low end of the acceptable range (-3; Table 3) and was dominated by amphipods and *Chironomidae* larvae. There were only a few caddisfly or mayfly organisms found during the count.

At Station 8, Peters Creek's riffle/run habitat scored 'marginal' (91; Table 2) and was dominated by sand with some clay and a small amount of gravel. There was some wood in the channel, but it was not well colonized by macroinvertebrates. There was debris in the trees at least 4 feet above the top of the water level. A neighbor reported that after dredging was completed upstream of Ottagen Road that the Creek now floods over 84th Avenue on a regular basis. The right bank had a large raw area. There were a few sparse riffle areas of the stream that had a gravel substrate. The macroinvertebrate community scored in the low end of the acceptable range (-3; Table 3) and had a more even, but less diverse, community compared to the Station 7. Only 12 taxa were collected at Station 8, while Station 7 had 18 taxa collected. The most common taxa at Station 8 were amphipods, isopods, *Calopterygidae* (a damselfly family), and *Chironomidae* larvae. The macroinvertebrate community had low densities and only a few mayflies or caddisflies were counted.

Macatawa River (040500020403 and 040500020406)

The Macatawa River was sampled at three locations in the middle stretch of the river. Station 9 was at 84th Avenue, Station 10 was at Adams Street, and Station 11 was off of Black River Drive. The glide/pool habitat at Station 9 scored 'marginal' (68; Table 2) and was dominated by sand substrate. Station 9 is at the downstream extent of a large riparian area that has been preserved as a park (Upper Macatawa Nature Center) and is downstream of a large agricultural plot that has been restored to a wetland (upper Macatawa wetland restoration project). The water level was very low in the channel and there were several feet of exposed unstable banks indicating that there are long term impacts from historic dredging and ongoing flashiness that still impact this reach of the Macatawa River even following multiple large watershed restoration activities. There was not much instream habitat in the channel and what was there was covered in fine sediment and partially embedded. The macroinvertebrate community scored in the lower half of the acceptable range (-2; Table 3). The community was heavily dominated by *Chironomidae* larvae (midges) and *Hydrophsychidae* caddisflies, which are both filtering collectors. Although *Hydropsychids* are caddisflies, which is an order generally considered to be an indicator of better water quality, a caddisfly community that is all *Hydropsychids* is an indicator of disturbed system. There were only 13 taxa collected at Station 9. Of the 306 organisms counted only 18 were not midges or *Hydropsychids*, which a very unbalanced

macroinvertebrate community that is likely more impacted than the -2 community score represents. In 2005, the macroinvertebrate Procedure 51 survey at this site scored -6 at this location. There may have been a change in community structure between the 2005 and 2010 surveys (in 2005 only 1% of the community was estimated to be caddisflies), but it is not yet clear that this is an overall improvement as the basic scores suggest.

Station 10, at Adams Street, is approximately one half of a mile downstream of Station 9. The riffle/run habitat scored 'marginal' (81; Table 2). The substrate was dominated by sand with some clay areas. The banks were raw due to historic dredging and ongoing flashiness. There was minimal amount of habitat for macroinvertebrates, with only a limited amount of aquatic plants and wood in the channel. The macroinvertebrate community scored in the bottom of the acceptable range (-3; Table 3) and was dominated by *Chironomidae* larvae, *Hydropsychidae* caddisflies, and amphipods.

Station 11, off of Black River Drive, is approximately 2 miles downstream of Station 10 and is downstream of where both the South Branch of the Macatawa and Peters Creek join the main channel. The riffle/run habitat scored 'marginal' (89; Table 2) and the substrate was dominated by sand with some cobble, gravel, silt, and clay. The channel at this location was incised and the right bank was ten to fifteen feet above the water level. There was some cobble that may have been dumped in the river historically. The immediate riparian area at this location was wooded. The macroinvertebrate community scored in the upper half of the acceptable range (2; Table 3), which may be a reflection of the increased variety of habitat types. The community was still dominated by *Chironomidae* larvae and *Hydropsychidae* caddisflies, but had three mayfly taxa and a higher proportion of mayflies than any other station on the Macatawa River.

North Branch Macatawa River (040500020404)

The North Branch of the Macatawa River was sampled at Ottagan Road (Station 12) which is towards the bottom of the North Branch's watershed. The riffle/run habitat scored 'marginal' (94; Table 2). The substrate was dominated by sand with a good amount of cobble and gravel, which was not well colonized and was covered in fine material. The banks down to the channel were very steep. The channel was not well filled with water and was a series of pools and runs with a few riffles. The banks extend 3-4 feet above the water level. The macroinvertebrate community scored acceptable (-1, Table 3), and was dominated by *Hydropsychidae* caddisflies, which were the only caddisfly taxa collected. However, there were four mayfly taxa collected in the sample which is the most of any site during this survey. A local landowner commented that the river can come up 10 feet during high flow events, which is likely one of the largest stressors on the instream macroinvertebrate community.

South Branch Macatawa River (040500020402)

The South Branch Macatawa River was sampled upstream of M40 (Station 13), which is in the upper half of the South Branch's watershed. The riffle/run habitat scored 'marginal' (80; Table 2). The substrate was dominated by sand. There were some small riffles forming and some sand bars. The banks were held in some by tree roots, but there was debris in the trees 4 feet above the water level and large woody debris pushed to the edges of the channel. The macroinvertebrate community scored acceptable (-1; Table 3) and was dominated by isopods, *Calopterygidae* damselflies, and *Chironomidae* larvae. Overall, the community was more even than at some other stations and there were three taxa of mayflies found.

**Outside Monitoring Requests-NPS**

The Macatawa Area Coordinating Council (MACC) requested monitoring on three drains in the headwaters of the South Branch Macatawa River. In the late 1990s this area of the watershed

was found to have some of the largest concentrations of nutrients and sediment loading to Lake Macatawa. The MACC is pursuing a project to implement many agricultural Best Management Practices (BMPs) in these small watersheds and requested pre-implementation monitoring.

In 2010 we visited Jaarda Drain at 140th Avenue (Station 14), Kleinheksel Drain at 140th Avenue (Station 15), and East Fillmore Drain at 144th Avenue (Station 16) and determined that macroinvertebrate community assessment using Procedure 51 was either not generally appropriate at these locations or that Procedure 51 would not provide helpful information to evaluate the impact of future BMP installation. Procedure 51 habitat data was collected at each station (Table 4) and a road stream crossing form was filled out to have a general characterization of each site (Table 5).

