

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
WATER BUREAU  
APRIL 2009

STAFF REPORT

BIOLOGICAL SURVEYS OF SELECTED NORTHWEST LOWER PENINSULA STREAMS  
ANTRIM, CHARLEVOIX, EMMET, GRAND TRAVERSE, AND  
KALKASKA COUNTIES, MICHIGAN  
JULY TO AUGUST 2008

## Introduction

Biological and physical habitat conditions of northwest Lower Peninsula streams in Antrim, Charlevoix, Emmet, Grand Traverse, and Kalkaska Counties were assessed by Surface Water Assessment Section (SWAS) staff in 2008. The primary objectives of the assessments were:

1. To support the development of water quality-based effluent limits (WQBELs) for National Pollutant Discharge Elimination System (NPDES) permits.
2. Identify nonpoint sources (NPS) of water quality impairment.
3. Evaluate the effectiveness of the NPS Program.
4. Assess the current status and condition of individual water bodies and determine if Michigan Water Quality Standards (WQS) are being met.
5. Gather water quality data needed for Fiscal Year (FY) 2010 Total Maximum Daily Load (TMDL) development or delisting.
6. Satisfy monitoring requests submitted by internal and external customers.

The macroinvertebrate community and physical habitat were qualitatively assessed at 32 stations (Table 1; Figure 1), and the fish community was qualitatively assessed at 2 stations, using the SWAS Procedure 51 (available upon request, MDEQ, 1990; Creal et al., 1996) for wadeable streams.

The macroinvertebrate and fish communities were assessed and scored with metrics which rate the communities on a scale from excellent to poor. Scores can range from 10 to -10 for fish and 9 to -9 for macroinvertebrates. 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). Cold water fish communities are not scored using the Procedure 51 metrics, and instead are considered acceptable if 1% of the organisms collected are in the family *Salmonidae*. 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.

Two site selection methods were used to assess northwest Lower Peninsula streams in 2008: stratified random and targeted. A probabilistic monitoring approach, using stratified random site selection to address statewide and regional questions about water quality, was used to select several stations within the northwest Lower Peninsula region (MDEQ, 2006 draft). The biosurveys west of the Boardman River (including coastal tributaries in Leelanau County and the Platte and Betsie River watersheds) were conducted separately from the northwest Lower Peninsula streams from the Boardman River northeast to Mackinaw and will be addressed in a separate report. In addition to probabilistic monitoring, sites within the northwest Lower Peninsula were selected for targeted monitoring to fulfill specific monitoring requests, assess known or potential areas of concern, collect information and assess attainment of designated

uses from areas where historic information was lacking, or to provide information for NPDES activities.

## **Watershed Information**

Many streams within the northwest Lower Peninsula drain relatively small coastal watersheds. Two of the larger watersheds in the region are the Boardman River and the Elk River Chain of Lakes. The Boardman River drains approximately 300 square miles of land in Kalkaska and Grand Traverse Counties and consists of approximately 130 miles of river and stream tributaries (MDNR, 1975). Twelve lakes also drain into the river system (MDNR, 1975). The Elk River Chain of Lakes watershed covers over 500 square miles in Antrim, Charlevoix, Grand Traverse, and Kalkaska Counties and is the largest subwatershed of Grand Traverse Bay. The Elk River Chain of Lakes includes Elk and Torch Lakes, two of the clearest lakes in Michigan.

Most of the northwest Lower Peninsula is located in the Northern Central Hardwood Forests ecoregion (Omernik and Gallant, 1988). The northeastern half of Emmet County is located in the Northern Lakes and Forest ecoregion (Omernik and Gallant, 1988). The region is a mixture of state and private forest and agricultural and urban land uses. Agriculture in the area is a mixture of fruit orchards, grain and row crops, and livestock production. Most agricultural practices are small and interspersed with residential and natural land. Tourism is a major industry in the region and land with access to or views of the region's water bodies is highly valued.

The 32 biological surveys performed in the region were located on the following streams: French Farm Creek, Carp Lake River, Big Sucker Creek, Tannery Creek, and Bear River in Emmet County; Hay Marsh Creek, Susan Creek, South Branch Boyne River, Boyne River, Warner Creek, Deer Creek, and Whiskey Creek in Charlevoix County; Jordan River, Green River, and Antrim Creek in Antrim County; North Branch Boardman River in Kalkaska County; and Yuba Creek, Twenty Two Creek, Jackson Creek, East Creek, Boardman River, and Kids Creek in Grand Traverse County.

Kid's Creek, from its confluence with the Boardman River upstream to US-31/M-37, is listed in the Clean Water Act Section 303(d) report as not meeting the other indigenous aquatic life and wildlife designated use due to a poor macroinvertebrate community (Lesage and Smith, 2008). A TMDL for Kid's Creek is scheduled for development in 2010. Mitchell Creek, in Antrim County, does not attain designated uses because of elevated *E. coli* concentrations and an *E. coli* TMDL is scheduled for 2015. The Boyne River has a fish consumption advisory due to elevated PCBs in fish tissue. Elevated water column concentrations of PCBs in the Boardman River indicate the other indigenous aquatic life and wildlife designated use is not being met. PCB TMDLs are scheduled for development in both watersheds in 2010.

## **2007 Macroinvertebrate, Fish, and Habitat Biosurvey Sampling Results**

### French Farm Creek

French Farm Creek was sampled at Wilderness Park Drive (C81) (Station 1). The riffle/run habitat scored excellent (168; Table 2). The substrate was dominated by sand and silt. The channel had an extensive amount of senescing Cladophera, which was not at a nuisance level. The macroinvertebrate community scored acceptable (0; Table 3), but was dominated by isopods, snails, and leaches, which are tolerant to many instream stressors.

### Carp Lake River

Carp Lake River was sampled downstream of Munger Road (Station 2). The riffle/run habitat scored excellent (160; Table 2). The substrate was dominated by gravel and approximately 50% of the substrate was not covered by water at the time of the survey. The riparian area was comprised of a mixed pine forest lacking an understory. Riffles were relatively infrequent. The macroinvertebrate community scored acceptable (3; Table 3) and was comprised of many taxa that are intolerant to pollution and instream stressors, including six mayfly families, nine caddisfly families, and one stonefly family.

### Big Sucker Creek

Big Sucker Creek was sampled at Sturgeon Bay Trail (Station 3). The glide/pool habitat scored excellent (159; Table 2). The substrate was dominated by sand, with silt margins. There was an extensive amount of large woody debris in the channel. The riparian area was swampy and grasses and dead trees dominated the area. The macroinvertebrate community scored acceptable (4; Table 3) and was comprised of a diverse group of organisms.

### Tannery Creek

Tannery Creek was sampled at Country Club Road (Station 4) and downstream of US-31 behind Glen's supermarket (Station 5). At Station 4, upstream of Country Club Road, the riffle/run habitat scored excellent (160; Table 2). The substrate was dominated by gravel and cobble, there were many riffle/pool sequences, and the stream was high gradient and cold. The macroinvertebrate community scored acceptable (4; Table 3). Although there was only one taxa of mayfly collected, the rest of the community was relatively diverse, especially for a small stream. Fifty-five brook trout were collected during the fish community assessment. The individual fish ranged in length from one to nine inches, indicating that brook trout may be reproducing in Tannery Creek (Table 4).

The riffle/run habitat at Station 5 scored marginal (104; Table 2). This section of Tannery Creek is a steep series of pools and drops. In the upstream part of this section there are concrete walls on both banks and a concrete stream bottom as the water goes through what may be an old sluice or millrace. This section of Tannery Creek appears to have highly variable flows as evidenced by the height of bank scour and the debris and garbage left in vegetation above the stream. The substrate was dominated by sand and silt, with a small amount of gravel and some cobble. The rocks that were present were not well colonized by macroinvertebrates or algae. The macroinvertebrate community scored poor (-5; Table 3). Only 16 taxa were collected, including only one mayfly family and one caddisfly family, both of which are known to be more tolerant of instream stressors (*Baetidae* and *Hydropsychidae*). It was not clear if the physical alterations in this section of Tannery Creek are the cause of the 'poor' macroinvertebrate community or if there are water quality problems in the stream.

The fish community was also assessed at Station 5, and 42 brook trout and 1 rainbow trout were collected. Although 50 fish were not collected, which is the minimum number needed to determine if a coldwater stream is meeting the coldwater fisheries designated use (Creal et al., 1996), the presence of so many trout indicates that water temperature is likely not the limiting factor in the presence of fish in this section of Tannery Creek (Table 4).

### Hay Marsh Creek

Hay Marsh Creek, a headwater tributary to the Bear River, was sampled at Holms Road (Station 6). The glide/pool habitat scored good (134; Table 2), although there was very little epifaunal substrate suitable for colonization. Hay Marsh Creek flows through a wetland and the

channel is full of fine particulate organic matter. Besides silts, the main substrate for macroinvertebrates was submerged or overhanging vegetation. The creek was backed up at Holms Road due to a pile up of large debris in front of the culvert. The macroinvertebrate community scored acceptable (-3, Table 3), although it was dominated by isopods and snails. In some streams a large numbers of isopods and snails can indicate stream degradation. However, in Hay Marsh Creek these organisms may indicate that Procedure 51 is not an adequate assessment tool for a wetland stream.