**Conclusions**

The results of the 13 Procedure 51 surveys conducted in 2010 were used to assess individual waterbodies in Macatawa Area watersheds for the 2012 Integrated Report. There were no specific nonpoint sources of water quality impairments noted beyond the broad scale impacts of agricultural and residential nonpoint source pollution and storm water runoff. The MACC has developed a nonpoint source phosphorus reduction plan (*The link provided was broken and has been removed* - accessed on March 1, 2012) and is implementing many of the specific prioritized projects in the plan. This Implementation Plan contains a strategy to implement approximately thirty methods for reducing phosphorus, erosion and concentrated flows in the waters of the Macatawa Watershed, and places priority on five to ten methods in each of three various land use classes (Residential/Commercial Nonpoint Sources, Agricultural Nonpoint Sources, Road/.Drain/Construction Nonpoint Sources) according to their measured cost effectiveness. The goal of this Implementation Plan is to lower the nonpoint source phosphorus loads in the watershed from approximately 126,000 pounds per year to 35,000 pounds per year. A hydrologic study of the watershed was completed in 2009 (Fongers, 2009) that provides additional information for the prioritization of nonpoint source projects.

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## References

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Walterhouse, M. 2007(a) A biological survey of sites in the Lake Macatawa watershed, Allegan and Ottawa Counties, Michigan, June 2005. MI/DEQ/WB-07/014

Walterhouse, M. 2007(b). A biological survey of sites in the Pigeon River watershed, Ottawa County, Michigan, July, 2005. MI/DEQ/WB-07/062

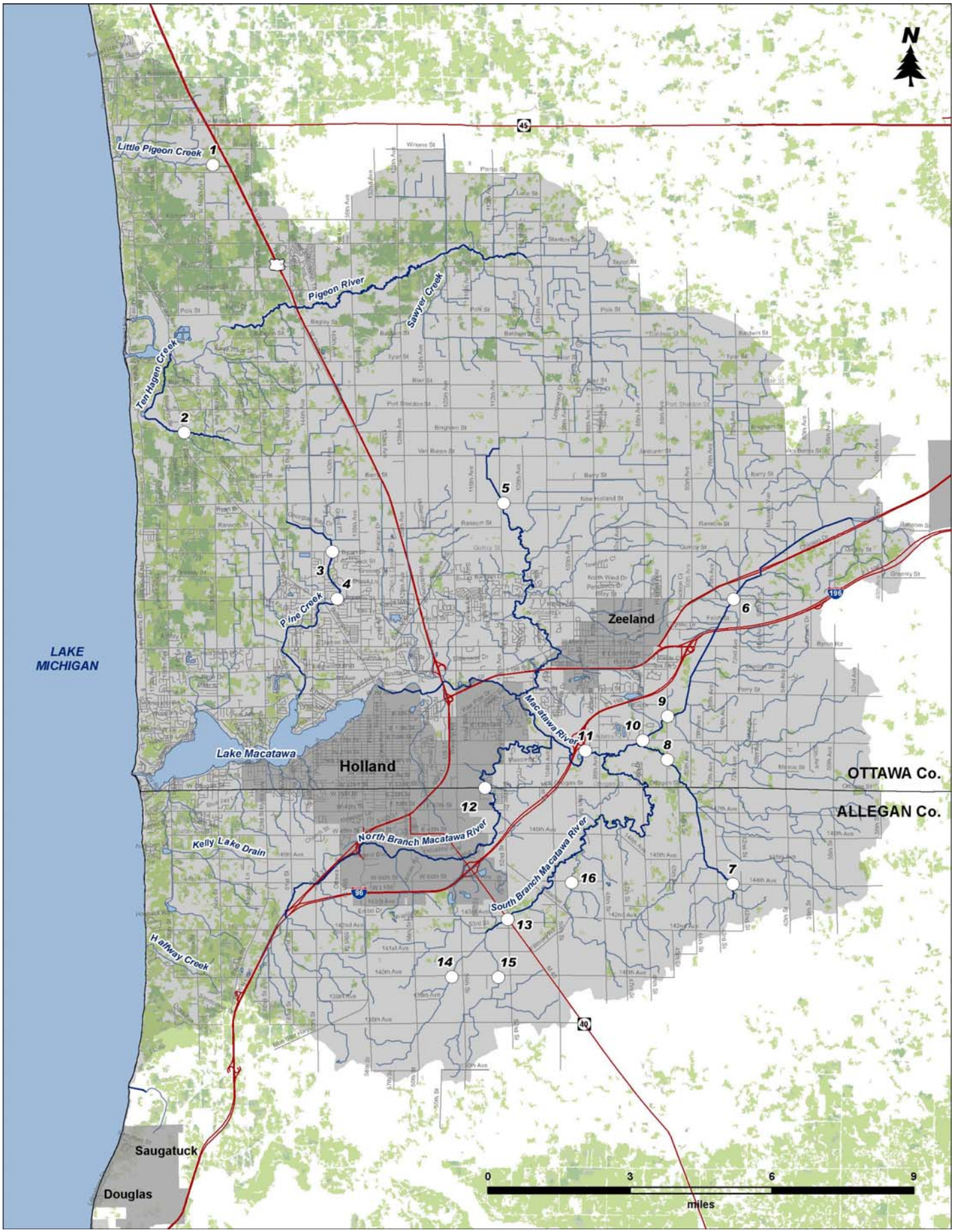


Figure 1. Macatawa Area watershed and 2010 survey locations.

Table 1. 2010 Macatawa Area watersheds monitoring locations.