### Bear River

Bear River was sampled at Evergreen Road (Station 7), Click Road (Station 8), and Howard Street (Station 9). These three stations are within four stream miles of each other, in the lower half of the watershed. The glide/pool habitat at all three stations scored good (123 at Station 7, 148 at Station 8, and 115 at Station 9; Table 2).

At Station 7, the most upstream station, the substrate was comprised of a mixture of silt and sand. The depth of the water and the silt made sampling the river at this location difficult. There was very little substrate favorable for colonization by macroinvertebrates. The macroinvertebrate community scored poor (-5; Table 3). Although multiple mayfly and caddisfly taxa were collected, they were present in low numbers. The community was dominated by corixids (*Corixidae*), which are a surface dependent taxa and can be found in large numbers on the surface of heavy silt deposits. High percentages of surface breathers can indicate large dissolved oxygen shifts or high levels of biological oxygen demand.

At Station 8, the substrate was dominated by sand, with loose sand being prevalent. There was marl on the rocks, which indicates harder water and can reduce the macroinvertebrate colonization potential. The macroinvertebrate community scored acceptable (2; Table 3). There were five mayfly taxa and six caddisfly taxa collected. In general, the community was diverse and not dominated strongly by a single taxon.

Edly (2005) recommended assessing the macroinvertebrate community of the Bear River at Howard Street, because water levels were too high and the water was too turbid during the 2003 watershed survey. At Station 9, upstream of Howard Street, the substrate was almost all sand. There was a moderate amount of new sand in the channel and it appeared that the bottom of the channel was changing frequently. The macroinvertebrate community scored acceptable (-2; Table 3), but had a low density of macroinvertebrates. Similar to the upstream stations, there were several different caddisfly families collected and multiple mayfly families. The new sand in the channel may be a sign of development in the watershed. In 1993, during the last macroinvertebrate survey the community scored fair (Walker, 1994), but would have rated acceptable, with a score of 1, using our current scoring system. It is not possible to say if this is really an indication of an actual change because different methods and scoring systems were used and there is an unknown amount of variance around a P51 score.

### Susan Creek

Susan Creek was sampled at US-31 (Station 10). The riffle/run habitat scored excellent (165; Table 2). The substrate of this small coastal stream was dominated by sand and gravel. The water did not fill the channel and there was an extensive amount of large woody debris in or above the channel, often perpendicular to stream flow. The stream also had an excellent riparian area. The macroinvertebrate community scored acceptable (2; Table 3).

### South Branch Boyne River

The South Branch of the Boyne River was sampled at a two-track off US-131 (Station 11). The riffle/run habitat scored excellent (157; Table 2). The substrate was primarily sand and the wood and rocks in the channel were covered in marl. There was an extensive amount of woody debris and the river was deep and fast. The macroinvertebrate community scored acceptable (4; Table 3), with the highest score in the acceptable range. There were five mayfly, ten caddisfly, and two stonefly families collected, all indicating that there are minimal environmental stressors in the South Branch of the Boyne River.

### Boyne River

The Boyne River was sampled in Boyne City at the park upstream of Park Street (Station 12). The riffle/run habitat scored good (122; Table 2). The substrate was dominated by cobble. Both banks were stabilized with riprap (Figure 2). The right bank also had some native plantings above the riprap. There was controlled access to the river through the stairways built from the park to the river. There were some areas of the left bank that were moderately unstable. The macroinvertebrate community scored excellent (6; Table 3). More than half of the taxa collected were mayflies, caddisflies, or stoneflies indicating that the riparian urban land uses have not impacted the river to the extent of making the river intolerable to taxa that are not tolerant to in-stream stressors.



Figure 2. Boyne River at Park Street in Boyne City, Michigan, July 2008.

### Warner Creek

Warner Creek, a headwater tributary to Deer Creek, was sampled at Korthase Road (Station 13). The glide/pool habitat scored good (142; Table 2). The substrate was comprised entirely of sand, with heavy deposits changing the bottom of the stream frequently and very few pools. There was a moderate amount of large woody debris and aquatic macrophytes present in the channel, which provided some substrate for macroinvertebrate colonization. The macroinvertebrate community scored acceptable, with the highest score in the acceptable range (4; Table 3).

### Deer Creek

Deer Creek was sampled off of Carson Road (Station 14). The riffle/run habitat scored excellent (187; Table 2). The riparian area was undeveloped and dominated by grasses. Cobble and gravel were the dominant substrate. There were many riffles and different velocity and depth combinations, there were silts and undercut banks at the margins, and there was a moderate amount of woody debris in the stream. The macroinvertebrate community scored excellent (5; Table 3).

### Jordan River

The Jordan River was sampled off of South Jordan River Road (upstream of the fish hatchery) (Station 15). The section of stream assessed during this survey was the eastern channel of the Jordan, which is braided at this location. The riffle/run habitat scored excellent (161; Table 2).

The substrate was dominated by sand, with some embedded gravel and cobble. There was an extensive amount of large woody debris, with moss and marl deposits on the wood, rootwads, and undercut banks. The river was very high gradient at this location. The macroinvertebrate community scored acceptable (3; Table 3), with many intolerant taxa collected and an even distribution of organisms across the 43 different taxa.

### Green River

The Green River, a tributary to the Jordan River, was sampled at Green River Road (Station 16), the north crossing of M-66 (Station 17), and Penny Bridge Road (Station 18). These three stations are within two miles of each other, in the lower half of the Green River watershed. The glide/pool habitat at Station 16, the most upstream station, scored good (154; Table 2), with the highest numeric score within the good range. The substrate was dominated by sand. There was an extensive amount of woody debris, but the wood was not in an ideal state for epifaunal colonization because there was sand and moss on the wood. The macroinvertebrate community scored acceptable (4; Table 3), with a high score within the acceptable range. Although there were many intolerant taxa (mayflies, caddisflies, and stoneflies), half of the community was chironomids (*Chironomidae*), which may indicate some environmental stress.

The glide/pool habitat at Station 17, at the north crossing of M-66, scored excellent (178; Table 2). The substrate was dominated by sand, with a large amount of woody debris in the channel. The macroinvertebrate community scored acceptable (2; Table 3). The macroinvertebrate community was relatively diverse, but only two different mayfly taxa were found and there was a generally low percentage of caddisflies collected at this location.

The riffle/run habitat at Station 18, at Penny Bridge Road, scored excellent (193; Table 2). There was marl formation on the large woody debris and the substrate was dominated by cobble. The large woody debris created pools and fast scour areas. The macroinvertebrate community scored acceptable (3; Table 3). Although only 20 taxa were collected, there were many mayflies, caddisflies, and stoneflies.

### Whiskey Creek

Whiskey Creek was sampled in Fishermans Island State Park at the end of the two-track that runs north from the village of Norwood (Station 19). The riffle/run habitat scored good (143; Table 2). Although there were signs of flashiness, such as eroding banks and the stream not filling the channel (Figure 3), high flows may only occur during snowmelt. There are no known sources of environmental stressors in the watershed, which exists mainly in the state park. The macroinvertebrate community scored at the low end of the acceptable range (-4; Table 3). There were seven taxa of caddisflies collected, although at low densities, but no mayflies or stoneflies. The macroinvertebrate community assemblage could indicate some environmental stress, but because there are no known sources of impairment, the stress is likely due to the very low flows that occur during the summer.



Figure 3. Whiskey Creek in Fishermans Island State Park.

### Antrim Creek

Antrim Creek was sampled downstream of Old Dixie Highway in the Antrim Creek Natural Area (Station 20). The riffle/run habitat scored good (152; Table 2). The substrate was dominated by cobble. There were many riffles and bends in this high gradient stream. The banks are steep (over ten feet at some locations) and naturally eroding. The macroinvertebrate community scored acceptable (2; Table 3).

### Yuba Creek

Yuba Creek was sampled at US-131 (Station 21). The riffle/run habitat scored good (132; Table 2). The substrate was dominated by sand, with some mixed gravel and cobble. The left bank was impacted by a road, which limited the amount of protection provided by the riparian area. There was a moderate amount of sediment deposition. The macroinvertebrate community scored acceptable (1; Table 3).

### North Branch Boardman River

The North Branch of the Boardman River was sampled at US-131 in Kalkaska (Station 22), off of a two-track off of US-131, (Station 23), and at Boardman River Road (Station 24). The riffle/run habitat at Station 22 scored good (146; Table 2). The sand-dominated substrate limited the amount of macroinvertebrate habitat suitable for colonization, but there was an extensive to moderate amount of overhanging vegetation, undercut banks, and rootwads. The macroinvertebrate community scored excellent (5; Table 3) and many mayfly, caddisfly, and stonefly taxa were collected.

At Station 23, off of a two-track off of US-131, the riffle/run habitat scored excellent (174; Table 2). This section of the North Branch of the Boardman River has a very well protected riparian area, with very few river crossings. The predominant substrate was sand with some gravel and cobble. Almost all of the banks were undercut. The macroinvertebrate community scored acceptable (4; Table 3), with the highest score in the acceptable range.

At Station 24, at Boardman River Road, the riffle/run habitat scored excellent (174; Table 2). Right at this road crossing there is a home and some lawn that runs up to the edge of the river. There is also a steep rise set back from the edge of the left bank that has some erosion potential. The substrate in the river was a mixture of sand and gravel. The macroinvertebrate community scored excellent (7; Table 3), and included ten caddisfly families.

### South Branch Boardman River

The South Branch of the Boardman River was sampled at a powerline off of South Branch Road (Station 25). The glide/pool habitat scored excellent (173; Table 2). In general, the river was rather straight, but it did not appear to be due to channelization. The banks were stable and there was a well protected riparian zone. The macroinvertebrate community scored acceptable (3; Table 3), but had many taxa that are intolerant to environmental stressors.

### Twenty Two Creek

Twenty Two Creek, a tributary to the Boardman River, was sampled at a two-track off of Mayfield Road (Station 26). The glide/pool habitat scored excellent (155; Table 2). The stream was sandy, with an extensive amount of woody debris and undercut banks and small patches of gravel and cobble. The macroinvertebrate community scored excellent (5; Table 3) and was comprised of many taxa intolerant of environmental stress; including six mayfly, ten caddisfly, and three stonefly taxa.

### Jackson Creek

Jackson Creek, a tributary to East Creek, was sampled downstream of Wood Road (Station 27) and at Marsh Road (Station 28). The glide/pool habitat at Station 27, downstream of Wood Road, scored good (148; Table 2). At this location Jackson Creek is a small, one-foot wide, spring-fed stream. The substrate is sandy with some wood and fine organic matter present. There are essentially no pools in the stream, but that is not abnormal in a headwater stream. The macroinvertebrate community scored acceptable (3; Table 3). There were a very large number of taxa (28) collected for a one-foot wide stream (smaller streams typically have less macroinvertebrate diversity), including many taxa that are intolerant to environmental stressors.

At Station 28, Marsh Road, the riffle/run habitat scored good (106; Table 2). There was a house on the left bank and mowed lawn down to both banks for most of the area sampled. The section of the stream that did not have any canopy had extensive algal growths, which were senescing at the time the river was sampled. In the lower section of the sample area there was some cobble and gravel. In the upstream section of the sample area there were woods on both banks and the substrate changed to bedrock dominated. Overall, the macroinvertebrate community scored excellent (6; Table 3); however, there were relatively large numbers of a few taxa collected (*Oligochaeta*, *Baetidae*, *Hydropsychidae*, and *Chironomidae*), which may indicate a low level of environmental stress.

### East Creek

East Creek, a tributary to the Boardman River, was sampled at Mayfield Road (Station 29). The riffle/run habitat scored excellent (168; Table 2). The substrate was dominated by sand with some cobble/gravel riffles. There were some large sand deposits that appeared to be moving frequently. The banks were undisturbed and well protected by vegetation for a long distance upstream. The only bank riparian disturbance was a horse path that crossed the creek just upstream from the bridge. The macroinvertebrate community scored acceptable (4; Table 3).

### Boardman River

The Boardman River was sampled off of a private road that was across from Sleights Road (Station 30). The riffle/run habitat scored good (149; Table 2). The houses and lawn in the riparian area was the main habitat impairment. The substrate was a stable mixture of sand, gravel, and cobble. The macroinvertebrate community scored acceptable (2; Table 3). Some sections of the river were very fast and bordering on nonwadeable, which may have made the amount of river sampled less than ideal and may have reduced the macroinvertebrate score during this survey.

### Kid's Creek

Kid's Creek, at tributary to the Boardman River, was sampled at M-37/US-31 (Station 31) and approximately one-half mile downstream at Silver Lake Road (Station 32). The glide/pool habitat at Station 31, at M-37/US-31, scored good (117; Table 2). The substrate was mainly sandy, with some small gravel patches and silts in the margins. The macroinvertebrate community scored acceptable (0; Table 3). There were several caddisfly, one mayfly, and one stonefly family collected. There were also a relatively large number (16) of stoneflies collected, which are one of the most sensitive groups of macroinvertebrates.

The riffle/run habitat at Station 32 scored good (117; Table 2). The substrate was almost all sand. The riparian area was a fallow field, but upstream the riparian area is a large parking lot for Meijer. The macroinvertebrate community scored acceptable (-4; Table 3), with the lowest



score in the acceptable range. Over three-quarters of the organisms collected were oligochaetes (*Oligochaetae*), which are worms and are tolerant to environmental stressors. There was only one taxa of mayfly and one individual caddisfly collected at this station. In general, the macroinvertebrate community appeared to be more impacted than at Station 31.

## Summary of Results of Monitoring Objectives

### 1. Support WQBEL development for NPDES permits.

There was no 2008 NPDES-related monitoring within the northwest Lower Peninsula streams.

### 2. Identify NPS of water quality impairment.

Green River The culvert at Green River Road is not large enough for the size of the river (Figure 4). There were three small, arch-topped culverts that did not span the width of the river causing the road to act as an impoundment. There was some evidence of light erosion right at the road crossing, possibly due to the undersized culverts.



Figure 4. Green River at Green River Road looking downstream at the road.

### 3. Evaluate the effectiveness of the NPS Program.

A stream bank stabilization project was completed on the Boyne River in 2006 by the Friends of the Boyne River. The project replaced a seawall in the city park, and there was concern that the project may have reduced macroinvertebrate community diversity. The macroinvertebrate community assessment conducted in the city park showed that there were still many taxa that are intolerant to environmental stressors. Sixteen of the 28 taxa collected were mayflies, stoneflies, or caddisflies. It appears that the bank stabilization and seawall replacement did not cause any long-term negative impacts on the macroinvertebrate community in the Boyne River.

### 4. Assess the current status and condition of individual waters of the state and determine whether designated uses are being met.

A combination of aquatic macroinvertebrate community assessment and habitat assessment was conducted at 32 stations during this survey. The Procedure 51 macroinvertebrate community scored poor in the Bear River at Evergreen Trail and Tannery Creek downstream of US-31. At Bear River at Evergreen Trail, the poor macroinvertebrate community score may be a result of the inadequate sampling effort due to the depth of the river and the silt substrate. The macroinvertebrate community in Tannery Creek downstream of US-31, behind Glen's Supermarket, also scored poor. This score may be the result of sampling in the millrace and in the pools along the steep gradient immediately downstream of the millrace.

Beyond determining the designated use support of streams in the northwest Lower Peninsula (HUC 4060105), sites were selected in a manner to determine the general status of streams in the region. Twenty-six of the 32 stations sampled during this survey are

considered status stations, which were chosen with a randomized design. These 26 stations, along with 8 stations in the Platte River and Betsie River watersheds (HUC 4060104), were analyzed to answer questions about the regional water quality of both HUC regions. Of these 34 status stations in the northwest Lower Peninsula, all but two (Bear River at Evergreen Trail and Leo Creek at M-22 [as described in Wesener [draft report]]) were found to have acceptable or excellent macroinvertebrate communities.

In 2008, 94% ± 9% (using a 95% confidence interval) of northwest Lower Peninsula streams were estimated to be supporting the “other indigenous wildlife and aquatic life” designated use component of R.323.1100(1)(e) of the Michigan WQS. This estimate is based on 34 stratified random sites selected within the region. The 34 sampling locations were stratified by the percentage of the total wadeable stream miles each respective classification represented (e.g., 45% of the streams were classified as small warm, 45% of the total sampling effort would be used for small warm streams, 45% of 40 total sampling locations equals about 18 locations in small warm streams).

The northwest Lower Peninsula classification percentages, followed by an estimate of the number of sampling stations to proportionately represent the entire region, are presented below (Table 5).

Classification	River Miles	Percent of River Miles	Number of Sites	Percent Attaining
Coastal	105	23.2	7	86
Small Cold	187	41.4	15	100
Medium Cold	91	20.1	7	86
Medium Warm	33	7.3	3	100
Large Cold	18	4	1	100
Large Warm	18	4	1	100
TOTAL	452		34	

Summary statistics were calculated from the probabilistic monitoring results (N=34) to address regional attainment status for northwest Lower Peninsula streams. The probabilistic monitoring results can be extrapolated to the entire region. The average Procedure 51 macroinvertebrate score for the northwest Lower Peninsula streams was 2.0, with a 95% confidence level of +/- 1.0.

**5. Gather water quality data needed for FY 2010 TMDL development or delisting.**

Kid’s Creek is listed as Category 5 and scheduled for biota TMDL development in 2010. A Category 5 Water Body is a water body where available data indicate that a designated use is not being supported or is threatened, and a TMDL is needed to reduce the load of the pollutant causing the impairment (LeSage and Smith, 2008). The listing is a result of the historic poor macroinvertebrate community documented downstream of US-31/M-37. In 2008, Kid’s Creek was monitored at two locations to confirm the delineation of the impaired reach. Both sites had ‘acceptable’ macroinvertebrate communities; however, the entire stretch of Kid’s Creek downstream of US-31/M-37 continues to be impacted by urban development.