| Station # | Name | Location | Latitude | Longitude | 12 HUC | P51 Bug Score | P51 Habitat Score | P51 Habitat Rating |
|---|---|---|---|---|---|---|---|---|
| 1 | Little Pigeon Creek | 158th Avenue | 42.95996 | -86.17954 | 40500020301 | -4 | 116 | Good |
| 2 | Ten Hagen Creek | Butternut Drive | 42.87769 | -86.19125 | 40500020303 | -3 | 139 | Good |
| 3 | Pine Creek | Quincy Street | 42.84118 | -86.12949 | 40500020407 | -4 | 104 | Marginal |
| 4 | Pine Creek | Riley Street | 42.82666 | -86.12754 | 40500020407 | -2 | 92 | Marginal |
| 5 | Bosch & Hulst Drain (Noordeloos Creek) | New Holland Street | 42.85611 | -86.05833 | 40500020405 | -4 | 53 | Poor |
| 6 | Macatawa River | Riley Street | 42.82663 | -85.96246 | 40500020401 | -3 | 64 | Marginal |
| 7 | Peters Creek | 144th Avenue | 42.73930 | -85.96292 | 40500020403 | -3 | 97 | Marginal |
| 8 | Peters Creek | 84th Avenue | 42.77746 | -85.99019 | 40500020403 | -2 | 91 | Marginal |
| 9 | Macatawa River | 84th Avenue | 42.79079 | -85.98991 | 40500020403 | -2 | 68 | Marginal |
| 10 | Macatawa River | Adams Street | 42.78341 | -86.00035 | 40500020403 | -3 | 81 | Marginal |
| 11 | Macatawa River | Black River Drive | 42.78016 | -86.02413 | 40500020406 | 2 | 89 | Marginal |
| 12 | North Branch Macatawa River | Ottogan Street | 42.76879 | -86.06589 | 40500020404 | -1 | 94 | Marginal |
| 13 | South Branch Macatawa River | M40 | 42.72843 | -86.05655 | 40500020402 | -1 | 80 | Marginal |
| 14 | Jaarda Drain | 140th Avenue | 42.71073 | -86.0797 | 40500020402 | -- | 42 | Poor |
| 15 | Kleinheksel Drain | 140th Avenue | 42.71063 | -86.06037 | 40500020402 | -- | 55 | Poor |
| 16 | East Fillmore Drain | 144th Avenue | 42.7397 | -86.0299 | 40500020402 | -- | 104 | Marginal |

Table 2. Habitat evaluation for streams in the Macatawa area watersheds, August, 2010

| | Station 1<br>Little Pigeon River<br>158th Avenue<br>RIFFLE/RUN | Station 2<br>Ten Hagen Creek<br>Butternut Drive<br>GLIDE/POOL | Station 3<br>Pine Creek<br>Quincy Road<br>GLIDE/POOL | Station 4<br>Pine Creek<br>Riley Street<br>GLIDE/POOL | Station 5<br>Bosch & Hulst Drain<br>New Holland Street<br>GLIDE/POOL |
|---|---|---|---|---|---|
| HABITAT METRIC | | | | | |
| **Substrate and Instream Cover** | | | | | |
| Epifaunal Substrate/ Avail Cover (20) | 6 | 8 | 7 | 11 | 2 |
| Embeddedness (20)* | 6 | | | | |
| Velocity/Depth Regime (20)* | 8 | | | | |
| Pool Substrate Characterization (20)** | | 8 | 8 | 11 | 2 |
| Pool Variability (20)** | | 10 | 13 | 8 | 0 |
| **Channel Morphology** | | | | | |
| Sediment Deposition (20) | 12 | 9 | 10 | 10 | 13 |
| Flow Status - Maint. Flow Volume (10) | 5 | 8 | 8 | 7 | 8 |
| Flow Status - Flashiness (10) | 7 | 9 | 5 | 5 | 1 |
| Channel Alteration (20) | 18 | 19 | 11 | 15 | 9 |
| Frequency of Riffles/Bends (20)* | 13 | | | | |
| Channel Sinuosity (20)** | | 15 | 5 | 10 | 0 |
| **Riparian and Bank Structure** | | | | | |
| Bank Stability (L) (10) | 7 | 10 | 5 | 2 | 5 |
| Bank Stability (R) (10) | 8 | 10 | 5 | 2 | 5 |
| Vegetative Protection (L) (10) | 6 | 8 | 8 | 3 | 3 |
| Vegetative Protection (R) (10) | 8 | 8 | 8 | 4 | 3 |
| Riparian Veg. Zone Width (L) (10) | 4 | 8 | 5 | 2 | 1 |
| Riparian Veg. Zone Width (R) (10) | 8 | 9 | 6 | 2 | 1 |
| TOTAL SCORE (200): | 116 | 139 | 104 | 92 | 53 |
| HABITAT RATING: | GOOD (SLIGHTLY IMPAIRED) | GOOD (SLIGHTLY IMPAIRED) | MARGINAL (MODERATELY IMPAIRED) | MARGINAL (MODERATELY IMPAIRED) | POOR (SEVERELY IMPAIRED) |

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

| | | | | | |
|---|---|---|---|---|---|
| Date: | 8/23/2010 | 8/23/2010 | 8/23/2010 | 8/23/2010 | 8/23/2010 |
| Weather: | Sunny | Sunny | Sunny | Sunny | Sunny |
| Air Temperature: | 70 Deg. F. | 78 Deg. F. | 83 Deg. F. | 80 Deg. F. | 82 Deg. F. |
| Water Temperature: | 57 Deg. F. | 64 Deg. F. | 74 Deg. F. | 68 Deg. F. | 75 Deg. F. |
| Ave. Stream Width: | 4 Feet | 18 Feet | 12 Feet | 13 Feet | 12 Feet |
| Ave. Stream Depth: | 0.2 Feet | 0.3 Feet | 0.5 Feet | 0.6 Feet | 0.5 Feet |
| Surface Velocity: | 0.3 Ft./Sec. | 0.5 Ft./Sec. | 0.4 Ft./Sec. | 0.5 Ft./Sec. | 0.01 Ft./Sec. |
| Estimated Flow: | 0.24 CFS | 2.7 CFS | 2.4 CFS | 3.9 CFS | 0.06 CFS |
| Stream Modifications: | None | None | Dredged | Dredged | Dredged |
| Nuisance Plants (Y/N): | N | N | N | N | Y |
| Report Number: | | | | | |
| STORET No.: | 700641 | 700642 | 700598 | 700520 | 700643 |
| Stream Name: | Little Pigeon River | Ten Hagen Creek | Pine Creek | Pine Creek | Bosch & Hulst Drain |
| Road Crossing/Location: | 158th Street | Butternut Drive | Quincy Road | Riley Street | New Holland Street |
| County Code: | 70 | 70 | 70 | 70 | 70 |
| TRS: | 07N16W26 | 06N16W27 | 05N15W06 | 05N15W18 | 06N15W35 |
| Latitude (dd): | 42.95996 | 42.87769 | 42.84118 | 42.82666 | 42.85611 |
| Longitude (dd): | -86.17954 | -86.19125 | -86.12949 | -85.12754 | -86.05833 |
| Ecoregion: | SMNITP | SMNITP | SMNITP | SMNITP | SMNITP |
| Stream Type: | Coldwater | Coldwater | Warmwater | Warmwater | Warmwater |
| USGS Basin Code: | 4050002 | 4050002 | 4050002 | 4050002 | 4050002 |