## 6. Satisfy monitoring requests submitted by external and internal customers.

Monitoring requests were submitted by watershed groups and a local conservation district office. Tannery Creek was evaluated because of concern about development impacts on the stream. Previous tribal monitoring showed a poor macroinvertebrate community and high water temperatures. We conducted macroinvertebrate and fish community assessment at Country Club Road (Station 4) and downstream of US-31 behind Glen's supermarket (Station 5). The macroinvertebrate community at Station 4 was acceptable, but was poor at Station 5 (Table 3). It was not clear if the physical alterations in Tannery Creek downstream of US-31 are the cause of the 'poor' macroinvertebrate community or if there are water quality problems in the stream. A large number of trout were collected at both stations. A temperature logger deployed at Station 4 showed that water temperatures in Tannery Creek averaged 60° F and ranged between 52° and 66° F from mid July to mid September. There were no suitable places to put a logger at Station 5, but the presence of trout indicates that water temperatures may be within an acceptable range for coldwater fish.

The Boyne River at Park Street, in Boyne City, was evaluated because of reported concern about a possible loss in macroinvertebrate diversity observed during volunteer stream monitoring activities, possibly due to stream-side construction (Station 12). Our macroinvertebrate survey showed an excellent macroinvertebrate community (Table 3). The community was diverse and was comprised of many taxa intolerant to environmental stress, including nine different mayfly families.

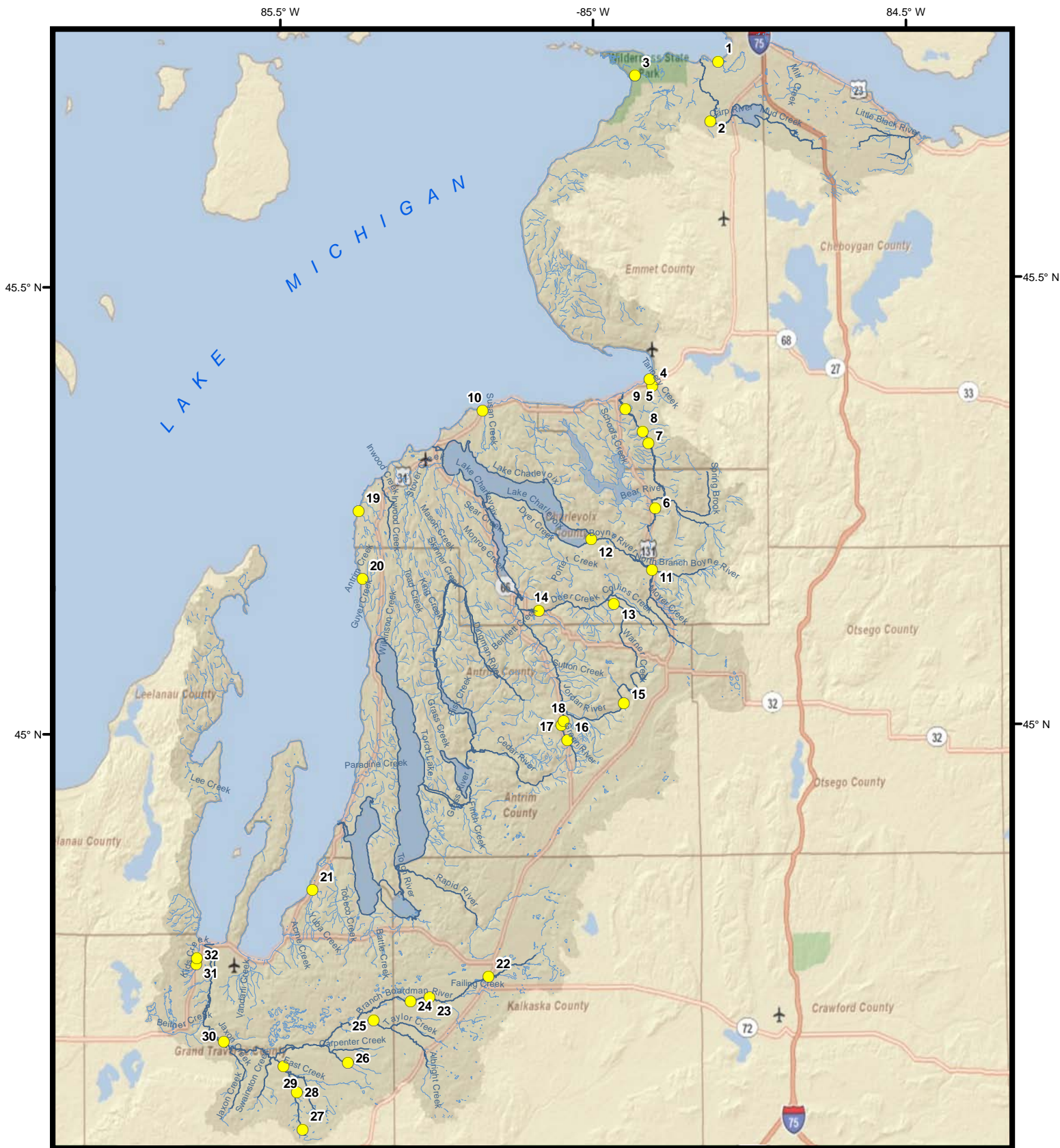
The North Branch of the Boardman River at US-131, in Kalkaska, was selected as part of the random site selection process, but there was also a request for monitoring in the area due to concern about a previous poor macroinvertebrate rating (reported, according to the request, in the mid 1990s). The potential impacts on the North Branch of the Boardman include sediment from upstream development in the village of Kalkaska, stormwater runoff from the village of Kalkaska, stormwater overflow from the US-131 retention basin, and temperature impacts from the upstream impoundment. We sampled upstream of US-131 and found that there was a large amount of soft moving sand, which limited the amount of available habitat for macroinvertebrates to colonize. However, other available instream habitat was suitable to support a macroinvertebrate community, which rated excellent, possibly indicating that the local Best Management Practices have helped improve instream conditions for macroinvertebrates. The water temperature in the stream was recorded at 68° F during the survey, which is at the upper edge of the temperature WQS for coldwater streams.

Field Work By: Sarah Holden, Aquatic Biologist  
Tamara Lipsey, Aquatic Biologist  
Jeffrey Cooper, Aquatic Biologist  
Matthew Wesener, Aquatic Biologist  
Sarah LeSage, Aquatic Biologist  
Surface Water Assessment Section  
Water Bureau

Report By: Sarah Holden, Aquatic Biologist  
Surface Water Assessment Section  
Water Bureau

## Literature Cited

- Creal, W., S. Hanshue, S. Kosek, M. Oemke, and M. Walterhouse. 1996. Update of GLEAS Procedure 51 Metric Scoring and Interpretation. MDEQ Staff Report No. MI/DEQ/SWQ-96/068. Revised May 1998.
- Edly, K. 2005. A Biological Survey of the Bear River Watershed and Selected Emmet County Streams in Charlevoix and Emmet Counties, Michigan, August 2003. MDEQ, Water Bureau. Report No. MI/DEQ/WB-05/060
- LeSage, S.W. and J. Smith. 2008. Water Quality and Pollution Control in Michigan, 2008, Sections 303(d), 305(b), and 314 Integrated Report. MDEQ Report No. MI/DEQ/WB-08/007. Michigan Department of Environmental Quality, Water Bureau, Lansing, Michigan.
- MDEQ. 1990. SWAS Procedure 51 - Qualitative Biological and Habitat Survey Protocols for Wadeable Streams and Rivers, April 24, 1990. Revised June 1991, August 1996, January 1997, May 2002, and December 2008.
- MDEQ. 2006 draft. Water Bureau, Surface Water Assessment Section, Procedure. Biological Trend Monitoring Procedure for Wadeable Streams.
- MDNR, 1975. Natural River Plan - Boardman River. Michigan Department of Natural Resources.
- Omernik, J. and A. Gallant. 1988. Ecoregions of the Upper Midwest States. USEPA, Environmental Research Laboratory. EPA/600/3-88/037.
- Walker, B. 1994. A Biological Survey of Bear River in Emmet and Charlevoix Counties, Michigan, July 26-27, 1993. MDEQ, Water Bureau. Report No. MI/DNR/SWQ-94/046



- Site Locations
- Valley Segment (VSEG)
- River/Stream
- HUC 04060105

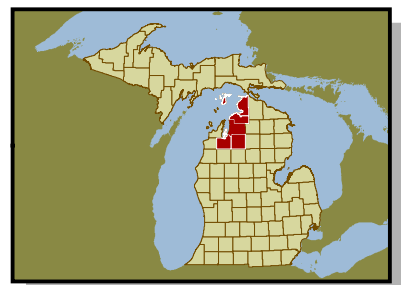
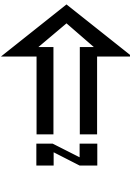
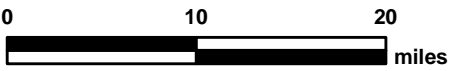


Figure 1: Site Locations in Northwest Lower Peninsula Lake Michigan Tributaries, Antrim, Charlevoix, Emmet, Grand Traverse, and Kalkaska Counties, 2008.

Table 1. Monitoring locations in the Northwest Lower Peninsula, 2008.