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

Table 2. Habitat evaluation for streams in the Macatawa area watersheds, August, 2010

| | Station 6<br>Macatawa River<br>Riley Street<br>GLIDE/POOL | Station 7<br>Peters Creek<br>144th Avenue<br>GLIDE/POOL | Station 8<br>Peters Creek<br>84th Avenue<br>RIFFLE/RUN | Station 9<br>Macatawa River<br>84th Avenue<br>GLIDE/POOL | Station 10<br>Macatawa River<br>Adams Street<br>RIFFLE/RUN |
|---|---|---|---|---|---|
| HABITAT METRIC | | | | | |
| **Substrate and Instream Cover** | | | | | |
| Epifaunal Substrate/ Avail Cover (20) | 2 | 5 | 4 | 2 | 4 |
| Embeddedness (20)* | | | 5 | | 5 |
| Velocity/Depth Regime (20)* | | | 12 | | 8 |
| Pool Substrate Characterization (20)** | 5 | 6 | | 5 | |
| Pool Variability (20)** | 5 | 10 | | 3 | |
| **Channel Morphology** | | | | | |
| Sediment Deposition (20) | 3 | 8 | 6 | 4 | 3 |
| Flow Status - Maint. Flow Volume (10) | 7 | 6 | 8 | 4 | 6 |
| Flow Status - Flashiness (10) | 2 | 5 | 2 | 2 | 2 |
| Channel Alteration (20) | 8 | 15 | 18 | 10 | 11 |
| Frequency of Riffles/Bends (20)* | | | 13 | | 10 |
| Channel Sinuosity (20)** | 7 | 15 | | 2 | |
| **Riparian and Bank Structure** | | | | | |
| Bank Stability (L) (10) | 6 | 2 | 2 | 3 | 4 |
| Bank Stability (R) (10) | 5 | 3 | 3 | 3 | 4 |
| Vegetative Protection (L) (10) | 6 | 7 | 4 | 6 | 6 |
| Vegetative Protection (R) (10) | 5 | 7 | 5 | 6 | 6 |
| Riparian Veg. Zone Width (L) (10) | 2 | 5 | 3 | 9 | 6 |
| Riparian Veg. Zone Width (R) (10) | 1 | 3 | 6 | 9 | 6 |
| TOTAL SCORE (200): | 64 | 97 | 91 | 68 | 81 |
| 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 Ratir describes the general riverine environment at the site(s)

| | | | | | |
|---|---|---|---|---|---|
| Date: | 8/24/2010 | 8/24/2010 | 8/24/2010 | 8/24/2010 | 8/24/2010 |
| Weather: | Cloudy | Sunny | Partly Cloudy | Cloudy | Sunny |
| Air Temperature: | 66 Deg. F. | 82 Deg. F. | 82 Deg. F. | 70 Deg. F. | 78 Deg. F. |
| Water Temperature: | 68 Deg. F. | 64 Deg. F. | 68 Deg. F. | 74 Deg. F. | 70 Deg. F. |
| Ave. Stream Width: | 12 Feet | 10 Feet | 16 Feet | 20 Feet | 18 Feet |
| Ave. Stream Depth: | 0.6 Feet | 0.3 Feet | 0.6 Feet | 0.3 Feet | 0.3 Feet |
| Surface Velocity: | 0.1 Ft./Sec. | 0.3 Ft./Sec. | 0.4 Ft./Sec. | 0.1 Ft./Sec. | 0.3 Ft./Sec. |
| Estimated Flow: | 0.72 CFS | 0.9 CFS | 3.84 CFS | 0.6 CFS | 1.62 CFS |
| Stream Modifications: | Dredged | Canopy Removal | Canopy Removal | Dredged | Dredged |
| Nuisance Plants (Y/N): | N | N | N | N | N |
| Report Number: | | | | | |
| STORET No.: | 700607 | 30695 | 700638 | 700523 | 700640 |
| Stream Name: | Macatawa River | Peters Creek | Peters Creek | Macatawa River | Macatawa River |
| Road Crossing/Location: | Riley Street | 144th Avenue | 84th Avenue | 84th Avenue | Adams Street |
| County Code: | 70 | 03 | 70 | 70 | 70 |
| TRS: | 05N14W09 | 04N14W16 | 05N14W32 | 05N14W29 | 05N14W29 |
| Latitude (dd): | 42.826632 | 42.7393 | 42.77746 | 42.790787 | 42.78341 |
| Longitude (dd): | -85.962462 | -85.96292 | -85.99019 | -85.98991 | -86.00035 |
| Ecoregion: | SMNITP | SMNITP | SMNITP | SMNITP | SMNITP |
| Stream Type: | Warmwater | Warmwater | Warmwater | Warmwater | Warmwater |
| USGS Basin Code: | 4050002 | 4050002 | 4050002 | 4050002 | 4050002 |

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

Table 2. Habitat evaluation for streams in the Macatawa area watersheds, August, 2010

| | Station 11<br>Macatawa River<br>Black River Drive<br>RIFFLE/RUN | Station 12<br>North Branch<br>Macatawa River<br>Ottogan Road<br>RIFFLE/RUN | Station 13<br>South Branch<br>Macatawa River<br>upstream M40<br>RIFFLE/RUN |
|---|---|---|---|
| HABITAT METRIC | | | |
| **Substrate and Instream Cover** | | | |
| Epifaunal Substrate/ Avail Cover (20) | 7 | 11 | 7 |
| Embeddedness (20)* | 5 | 9 | 10 |
| Velocity/Depth Regime (20)* | 15 | 12 | 11 |
| Pool Substrate Characterization (20)** | | | |
| Pool Variability (20)** | | | |
| **Channel Morphology** | | | |
| Sediment Deposition (20) | 6 | 8 | 6 |
| Flow Status - Maint. Flow Volume (10) | 5 | 1 | 5 |
| Flow Status - Flashiness (10) | 1 | 1 | 1 |
| Channel Alteration (20) | 13 | 12 | 12 |
| Frequency of Riffles/Bends (20)* | 11 | 12 | 6 |
| Channel Sinuosity (20)** | | | |
| **Riparian and Bank Structure** | | | |
| Bank Stability (L) (10) | 2 | 3 | 3 |
| Bank Stability (R) (10) | 4 | 3 | 3 |
| Vegetative Protection (L) (10) | 6 | 6 | 4 |
| Vegetative Protection (R) (10) | 6 | 6 | 6 |
| Riparian Veg. Zone Width (L) (10) | 5 | 5 | 1 |
| Riparian Veg. Zone Width (R) (10) | 3 | 5 | 5 |
| TOTAL SCORE (200): | 89 | 94 | 80 |
| HABITAT RATING: | MARGINAL (MODERATELY IMPAIRED) | MARGINAL (MODERATELY IMPAIRED) | MARGINAL (MODERATELY IMPAIRED) |

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

| | | | |
|---|---|---|---|
| Date: | 8/24/2010 | 8/25/2010 | 8/25/2010 |
| Weather: | Partly Cloudy | Sunny | Sunny |
| Air Temperature: | 82 Deg. F. | 72 Deg. F. | 75 Deg. F. |
| Water Temperature: | 74 Deg. F. | 68 Deg. F. | 66 Deg. F. |
| Ave. Stream Width: | 20 Feet | 10 Feet | 14 Feet |
| Ave. Stream Depth: | 0.6 Feet | 0.2 Feet | 0.3 Feet |
| Surface Velocity: | 0.5 Ft./Sec. | 0.7 Ft./Sec. | 0.3 Ft./Sec. |
| Estimated Flow: | 6 CFS | 1.4 CFS | 1.26 CFS |
| Stream Modifications: | Canopy Removal | None | Dredged |
| Nuisance Plants (Y/N): | N | N | N |
| Report Number: | | | |
| STORET No.: | 700639 | 30697 | 30696 |
| Stream Name: | Macatawa River | North Branch Macatawa River | South Branch Macatawa River |
| Road Crossing/Location: | Black River Drive | Ottogan Road | upstream M40 |
| County Code: | 70 | 03 | 03 |
| TRS: | 05N15W36 | 04N15W3 | 04N15W15 |
| Latitude (dd): | 42.78016 | 42.76879 | 42.72843 |
| Longitude (dd): | -86.02413 | -86.06589 | -86.05655 |
| Ecoregion: | SMNITP | SMNITP | SMNITP |
| Stream Type: | Warmwater | Warmwater | Warmwater |
| USGS Basin Code: | 4050002 | 4050002 | 4050002 |

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

Table 3A. Qualitative macroinvertebrate sampling results for the Macatawa area watersheds, August, 2010.

| TAXA | Little Pigeon River 158th Avenue 8/23/2010 STATION 1 | Ten Hagen Creek Butternut Drive 8/23/2010 STATION 2 | Pine Creek Quincy Road 8/23/2010 STATION 3 | Pine Creek Riley Street 8/23/2010 STATION 4 |
|---|---|---|---|---|
| PLATYHELMINTHES (flatworms) | | | | |
| Turbellaria | | | 1 | 3 |
| ANNELIDA (segmented worms) | | | | |
| Oligochaeta (worms) | 2 | 6 | 3 | 3 |
| ARTHROPODA | | | | |
| Crustacea | | | | |
| Amphipoda (scuds) | 4 | 51 | 115 | 63 |
| Decapoda (crayfish) | | 1 | | |
| Isopoda (sowbugs) | 4 | 130 | 33 | 7 |
| Arachnoidea | | | | |
| Hydracarina | | 2 | | |
| Insecta | | | | |
| Ephemeroptera (mayflies) | | | | |
| Baetidae | | | | 4 |
| Caenidae | | | 1 | |
| Heptageniidae | | 18 | | |
| Odonata | | | | |
| Anisoptera (dragonflies) | | | | |
| Aeshnidae | | 2 | 1 | |
| Libellulidae | | 2 | | |
| Zygoptera (damselflies) | | | | |
| Calopterygidae | | 6 | 26 | 96 |
| Coenagrionidae | | | 15 | |
| Hemiptera (true bugs) | | | | |
| Corixidae | | | 1 | |
| Gerridae | 3 | 1 | 1 | |
| Notonectidae | | | 1 | 1 |
| Veliidae | | | 1 | 1 |
| Megaloptera | | | | |
| Corydalidae (dobson flies) | | 6 | | |
| Trichoptera (caddisflies) | | | | |
| Hydropsychidae | | 16 | 13 | 12 |
| Hydroptilidae | | | | 5 |
| Leptoceridae | | 4 | | 1 |
| Limnephilidae | 18 | | | |
| Phryganeidae | 1 | | 1 | |
| Coleoptera (beetles) | | | | |
| Dytiscidae (total) | | 1 | | |
| Hydrophilidae (total) | 2 | | | |
| Gyrinidae (larvae) | | | 1 | |
| Diptera (flies) | | | | |
| Chironomidae | 149 | 8 | 60 | 63 |
| Dixidae | | 1 | | |
| Simuliidae | | | 5 | |
| Tabanidae | | 2 | | |
| Tipulidae | 47 | 6 | | 2 |
| MOLLUSCA | | | | |
| Gastropoda (snails) | | | | |
| Ancylidae (limpets) | | | 1 | |
| Physidae | 25 | | 3 | 4 |
| Planorbidae | 3 | | | |
| Pelecypoda (bivalves) | | | | |
| Sphaeriidae (clams) | | 1 | 1 | 2 |
| TOTAL INDIVIDUALS | 258 | 264 | 284 | 267 |

Table 3B. Macroinvertebrate metric evaluation of the Macatawa area watersheds, August, 2010.

| METRIC | Little Pigeon River 158th Avenue 8/23/2010 STATION 1 Value | Score | Ten Hagen Creek Butternut Drive 8/23/2010 STATION 2 Value | Score | Pine Creek Quincy Road 8/23/2010 STATION 3 Value | Score | Pine Creek Riley Street 8/23/2010 STATION 4 Value | Score |
|---|---|---|---|---|---|---|---|---|
| TOTAL NUMBER OF TAXA | 11 | 0 | 19 | 0 | 20 | 0 | 15 | 0 |
| NUMBER OF MAYFLY TAXA | 0 | -1 | 1 | -1 | 1 | -1 | 1 | -1 |
| NUMBER OF CADDISFLY TAXA | 2 | 0 | 2 | 0 | 2 | 0 | 3 | 0 |
| NUMBER OF STONEFLY TAXA | 0 | -1 | 0 | -1 | 0 | -1 | 0 | -1 |
| PERCENT MAYFLY COMP. | 0.00 | -1 | 6.82 | 0 | 0.35 | -1 | 1.50 | -1 |
| PERCENT CADDISFLY COMP. | 7.36 | 0 | 7.58 | 0 | 4.93 | 0 | 6.74 | 0 |
| PERCENT DOMINANT TAXON | 57.75 | -1 | 49.24 | -1 | 40.49 | -1 | 35.96 | 0 |
| PERCENT ISOPOD, SNAIL, LEECH | 12.40 | -1 | 49.24 | -1 | 13.03 | -1 | 4.12 | 0 |
| PERCENT SURF. AIR BREATHERS | 1.94 | 1 | 0.76 | 1 | 1.41 | 1 | 0.75 | 1 |
| TOTAL SCORE | | -4 | | -3 | | -4 | | -2 |
| MACROINV. COMMUNITY RATING | | ACCEPT. | | ACCEPT. | | ACCEPT. | | ACCEPT. |