Station #	R/T	VSeg	Stream		Waterbody	Location	County	Lat.	Long.	TRS	Macro	Hab
			Type	Storet								
1	R	NWLP-01	COA	240195	French Farm Creek	C81 (Wilderness Park Dr)	Emmet	45.74620	-84.80106	39N04WS28	0	E
2	R	3450	CS	240194	Carp Lake River	d/s Munger Rd	Emmet	45.68006	-84.81477	38N04WS20	3	E
3	R	NWLP-02	COA	240192	Big Sucker Creek	Sturgeon Bay Trl	Emmet	45.73200	-84.93400	39N05WS33	4	E
4	T			240072	Tannery Creek	Country Club Road	Emmet	45.38431	-84.91333	35N05WS34	4	E
5	T			240196	Tannery Creek	d/s US31 behind Glens Supermarket	Emmet	45.39202	-84.91730	35N05WS33	-5	M
6	R	3449	CS	150233	Hay Marsh Creek	Holms Rd	Charlevoix	45.24781	-84.91115	33N05WS22	-3	G
7	R	3445	CM	240197	Bear River	Evergreen Trail	Emmet	45.32075	-84.92083	34N05WS21	-5	G
8	R	3445	CM	240193	Bear River	Click Rd	Emmet	45.33400	-84.92900	34N05WS21	2	G
9	T			240141	Bear River	Howard Street	Emmet	45.35924	-84.95628	34N05W07	-2	G
10	R	NWLP-07	COA	150009	Susan Creek	US 31	Charlevoix	45.35900	-85.18300	34N07WS08	2	E
11	R	3151	CS	150234	S B Boyne River	two-track off US 131	Charlevoix	45.17885	-84.91757	32N05WS09	4	E
12	T			150100	Boyne River	Park Street	Charlevoix	45.21444	-85.01308	33N06W35	6	G
13	R	3162	CS	150232	Warner Creek	Korthase Rd	Charlevoix	45.14178	-84.97839	32N05WS30	4	G
14	R	3159	CM	150231	Deer Creek	Carson Rd	Charlevoix	45.13494	-85.09720	32N06W30	5	E
15	R	3157	CS	050269	Jordan River	off S Jordan River Rd	Antrim	45.03051	-84.96491	30N05WS06	3	E
16	R	3158	CS	050209	Green River	Green River Rd	Antrim	44.98957	-85.05477	30N06WS20	4	G
17	R	3158	CS	050267	Green River	M-66 (South)	Antrim	45.00670	-85.06360	30N06WS08	2	E
18	R	3158	CS	050266	Green River	Penny Bridge Rd	Antrim	45.01100	-85.06000	30N06WS09	3	E
19	R	NWLP-10	COA	150235	Whiskey Creek	two-trk S of Fishermans Island St Prk	Charlevoix	45.24815	-85.38086	33N09WS23	-4	G
20	R	NWLP-11	COA	050270	Antrim Creek	Old Dixie Hwy	Antrim	45.17242	-85.37546	32N09WS14	2	G
21	R	NWLP-16	COA	280404	Yuba Creek	US 31	Grand Traverse	44.82500	-85.45800	28N10WS13	1	G
22	R/T	3129	CM	400007	N B Boardman River	US 131	Kalkaska	44.72631	-85.18232	27N07WS20	5	G
23	R	3129	CM	400140	N B Boardman River	two-track off US 131 (NW of Crofton)	Kalkaska	44.70409	-85.27530	27N08WS27	4	E
24	R	3129	CM	400139	N B Boardman River	Boardman River Rd	Kalkaska	44.69925	-85.30546	27N08WS32	7	E
25	R	3132	CS	280405	S B Boardman River	two-track off South Branch Rd	Grand Traverse	44.67890	-85.36300	26N09WS02	3	E
26	R	3134	CS	280407	Twentytwo Creek	two-track off Mayfield Rd	Grand Traverse	44.63157	-85.40434	26N09WS21	6	E
27	R	3138	CS	280406	Jackson Creek	d/s Wood Rd	Grand Traverse	44.55710	-85.47581	25N10WS14	3	G
28	R	3138	CS	280309	Jackson Creek	Marsh Rd	Grand Traverse	44.59858	-85.48434	25N10WS02	6	G
29	R	3136	CS	280318	East Creek	Mayfield Rd	Grand Traverse	44.62764	-85.50488	26N10WS27	4	E
30	R	3124	CL	280409	Boardman River	private road across from Sleights Rd	Grand Traverse	44.65576	-85.59860	26N11W14	2	G
31	T			280314	Kids Creek	M37/M31	Grand Traverse	44.74259	-85.64102	27N11W16	0	G
32	T			280408	Kids Creek	u/s Silver Lake Road	Grand Traverse	44.74979	-85.64016	27N11W09	-4	G

Macro = Procedure 51 Macroinvertebrate community score (Poor = -9 to -5; Acceptable = -4 to 4; Excellent = 4 to 9). Hab = Procedure 51 Habitat rating  
R = Random; T = Target

Table 2. Habitat evaluation for Northwest Lower Peninsula streams, 2008.

	French Farm Creek C81 RIFFLE/RUN STATION 1	Carp Lake River d/s Munger Road RIFFLE/RUN STATION 2	Big Sucker Creek Sturgeon Bay Trail GLIDE/POOL STATION 3	Tannery Creek Country Club Road RIFFLE/RUN STATION 4	Tannery Creek d/s US 31, behind Glens RIFFLE/RUN STATION 5
<b>HABITAT METRIC</b>					
<b>Substrate and Instream Cover</b>					
Epifaunal Substrate/ Avail Cover (20)	11	16	12	18	12
Embeddedness (20)*	15	16		14	11
Velocity/Depth Regime (20)*	15	12		17	16
Pool Substrate Characterization (20)**			13		
Pool Variability (20)**			8		
<b>Channel Morphology</b>					
Sediment Deposition (20)	15	16	11	18	13
Flow Status - Maint. Flow Volume (10)	9	4	10	9	8
Flow Status - Flashiness (10)	10	9	10	6	3
Channel Alteration (20)	19	20	20	20	5
Frequency of Riffles/Bends (20)*	14	7		20	15
Channel Sinuosity (20)**			15		
<b>Riparian and Bank Structure</b>					
Bank Stability (L) (10)	10	10	10	8	2
Bank Stability (R) (10)	10	10	10	8	2
Vegetative Protection (L) (10)	10	10	10	8	6
Vegetative Protection (R) (10)	10	10	10	8	6
Riparian Veg. Zone Width (L) (10)	10	10	10	3	2
Riparian Veg. Zone Width (R) (10)	10	10	10	3	3
<b>TOTAL SCORE (200):</b>	<b>168</b>	<b>160</b>	<b>159</b>	<b>160</b>	<b>104</b>
<b>HABITAT RATING:</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>
<p>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).</p>					
Date:	8/18/2008	8/18/2008	7/14/2008	7/24/2008	7/24/2008
Weather:	Sunny	Sunny	Cloudy	Sunny	Sunny
Air Temperature:	75 Deg. F.	78 Deg. F.	62 Deg. F.	75 Deg. F.	68 Deg. F.
Water Temperature:	70 Deg. F.	70 Deg. F.	63 Deg. F.	60 Deg. F.	65 Deg. F.
Ave. Stream Width:	5 Feet	25 Feet	12 Feet	7 Feet	10 Feet
Ave. Stream Depth:	0.3 Feet	0.8 Feet	0.83 Feet	0.3 Feet	0.7 Feet
Surface Velocity:	0.8 Ft./Sec.	0.05 Ft./Sec.	0.5 Ft./Sec.	1.1 Ft./Sec.	1 Ft./Sec.
Estimated Flow:	1.2 CFS	1 CFS	4.98 CFS	2.31 CFS	7 CFS
Stream Modifications:	None	None	None	None	Bank Stabilization
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	240195	240194	240192	240072	240196
Stream Name:	French Farm Creek	Carp Lake River	Big Sucker Creek	Tannery Creek	Tannery Creek
Road Crossing/Location:	C81	d/s Munger Road	Sturgeon Bay Trail	Country Club Road	d/s US 31, behind Glens
County Code:	24	24	24	24	24
TRS:	39N04W28	38N04W20	39N05W33	35N05W34	35N05W33
Latitude (dd):	45.7462	45.68006	45.732	45.38431	45.39202
Longitude (dd):	-84.80106	-84.81477	-84.934	-84.91377	-84.9173
Ecoregion:	NLAF	NLAF	NLAF	NCHF	NCHF
Stream Type:	Warmwater	Coldwater	Warmwater	Coldwater	Coldwater
USGS Basin Code:	4060105	4060105	4060105	4060105	4060105

\* Applies only to Riffle/Run stream Surveys

\*\* Applies only to Glide/Pool stream Surveys

Table 2. Habitat evaluation for Northwest Lower Peninsula streams, 2008.