Table 3A. Qualitative macroinvertebrate sampling results for the Macatawa area watersheds, August, 2010.

| TAXA | Bosch & Hulst Drain<br>New Holland Street<br>8/23/2010<br>STATION 5 | Macatawa River<br>Riley Street<br>8/24/2010<br>STATION 6 | Peters Creek<br>144th Avenue<br>8/24/2010<br>STATION 7 | Peters Creek<br>84th Avenue<br>8/24/2010<br>STATION 8 |
|---|---|---|---|---|
| PLATYHELMINTHES (flatworms) | | | | |
| Turbellaria | 6 | 3 | 1 | |
| ANNELIDA (segmented worms) | | | | |
| Hirudinea (leeches) | 3 | 5 | | |
| Oligochaeta (worms) | 1 | 9 | | |
| ARTHROPODA | | | | |
| Crustacea | | | | |
| Amphipoda (scuds) | | 1 | 143 | 56 |
| Decapoda (crayfish) | | | | 1 |
| Isopoda (sowbugs) | 94 | | 33 | 26 |
| Arachnoidea | | | | |
| Hydracarina | 9 | | | |
| Insecta | | | | |
| Ephemeroptera (mayflies) | | | | |
| Baetidae | 26 | 2 | 10 | 19 |
| Caenidae | 22 | | | |
| Heptageniidae | 2 | | | 4 |
| Odonata | | | | |
| Anisoptera (dragonflies) | | | | |
| Aeshnidae | | | 5 | |
| Cordulegastridae | 1 | | | |
| Libellulidae | 16 | 1 | | |
| Zygoptera (damselflies) | | | | |
| Calopterygidae | | 24 | | 23 |
| Coenagrionidae | 4 | 72 | 3 | |
| Hemiptera (true bugs) | | | | |
| Belostomatidae | | 1 | 1 | |
| Corixidae | 20 | | 6 | |
| Gerridae | 1 | 1 | 1 | 1 |
| Nepidae | | 2 | | |
| Notonectidae | | | 1 | |
| Pleidae | 1 | | 1 | |
| Trichoptera (caddisflies) | | | | |
| Hydropsychidae | | 6 | 3 | 16 |
| Leptoceridae | | 4 | | |
| Phryganeidae | | | 1 | |
| Coleoptera (beetles) | | | | |
| Dytiscidae (total) | | 1 | | |
| Gyrinidae (adults) | 1 | | | |
| Haliplidae (adults) | 6 | | | |
| Hydrophilidae (total) | 1 | | | |
| Dryopidae | | | 2 | |
| Diptera (flies) | | | | |
| Ceratopogonidae | | 2 | | |
| Chironomidae | 26 | 93 | 100 | 45 |
| Culicidae | | 5 | 2 | 1 |
| Dixidae | 2 | | 1 | |
| Tabanidae | | | | 1 |
| Tipulidae | 1 | | | |
| MOLLUSCA | | | | |
| Gastropoda (snails) | | | | |
| Physidae | 2 | 17 | 3 | |
| Pelecypoda (bivalves) | | | | |
| Sphaeriidae (clams) | 3 | 14 | | 3 |
| TOTAL INDIVIDUALS | 248 | 263 | 317 | 196 |

Table 3B. Macroinvertebrate metric evaluation of the Macatawa area watersheds, August, 2010.

| METRIC | Bosch & Hulst Drain<br>New Holland Street<br>8/23/2010<br>STATION 5 | | Macatawa River<br>Riley Street<br>8/24/2010<br>STATION 6 | | Peters Creek<br>144th Avenue<br>8/24/2010<br>STATION 7 | | Peters Creek<br>84th Avenue<br>8/24/2010<br>STATION 8 | |
|---|---|---|---|---|---|---|---|---|
| | Value | Score | Value | Score | Value | Score | Value | Score |
| TOTAL NUMBER OF TAXA | 22 | 0 | 19 | 0 | 18 | 0 | 12 | 0 |
| NUMBER OF MAYFLY TAXA | 3 | 0 | 1 | -1 | 1 | 0 | 2 | 0 |
| NUMBER OF CADDISFLY TAXA | 0 | -1 | 2 | 0 | 2 | 0 | 1 | -1 |
| NUMBER OF STONEFLY TAXA | 0 | -1 | 0 | -1 | 0 | -1 | 0 | -1 |
| PERCENT MAYFLY COMP. | 20.16 | 1 | 0.76 | -1 | 3.15 | 0 | 11.73 | 0 |
| PERCENT CADDISFLY COMP. | 0.00 | -1 | 3.80 | -1 | 1.26 | -1 | 8.16 | 0 |
| PERCENT DOMINANT TAXON | 37.90 | -1 | 35.36 | 0 | 45.11 | -1 | 28.57 | 0 |
| PERCENT ISOPOD, SNAIL, LEECH | 39.92 | -1 | 8.37 | 0 | 11.36 | -1 | 13.27 | -1 |
| PERCENT SURF. AIR BREATHERS | 12.10 | 0 | 3.80 | 1 | 3.79 | 1 | 1.02 | 1 |
| TOTAL SCORE | | -4 | | -3 | | -3 | | -2 |
| MACROINV. COMMUNITY RATING | | ACCEPT. | | ACCEPT. | | ACCEPT. | | ACCEPT. |

Table 3A. Qualitative macroinvertebrate sampling results for the 2010 the Macatawa area watersheds, August, 2010.

| TAXA | Macatawa River 84th Avenue 8/24/2010 STATION 9 | Macatawa River Adams Street 8/24/2010 STATION 10 | Macatawa River Black River Drive 8/24/2010 STATION 11 | North Branch Macatawa River Ottogan Road 8/25/2010 STATION 12 |
|---|---|---|---|---|
| PLATYHELMINTHES (flatworms) | | | | |
| Turbellaria | 1 | 6 | | 4 |
| ANNELIDA (segmented worms) | | | | |
| Hirudinea (leeches) | | 5 | 1 | 1 |
| Oligochaeta (worms) | | 3 | 2 | 2 |
| ARTHROPODA | | | | |
| Crustacea | | | | |
| Amphipoda (scuds) | 1 | 48 | 23 | 8 |
| Decapoda (crayfish) | | | 2 | 1 |
| Isopoda (sowbugs) | 1 | 6 | 13 | 33 |
| Arachnoidea | | | | |
| Hydracarina | | 1 | 1 | 1 |
| Insecta | | | | |
| Ephemeroptera (mayflies) | | | | |
| Baetidae | 1 | 1 | 17 | 17 |
| Caenidae | | | 1 | 3 |
| Ephemerellidae | | | | 2 |
| Heptageniidae | | | 3 | 5 |
| Odonata | | | | |
| Anisoptera (dragonflies) | | | | |
| Aeshnidae | | | 2 | |
| Libellulidae | | 1 | | |
| Zygoptera (damselflies) | | | | |
| Calopterygidae | 5 | 14 | 25 | 1 |
| Coenagrionidae | 1 | 12 | 3 | 7 |
| Hemiptera (true bugs) | | | | |
| Corixidae | 2 | 1 | | |
| Gerridae | 1 | 2 | 1 | 1 |
| Notonectidae | | | | 1 |
| Pleidae | | 2 | | |
| Veliidae | | | | 1 |
| Trichoptera (caddisflies) | | | | |
| Hydropsychidae | 186 | 55 | 90 | 58 |
| Hydroptilidae | | | 2 | |
| Coleoptera (beetles) | | | | |
| Haliplidae (adults) | | 1 | | |
| Dryopidae | 2 | | 1 | |
| Elmidae | | 1 | 5 | 31 |
| Diptera (flies) | | | | |
| Ceratopogonidae | 2 | 1 | 2 | |
| Chironomidae | 102 | 70 | 77 | 38 |
| Culicidae | | 1 | 1 | 2 |
| Simuliidae | | | 3 | |
| Stratiomyidae | | | 1 | |
| Tabanidae | | 1 | 3 | 2 |
| MOLLUSCA | | | | |
| Gastropoda (snails) | | | | |
| Ancylidae (limpets) | | | 1 | |
| Physidae | | 1 | 1 | 1 |
| Pelecypoda (bivalves) | | | | |
| Sphaeriidae (clams) | 1 | 32 | 2 | 3 |
| Unionidae (mussels) | | 1 | | |
| TOTAL INDIVIDUALS | 306 | 266 | 283 | 223 |

Table 3B. Macroinvertebrate metric evaluation of the Macatawa area watersheds, August, 2010.

| METRIC | Macatawa River 84th Avenue 8/24/2010 STATION 9 Value | Score | Macatawa River Adams Street 8/24/2010 STATION 10 Value | Score | Macatawa River Black River Drive 8/24/2010 STATION 11 Value | Score | North Branch Macatawa River Ottogan Road 8/25/2010 STATION 12 Value | Score |
|---|---|---|---|---|---|---|---|---|
| TOTAL NUMBER OF TAXA | 13 | 0 | 23 | 0 | 26 | 1 | 23 | 0 |
| NUMBER OF MAYFLY TAXA | 1 | -1 | 1 | -1 | 3 | 0 | 4 | 1 |
| NUMBER OF CADDISFLY TAXA | 1 | -1 | 1 | -1 | 2 | 0 | 1 | -1 |
| NUMBER OF STONEFLY TAXA | 0 | -1 | 0 | -1 | 0 | -1 | 0 | -1 |
| PERCENT MAYFLY COMP. | 0.33 | -1 | 0.38 | -1 | 7.42 | 0 | 12.11 | 0 |
| PERCENT CADDISFLY COMP. | 60.78 | 1 | 20.68 | 0 | 32.51 | 1 | 26.01 | 0 |
| PERCENT DOMINANT TAXON | 60.78 | -1 | 26.32 | 0 | 31.80 | 0 | 26.01 | 0 |
| PERCENT ISOPOD, SNAIL, LEECH | 0.33 | 1 | 4.51 | 0 | 5.65 | 0 | 15.70 | -1 |
| PERCENT SURF. AIR BREATHERS | 0.98 | 1 | 2.63 | 1 | 1.06 | 1 | 2.24 | 1 |
| TOTAL SCORE | | -2 | | -3 | | 2 | | -1 |
| MACROINV. COMMUNITY RATING | | ACCEPT. | | ACCEPT. | | ACCEPT. | | ACCEPT. |

Table 3A. Qualitative macroinvertebrate sampling results for the Macatawa area watersheds, August, 2010.

| TAXA | South Branch Macatawa River upstream M40 8/25/2010 STATION 13 |
|---|---|
| ARTHROPODA | |
| Crustacea | |
| Decapoda (crayfish) | 5 |
| Isopoda (sowbugs) | 49 |
| Arachnoidea | |
| Hydracarina | 2 |
| Insecta | |
| Ephemeroptera (mayflies) | |
| Baetidae | 4 |
| Ephemerellidae | 3 |
| Heptageniidae | 2 |
| Odonata | |
| Anisoptera (dragonflies) | |
| Aeshnidae | 1 |
| Zygoptera (damselflies) | |
| Calopterygidae | 48 |
| Coenagrionidae | 9 |
| Hemiptera (true bugs) | |
| Gerridae | 2 |
| Notonectidae | 2 |
| Trichoptera (caddisflies) | |
| Hydropsychidae | 16 |
| Coleoptera (beetles) | |
| Elmidae | 11 |
| Diptera (flies) | |
| Chironomidae | 47 |
| Simuliidae | 1 |
| MOLLUSCA | |
| Gastropoda (snails) | |
| Ancylidae (limpets) | 27 |
| Physidae | 5 |
| Pelecypoda (bivalves) | |
| Sphaeriidae (clams) | 16 |
| TOTAL INDIVIDUALS | 250 |

Table 3B. Macroinvertebrate metric evaluation of the Macatawa area watersheds, August, 2010.

| METRIC | South Branch Macatawa River upstream M40 8/25/2010 STATION 13 Value | Score |
|---|---|---|
| TOTAL NUMBER OF TAXA | 18 | 0 |
| NUMBER OF MAYFLY TAXA | 3 | 0 |
| NUMBER OF CADDISFLY TAXA | 1 | -1 |
| NUMBER OF STONEFLY TAXA | 0 | -1 |
| PERCENT MAYFLY COMP. | 3.60 | 0 |
| PERCENT CADDISFLY COMP. | 6.40 | 0 |
| PERCENT DOMINANT TAXON | 19.60 | 1 |
| PERCENT ISOPOD, SNAIL, LEECH | 32.40 | -1 |
| PERCENT SURF. AIR BREATHERS | 1.60 | 1 |
| TOTAL SCORE | | -1 |
| MACROINV. COMMUNITY RATING | | ACCEPT. |

Table 4. Habitat evaluation for three site visits on South Branch Macatawa River tributaries, August 25, 2010.