	Hay Marsh Creek Holms Road GLIDE/POOL STATION 6	Bear River Evergreen Road GLIDE/POOL STATION 7	Bear River Click Road GLIDE/POOL STATION 8	Bear River Howard Street GLIDE/POOL STATION 9	Susan Creek US-31 RIFFLE/RUN STATION 10
<b>HABITAT METRIC</b>					
<b>Substrate and Instream Cover</b>					
Epifaunal Substrate/ Avail Cover (20)	4	3	10	6	18
Embeddedness (20)*					14
Velocity/Depth Regime (20)*					10
Pool Substrate Characterization (20)**	6	6	8	7	
Pool Variability (20)**	5	10	14	8	
<b>Channel Morphology</b>					
Sediment Deposition (20)	3	3	10	6	15
Flow Status - Maint. Flow Volume (10)	10	10	10	10	3
Flow Status - Flashiness (10)	10	10	10	10	10
Channel Alteration (20)	18	13	20	16	20
Frequency of Riffles/Bends (20)*					15
Channel Sinuosity (20)**	18	10	10	10	
<b>Riparian and Bank Structure</b>					
Bank Stability (L) (10)	10	10	10	10	10
Bank Stability (R) (10)	10	10	10	10	10
Vegetative Protection (L) (10)	10	9	10	6	10
Vegetative Protection (R) (10)	10	9	10	6	10
Riparian Veg. Zone Width (L) (10)	10	10	10	6	10
Riparian Veg. Zone Width (R) (10)	10	10	6	4	10
<b>TOTAL SCORE (200):</b>	<b>134</b>	<b>123</b>	<b>148</b>	<b>115</b>	<b>165</b>
<b>HABITAT RATING:</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>
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:	8/18/2008	7/24/2008	7/14/2008	7/24/2008	8/20/2008
Weather:	Cloudy	Sunny	Sunny	Sunny	Sunny
Air Temperature:	78 Deg. F.	80 Deg. F.	74 Deg. F.	80 Deg. F.	60 Deg. F.
Water Temperature:	72 Deg. F.	70 Deg. F.	70 Deg. F.	70 Deg. F.	60 Deg. F.
Ave. Stream Width:	10 Feet	40 Feet	30 Feet	30 Feet	4 Feet
Ave. Stream Depth:	2 Feet	2 Feet	3 Feet	2.5 Feet	0.2 Feet
Surface Velocity:	0.05 Ft./Sec.	0.5 Ft./Sec.	0.3 Ft./Sec.	0.8 Ft./Sec.	0.5 Ft./Sec.
Estimated Flow:	1 CFS	40 CFS	27 CFS	60 CFS	0.4 CFS
Stream Modifications:	Impounded	Impounded	None	None	None
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	150233	240197	240193	240141	150009
Stream Name:	Hay Marsh Creek	Bear River	Bear River	Bear River	Susan Creek
Road Crossing/Location:	Holms Road	Evergreen Road	Click Road	Howard Street	US-31
County Code:	15	24	24	24	15
TRS:	33N05W22	34N05W21	34N05W21	34N05W08	34N07W08
Latitude (dd):	45.24781	45.32075	45.334	45.35883	45.35889
Longitude (dd):	-84.91146	-84.92083	-84.929	-84.9564	-85.18285
Ecoregion:	NCHF	NCHF	NCHF	NCHF	NCHF
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4060105	4060105	4060105	4060105	4060105

\* Applies only to Riffle/Run stream Surveys

\*\* Applies only to Glide/Pool stream Surveys



Table 2. Habitat evaluation for Northwest Lower Peninsula streams, 2008.

	SB Boyne River Two Track Off US 131 RIFFLE/RUN STATION 11	Boyne River Park Street RIFFLE/RUN STATION 12	Warner Creek Korthase Road GLIDE/POOL STATION 13	Deer Creek Carson Road RIFFLE/RUN STATION 14	Jordan River Off S Jordan River Road GLIDE/POOL STATION 15
<b>HABITAT METRIC</b>					
<b>Substrate and Instream Cover</b>					
Epifaunal Substrate/ Avail Cover (20)	12	12	10	19	11
Embeddedness (20)*	8	15		16	
Velocity/Depth Regime (20)*	16	14		18	
Pool Substrate Characterization (20)**			8		16
Pool Variability (20)**			8		10
<b>Channel Morphology</b>					
Sediment Deposition (20)	3	18	3	16	8
Flow Status - Maint. Flow Volume (10)	10	9	10	10	10
Flow Status - Flashiness (10)	10	8	10	10	10
Channel Alteration (20)	20	10	20	20	20
Frequency of Riffles/Bends (20)*	18	13		18	
Channel Sinuosity (20)**			13		16
<b>Riparian and Bank Structure</b>					
Bank Stability (L) (10)	10	7	10	10	10
Bank Stability (R) (10)	10	8	10	10	10
Vegetative Protection (L) (10)	10	4	10	10	10
Vegetative Protection (R) (10)	10	4	10	10	10
Riparian Veg. Zone Width (L) (10)	10	0	10	10	10
Riparian Veg. Zone Width (R) (10)	10	0	10	10	10
<b>TOTAL SCORE (200):</b>	<b>157</b>	<b>122</b>	<b>142</b>	<b>187</b>	<b>161</b>
<b>HABITAT RATING:</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>

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:	7/25/2008	7/25/2008	8/19/2008	8/19/2008	8/19/2008
Weather:	Sunny	Partly Cloudy	Sunny	Sunny	Sunny
Air Temperature:	68 Deg. F.	65 Deg. F.	60 Deg. F.	70 Deg. F.	73 Deg. F.
Water Temperature:	60 Deg. F.	65 Deg. F.	58 Deg. F.	58 Deg. F.	59 Deg. F.
Ave. Stream Width:	25 Feet	30 Feet	18 Feet	22 Feet	25 Feet
Ave. Stream Depth:	1.5 Feet	2 Feet	1 Feet	1.2 Feet	1.5 Feet
Surface Velocity:	1.5 Ft./Sec.	1.3 Ft./Sec.	1 Ft./Sec.	1.2 Ft./Sec.	2.5 Ft./Sec.
Estimated Flow:	56.25 CFS	78 CFS	18 CFS	31.68 CFS	93.75 CFS
Stream Modifications:	None redged, Bank Stabilization		None	None	None
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	150234	150100	150232	150231	50269
Stream Name:	SB Boyne River	Boyne River	Warner Creek	Deer Creek	Jordan River
Road Crossing/Location:	Two Track Off US 131	Park Street	Korthase Road	Carson Road	Off S Jordan River Road
County Code:	15	15	15	15	05
TRS:	32N05W09	33N06W35	32N05W30	32N06W30	30N05W06
Latitude (dd):	45.17885	45.21444	45.14178	45.13494	45.03051
Longitude (dd):	-84.91757	-85.01308	-84.97839	-85.0972	-84.96491
Ecoregion:	NCHF	NCHF	NCHF	NCHF	NCHF
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4060105	4060105	4060105	4060105	4060105

\* Applies only to Riffle/Run stream Surveys

\*\* Applies only to Glide/Pool stream Surveys

Table 2. Habitat evaluation for Northwest Lower Peninsula streams, 2008.

	Green River Green River Road GLIDE/POOL STATION 16	Green River M-66 GLIDE/POOL STATION 17	Green River Penny Bridge Rd RIFFLE/RUN STATION 18	Whiskey Creek 2 Track N of Norwood RIFFLE/RUN STATION 19	Antrim Creek d/s Old Dixie Hwy RIFFLE/RUN STATION 20
<b>HABITAT METRIC</b>					
<b>Substrate and Instream Cover</b>					
Epifaunal Substrate/ Avail Cover (20)	10	15	19	13	18
Embeddedness (20)*			20	13	14
Velocity/Depth Regime (20)*			15	13	14
Pool Substrate Characterization (20)**	11	18			
Pool Variability (20)**	10	15			
<b>Channel Morphology</b>					
Sediment Deposition (20)	5	15	19	10	13
Flow Status - Maint. Flow Volume (10)	10	10	10	6	7
Flow Status - Flashiness (10)	10	10	10	2	2
Channel Alteration (20)	20	20	20	20	20
Frequency of Riffles/Bends (20) <sup>‡</sup>			20	20	20
Channel Sinuosity (20)**	18	15			
<b>Riparian and Bank Structure</b>					
Bank Stability (L) (10)	10	10	10	3	3
Bank Stability (R) (10)	10	10	10	3	3
Vegetative Protection (L) (10)	10	10	10	10	9
Vegetative Protection (R) (10)	10	10	10	10	9
Riparian Veg. Zone Width (L) (10)	10	10	10	10	10
Riparian Veg. Zone Width (R) (10)	10	10	10	10	10
<b>TOTAL SCORE (200):</b>	<b>154</b>	<b>178</b>	<b>193</b>	<b>143</b>	<b>152</b>

<b>HABITAT RATING:</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>
------------------------	---	--	--	---	---

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:	8/19/2008	7/15/2008	7/15/2008	7/23/2008	7/23/2008
Weather:	Sunny	Partly Cloudy	Cloudy	Sunny	Sunny
Air Temperature:	73 Deg. F.	68 Deg. F.	65 Deg. F.	70 Deg. F.	72 Deg. F.
Water Temperature:	57 Deg. F.	53 Deg. F.	53 Deg. F.	64 Deg. F.	65 Deg. F.
Ave. Stream Width:	35 Feet	20 Feet	20 Feet	3 Feet	4 Feet
Ave. Stream Depth:	1 Feet	1 Feet	0.67 Feet	0.2 Feet	0.2 Feet
Surface Velocity:	1.2 Ft./Sec.	1 Ft./Sec.	1.5 Ft./Sec.	0.7 Ft./Sec.	1.2 Ft./Sec.
Estimated Flow:	42 CFS	20 CFS	20.1 CFS	0.42 CFS	0.96 CFS
Stream Modifications:	None	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	50209	50267	50266	150235	50270
Stream Name:	Green River	Green River	Green River	Whiskey Creek	Antrim Creek
Road Crossing/Location:	Green River Rd	M-66	Penny Bridge Rd	2 Track N of Norwood	d/s Old Dixie Hwy
County Code:	05	05	05	15	05
TRS:	30N06W20	30N06W08	30N06W09	33N09W23	32N09W14
Latitude (dd):	44.98942	45.0067	45.011	45.24815	45.17242
Longitude (dd):	-85.05502	-85.0636	-85.06	-85.38086	-85.37546
Ecoregion:	NCHF	NCHF	NCHF	NCHF	NCHF
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4060105	4060105	4060105	4060105	4060105

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

COMMENTS: M66 North Crossing In the Nature Center.

Table 2. Habitat evaluation for Northwest Lower Peninsula streams, 2008.

	Yuba Creek	NB Boardman River	NB Boardman River	NB Boardman River	SB Boardman River
	US 131	US 131	Off of 2 Track off 131	Boardman River Road	Powerline off South
	RIFFLE/RUN	RIFFLE/RUN	RIFFLE/RUN	RIFFLE/RUN	GLIDE/POOL
	STATION 21	STATION 22	STATION 23	STATION 24	STATION 25
<b>HABITAT METRIC</b>					
<b>Substrate and Instream Cover</b>					
Epifaunal Substrate/ Avail Cover (20)	15	10	17	18	17
Embeddedness (20)*	18	9	14	16	
Velocity/Depth Regime (20)*	15	15	18	16	
Pool Substrate Characterization (20)**					19
Pool Variability (20)**					12
<b>Channel Morphology</b>					
Sediment Deposition (20)	9	6	13	17	15
Flow Status - Maint. Flow Volume (10)	8	10	10	10	10
Flow Status - Flashiness (10)	5	10	10	10	10
Channel Alteration (20)	13	18	20	20	20
Frequency of Riffles/Bends (20)*	11	10	16	19	
Channel Sinuosity (20)**					10
<b>Riparian and Bank Structure</b>					
Bank Stability (L) (10)	4	10	10	8	10
Bank Stability (R) (10)	6	10	8	10	10
Vegetative Protection (L) (10)	8	10	10	9	10
Vegetative Protection (R) (10)	10	10	10	7	10
Riparian Veg. Zone Width (L) (10)	3	9	8	8	10
Riparian Veg. Zone Width (R) (10)	10	9	10	6	10
<b>TOTAL SCORE (200):</b>	<b>135</b>	<b>146</b>	<b>174</b>	<b>174</b>	<b>173</b>
<b>HABITAT RATING:</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>
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:	7/15/2008	7/21/2008	7/21/2008	7/21/2008	7/15/2008
Weather:	Sunny	Cloudy	Sunny	Sunny	Sunny
Air Temperature:	74 Deg. F.	70 Deg. F.	72 Deg. F.	72 Deg. F.	74 Deg. F.
Water Temperature:	66 Deg. F.	68 Deg. F.	65 Deg. F.	64 Deg. F.	63 Deg. F.
Ave. Stream Width:	15 Feet	6 Feet	18 Feet	25 Feet	35 Feet
Ave. Stream Depth:	0.67 Feet	2.5 Feet	2 Feet	2 Feet	1.5 Feet
Surface Velocity:	0.66 Ft./Sec.	1 Ft./Sec.	1.3 Ft./Sec.	1.7 Ft./Sec.	1.2 Ft./Sec.
Estimated Flow:	6.633 CFS	15 CFS	46.8 CFS	85 CFS	63 CFS
Stream Modifications:	Bank Stabilization	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	280404	400007	400140	400139	280405
Stream Name:	Yuba Creek	NB Boardman River	NB Boardman River	NB Boardman River	SB Boardman River
Road Crossing/Location:	US 131	US 131	Off of 2 Track off 131	Boardman River Road	Powerline off South
County Code:	28	40	40	40	28
TRS:	28N10W13	27N07W20	27N08W27	27N08W32	26N09W02
Latitude (dd):	44.825	44.72631	44.70409	44.69925	44.6789
Longitude (dd):	-85.458	-85.18232	-85.27303	-85.30546	-85.363
Ecoregion:	NCHF	NCHF	NCHF	NCHF	NCHF
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4060105	4060105	4060105	4060105	4060105

\* Applies only to Riffle/Run stream Survey;

\*\* Applies only to Glide/Pool stream Survey;

Table 2. Habitat evaluation for the Northwest Lower Peninsula streams, 2008.

	Twenty Two Creek	Jackson Creek	Jackson Creek	East Creek	Boardman River
	2 Track Off Mayfield Rd GLIDE/POOL STATION 26	D/S Wood Road GLIDE/POOL STATION 27	Marsh Road RIFFLE/RUN STATION 28	Mayfield Road RIFFLE/RUN STATION 29	Private Road across from Sleights Road RIFFLE/RUN STATION 30
<b>HABITAT METRIC</b>					
<b>Substrate and Instream Cover</b>					
Epifaunal Substrate/ Avail Cover (20)	10	8	6	12	15
Embeddedness (20)*			10	11	11
Velocity/Depth Regime (20)*			10	18	15
Pool Substrate Characterization (20)**	10	8			
Pool Variability (20)**	10	5			
<b>Channel Morphology</b>					
Sediment Deposition (20)	5	16	13	10	13
Flow Status - Maint. Flow Volume (10)	10	9	10	10	10
Flow Status - Flashiness (10)	10	10	9	10	10
Channel Alteration (20)	20	20	13	20	20
Frequency of Riffles/Bends (20)*			11	17	20
Channel Sinuosity (20)**	20	15			
<b>Riparian and Bank Structure</b>					
Bank Stability (L) (10)	10	9	10	10	8
Bank Stability (R) (10)	10	9	10	10	9
Vegetative Protection (L) (10)	10	10	2	10	5
Vegetative Protection (R) (10)	10	10	2	10	6
Riparian Veg. Zone Width (L) (10)	10	10	0	10	3
Riparian Veg. Zone Width (R) (10)	10	9	0	10	4
<b>TOTAL SCORE (200):</b>	<b>155</b>	<b>148</b>	<b>106</b>	<b>168</b>	<b>149</b>
<b>HABITAT RATING:</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>
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:	8/20/2008	7/15/2008	8/20/2008	7/22/2008	7/22/2008
Weather:	Sunny	Partly Cloudy	Sunny	Partly Cloudy	Partly Cloudy
Air Temperature:	75 Deg. F.	65 Deg. F.	78 Deg. F.	60 Deg. F.	68 Deg. F.
Water Temperature:	56 Deg. F.	60 Deg. F.	62 Deg. F.	60 Deg. F.	62 Deg. F.
Ave. Stream Width:	9 Feet	1 Feet	8 Feet	12 Feet	50 Feet
Ave. Stream Depth:	0.5 Feet	0.17 Feet	0.8 Feet	1.5 Feet	2.5 Feet
Surface Velocity:	1 Ft./Sec.	0.25 Ft./Sec.	1 Ft./Sec.	1.5 Ft./Sec.	2.5 Ft./Sec.
Estimated Flow:	4.5 CFS	0.0425 CFS	6.4 CFS	27 CFS	312.5 CFS
Stream Modifications:	None	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	280407	280406	280309	280318	280409
Stream Name:	Twenty Two Creek	Jackson Creek	Jackson Creek	East Creek	Boardman River
Road Crossing/Location:	2 Track Off Mayfield Rd	D/S Wood Rd	Marsh Road	Mayfield Road	Private Road across from Sleights Road
County Code:	28	28	28	28	28
TRS:	26N09W21	25N10W14	25N10W02	26N10W27	26N11W14
Latitude (dd):	44.63157	44.5571	44.59858	44.62764	44.65576
Longitude (dd):	-85.40434	-85.47581	-85.48434	-85.50488	-85.5986
Ecoregion:	NCHF	NCHF	NCHF	NCHF	NCHF
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4060105	4060105	4060105	4060105	4060105

\* Applies only to Riffle/Run stream Surveys

\*\* Applies only to Glide/Pool stream Surveys

Table 2. Habitat evaluation for Northwest Lower Peninsula streams, 2008.