| HABITAT METRIC | Station 14 Jaarda Drain a 140th Ave. GLIDE/POOL | Station 15 Kleinheksel Drain a 140th Ave. GLIDE/POOL | Station 16 East Fillmore Drain a 144th Ave. GLIDE/POOL |
|---|---|---|---|
| **Substrate and Instream Cover** | | | |
| Epifaunal Substrate/ Avail Cover (20) | 2 | 4 | 11 |
| Embeddedness (20)* | | | |
| Velocity/Depth Regime (20)* | | | |
| Pool Substrate Characterization (20)** | 3 | 6 | 8 |
| Pool Variability (20)** | 2 | 2 | 11 |
| **Channel Morphology** | | | |
| Sediment Deposition (20) | 2 | 2 | 14 |
| Flow Status - Maint. Flow Volume (10) | 6 | 4 | 8 |
| Flow Status - Flashiness (10) | 2 | 3 | 4 |
| Channel Alteration (20) | 5 | 7 | 11 |
| Frequency of Riffles/Bends (20)* | | | |
| Channel Sinuosity (20)** | 0 | 1 | 3 |
| **Riparian and Bank Structure** | | | |
| Bank Stability (L) (10) | 5 | 6 | 8 |
| Bank Stability (R) (10) | 5 | 5 | 8 |
| Vegetative Protection (L) (10) | 4 | 6 | 7 |
| Vegetative Protection (R) (10) | 4 | 4 | 7 |
| Riparian Veg. Zone Width (L) (10) | 1 | 3 | 2 |
| Riparian Veg. Zone Width (R) (10) | 1 | 2 | 2 |
| TOTAL SCORE (200): | 42 | 55 | 104 |
| HABITAT RATING | POOR (SEVERELY IMPAIRED) | POOR (SEVERELY 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).

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

Table 5. Road Stream Crossing datasheet data for three small streams in the South Branch of the Macatawa River watershed.

| Waterbody Name | Jaarda Drain | Kleinheksel Drain | East Fillmore Drain |
|---|---|---|---|
| | | | |
| Location | 140th Avenue | 140th Avenue | 144th Avenue |
| County | Allegan | Allegan | Allegan |
| Township | Fillmore | Fillmore | Fillmore |
| TRS | 4N15W28 | 4N15W27 | 4N15W12 |
| Lat/Lon | 42.71083; -86.07999 | 42.71157; -86.06003 | 42.74039; -86.03008 |
| STORET | 030567 | 030566 | 030517 |
| Investigators | Holden; Kohlhepp | Holden; Kohlhepp | Holden; Kohlhepp |
| Assessment Location | Upstream | Downstream (u/s had no visible flow) | Upstream and Downstream |
| Date/Time | 8/25/10; 12:30 | 8/25/10; 12:45 | 8/25/10; 1:15 |
| **Background Info** | | | |
| Event Conditions noted at site | none | none | none |
| Days Since Rain | >3 | >3 | >3 |
| Water Temp | 71F | 71F | 71F |
| Water Color | Clear | Clear | Clear |
| Stream Width (ft) | 6 | 8 | 10 |
| Stream Depth (ft) | 0.3 | 0.2 | 1 |
| Water Velocity (ft/sec) | 0.02 | 0.1 | 0.05 |
| Stream Flow Type | Stagnant | Low Flow | Low Flow |
| **Substrate %** | | | |
| Cobble/Gravel | | 1 | 5 |
| Sand | 60 | 29 | 50 |
| Silt/Detritus/Muck | 40 | 70 | 45 |
| **River Morphology** | | | |
| Riffle | none | none | none |
| Pool | none | none | none |
| Channel | Maintained | Maintained | Maintained |
| Designated Drain | Yes | Yes | Yes |
| Highest Water Mark (ft) | 3 to 5 | 3 to 5 | 3 to 5 |
| **Physical Appearance** | | | |
| Acuatic Plants | none | present | present |
| Floating Algae | none | none | none |
| Filamentous Algae | abundant | none | none |
| Baterial Sheen/Slimes | present | none | none |
| Turbidity | none | none | none |
| Oil Sheen | none | none | none |
| Foam | none | none | none |
| Trash | none | none | none |
| **Instream Cover** | | | |
| Undercut Banks | none | none | none |
| Overhanging Vegetation | moderate | sparse | sparse |
| Deep Pools | none | none | none |
| Boulders | none | none | none |
| Aquatic Plants | sparse, emergent | sparse | sparse |
| Logs or Woody Debris | sparse | sparse | sparse |

Table 5. Road Stream Crossing datasheet data for three small streams in the South Branch of the Macatawa River watershed.

| Waterbody Name | Jaarda Drain | Kleinheksel Drain | East Fillmore Drain |
|---|---|---|---|
| | | | |
| **Invertebrates Quickly Observed** | speridae | gerridae | haliplidae |
| | isopoda | hirudinea | corduligastridae |
| | physidae | decopoda | calopterigidae |
| | libulidae | isopoda | aeshnidae |
| | chironmoidae- red | | |
| | planorbidae | | |
| | decopoda | | |
| | hirudinea | | |
| | belostomatidae | | |
| | gyrinidae (adult) | | |
| **Stream Corridor** | | | |
| Riparian Vegetated Width ft. (L) | 3 | <10 | 10 |
| Riparian Vegetated Width ft. (R) | 3 | <10 | 10 |
| Bank Erosion | Low | Low | Low |
| Streamside Land Cover | Grass | Trees | Shrubs |
| Stream Canopy | 0% | 25-50% | 25-50% |
| **Adjacent Land Uses** | | | |
| Wetlands | -- | -- | -- |
| Shrub/Old Field | -- | -- | -- |
| Forest | -- | L | -- |
| Pasture | -- | -- | -- |
| Crop Residue | -- | -- | -- |
| Rowcrop | L/R | L/R | L/R |
| Residential Lawn/Park | -- | -- | -- |
| Impervious Surface | -- | -- | -- |
| Disturbed Ground | -- | -- | -- |
| No Vegetation | -- | -- | -- |
| **Potential Sources** | Crop Related Sources, Channelization, Removal of Riparian Vegetation, Bank Erosion, flow modification, | Crop Related Sources, Channelization, Removal of Riparian Vegetation, Bank Erosion, flow modification, | Crop Related Sources, Channelization, Dredging, Removal of Riparian Vegetation, Bank Erosion, flow modification, |
| **Comments** | Mucky bottom, 3-4 inches of water, manure smell | Trees on left bank providing canopy cover. Corn on right bank. | Very low flow, wind blowing water upstream. P51 would be possible here, but maybe better in June. |