	Kids Creek US31/M37 RIFFLE/RUN STATION 31	Kids Creek Upstream Silver Lake Road GLIDE/POOL STATION 32
<b>HABITAT METRIC</b>		
<b>Substrate and Instream Cover</b>		
Epifaunal Substrate/ Avail Cover (20)	10	5
Embeddedness (20)*	8	
Velocity/Depth Regime (20)*	13	
Pool Substrate Characterization (20)**		6
Pool Variability (20)**		10
<b>Channel Morphology</b>		
Sediment Deposition (20)	7	6
Flow Status - Maint. Flow Volume (10)	9	10
Flow Status - Flashiness (10)	9	9
Channel Alteration (20)	13	18
Frequency of Riffles/Bends (20)*	16	
Channel Sinuosity (20)**		11
<b>Riparian and Bank Structure</b>		
Bank Stability (L) (10)	7	9
Bank Stability (R) (10)	7	9
Vegetative Protection (L) (10)	6	6
Vegetative Protection (R) (10)	6	6
Riparian Veg. Zone Width (L) (10)	2	6
Riparian Veg. Zone Width (R) (10)	4	6
<b>TOTAL SCORE (200):</b>	<b>117</b>	<b>117</b>

HABITAT RATING:	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:	7/23/2008	7/22/2008
Weather:	Sunny	Rainy
Air Temperature:	64 Deg. F.	63 Deg. F.
Water Temperature:	66 Deg. F.	68 Deg. F.
Ave. Stream Width:	5 Feet	6 Feet
Ave. Stream Depth:	0.5 Feet	1.5 Feet
Surface Velocity:	1.5 Ft./Sec.	0.8 Ft./Sec.
Estimated Flow:	3.75 CFS	7.2 CFS
Stream Modifications:	Canopy Removal	Canopy Removal
Nuisance Plants (Y/N):	N	N
Report Number:		
STORET No.:	280314	280408
Stream Name:	Kids Creek	Kids Creek
Road Crossing/Location:	US31/M37	Upstream Silver Lake Road
County Code:	28	28
TRS:	27N11W16	27N11W09
Latitude (dd):	44.742587	44.74979
Longitude (dd):	-85.6410018	-85.64016
Ecoregion:	NCHF	NCHF
Stream Type:	Coldwater	Coldwater
USGS Basin Code:	4060105	4060105

\* Applies only to Riffle/Run stream Surveys

\*\* Applies only to Glide/Pool stream Surveys

Table 3A. Qualitative macroinvertebrate sampling results for Northwest Lower Peninsula streams, 2008.

TAXA	French Farm Creek C81 8/18/2008 STATION 1	Carp Lake River D/S Munger Road 8/18/2008 STATION 2	Big Sucker Creek Sturgeon Bay Trail 7/14/2008 STATION 3
PORIFERA (sponges)		1	
ANNELIDA (segmented worms)			
Hirudinea (leeches)	2		
Oligochaeta (worms)	9	11	16
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	6	90	32
Decapoda (crayfish)	1	1	4
Isopoda (sowbugs)	138	1	
Arachnoidea			
Hydracarina			3
Insecta			
Ephemeroptera (mayflies)			
Baetiscidae		1	
Baetidae	8	9	8
Caenidae	49	4	13
Ephemerellidae			1
Ephemeridae		4	
Heptageniidae	1	25	
Leptophlebiidae	10		1
Tricorythidae		1	
Odonata			
Anisoptera (dragonflies)			
Aeshnidae	1	1	13
Cordulegastridae	1	1	2
Gomphidae		1	5
Zygoptera (damselflies)			
Calopterygidae	3	20	14
Coenagrionidae	1		
Plecoptera (stoneflies)			
Chloroperlidae			2
Perlidae		10	2
Hemiptera (true bugs)			
Gerridae	1	1	1
Veliidae			3
Megaloptera			
Corydalidae (dobson flies)	1	1	1
Trichoptera (caddisflies)			
Brachycentridae			13
Glossosomatidae		2	
Helicopsychidae		1	
Hydropsychidae	10	22	4
Hydroptilidae	1		2
Lepidostomatidae			3
Leptoceridae		3	2
Limnephilidae		5	5
Molannidae		3	
Philopotamidae		1	
Phryganeidae	3	1	
Polycentropodidae			13
Uenoidae		3	
Coleoptera (beetles)			
Haliphidae (adults)	1		
Hydrophilidae (total)	1		1
Elmidae	5	12	12
Diptera (flies)			
Ceratopogonidae	1	2	1
Chironomidae	71	31	48
Dixidae	1		
Simuliidae	25	6	5
Tabanidae		3	
Tipulidae	1	1	
MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)		2	2
Hydrobiidae			3
Lymnaeidae			1
Physidae	12	5	3
Planorbidae	26		3
Pleuroceridae	1	13	
Pelecypoda (bivalves)			
Sphaeriidae (clams)	3	13	9
TOTAL INDIVIDUALS	394	312	251

Table 3B. Macroinvertebrate metric evaluation of Northwest Lower Peninsula streams, 2008.

METRIC	French Farm Creek C81 8/18/2008 STATION 1		Carp Lake River D/S Munger Road 8/18/2008 STATION 2		Big Sucker Creek Sturgeon Bay Trail 7/14/2008 STATION 3	
	Value	Score	Value	Score	Value	Score
	TOTAL NUMBER OF TAXA	30	1	37	1	35
NUMBER OF MAYFLY TAXA	4	1	6	1	4	0
NUMBER OF CADDISFLY TAXA	3	0	9	1	7	1
NUMBER OF STONEFLY TAXA	0	-1	1	0	2	1
PERCENT MAYFLY COMP.	17.26	0	14.10	0	9.16	0
PERCENT CADDISFLY COMP.	3.55	0	13.14	0	16.73	0
PERCENT DOMINANT TAXON	35.03	-1	28.85	-1	19.12	0
PERCENT ISOPOD, SNAIL, LEECH	45.43	-1	6.73	0	4.78	0
PERCENT SURF. AIR BREATHERS	0.76	1	0.32	1	1.99	1
TOTAL SCORE		0		3		4
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.

Table 3A. Qualitative macroinvertebrate sampling results for Northwest Lower Peninsula streams, 2008.

TAXA	Tannery Creek Country Club Rd 7/24/2008 STATION 4	Tannery Creek D/S US 31, behind Glens 7/24/2008 STATION 5	Hay Marsh Creek Holms Road 8/18/2008 STATION 6	Bear River Evergreen Road 7/24/2008 STATION 7
<b>ANNELIDA (segmented worms)</b>				
Oligochaeta (worms)	9	23	9	4
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)	59	85	27	17
Decapoda (crayfish)		3		1
Isopoda (sowbugs)			127	34
<b>Arachnoidea</b>				
Hydracarina	6	2	1	1
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetidae	34	12	1	6
Caenidae				1
Heptageniidae			1	
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae	1			1
Cordulegastridae	1			
Gomphidae				2
Libellulidae			1	
<b>Zygoptera (damselflies)</b>				
Calopterygidae	1		2	1
Coenagrionidae			22	
<b>Plecoptera (stoneflies)</b>				
Nemouridae	1			
<b>Hemiptera (true bugs)</b>				
<b>Belostomatidae</b>				
Corixidae				117
Gerridae	1	4	1	2
Nepidae				1
Pleidae			1	
<b>Megaloptera</b>				
Corydalidae (dobson flies)	2	2		
Sialidae (alder flies)			1	7
<b>Trichoptera (caddisflies)</b>				
<b>Brachycentridae</b>				
Hydropsychidae	23	12		1
Hydroptilidae	2			
Lepidostomatidae	4			
Leptoceridae			2	4
Limnephilidae				3
Philopotamidae	11			
Phryganeidae			6	
Polycentropodidae			2	
Uenoidae	1			
<b>Coleoptera (beetles)</b>				
<b>Halplidae (adults)</b>				
Dryopidae	1	1		2
Elmidae	5	6	1	2
<b>Diptera (flies)</b>				
Ceratopogonidae	5	1	1	3
Chironomidae	53	35	28	28
Dixidae			1	2
Simuliidae	36	71		2
Tabanidae			1	
Tipulidae		2		
<b>MOLLUSCA</b>				
<b>Gastropoda (snails)</b>				
Ancylidae (limpets)			17	
Hydrobiidae			20	6
Physidae	1	4	2	3
Planorbidae			3	1
Pleuroceridae		1		
<b>Pelecypoda (bivalves)</b>				
Sphaeriidae (clams)	2		19	2
<b>TOTAL INDIVIDUALS</b>	<b>259</b>	<b>264</b>	<b>297</b>	<b>256</b>



Table 3B. Macroinvertebrate metric evaluation of Northwest Lower Peninsula streams, 2008.

METRIC	Tannery Creek Country Club Rd 7/24/2008 STATION 4		Tannery Creek D/S US31, behind Glens 7/24/2008 STATION 5		Hay Marsh Creek Holms Road 8/18/2008 STATION 6		Bear River Evergreen Road 7/24/2008 STATION 7	
	Value	Score	Value	Score	Value	Score	Value	Score
	TOTAL NUMBER OF TAXA	22	1	16	0	25	1	29
NUMBER OF MAYFLY TAXA	1	0	1	-1	2	0	2	0
NUMBER OF CADDISFLY TAXA	5	1	1	-1	3	0	4	0
NUMBER OF STONEFLY TAXA	1	0	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	13.13	0	4.55	-1	0.67	-1	2.73	-1
PERCENT CADDISFLY COMP.	15.83	-1	4.55	-1	3.37	-1	3.52	-1
PERCENT DOMINANT TAXON	22.78	1	32.20	0	42.76	-1	45.70	-1
PERCENT ISOPOD, SNAIL, LEECH	0.39	1	1.89	0	56.90	-1	17.19	-1
PERCENT SURF. AIR BREATHERS	0.39	1	1.52	0	0.67	1	48.05	-1
TOTAL SCORE		4		-5		-3		-5
MACROINV. COMMUNITY RATING		ACCEPT.		POOR		ACCEPT.		POOR

Table 3A. Qualitative macroinvertebrate sampling results for Northwest Lower Peninsula streams, 2008.

TAXA	Bear River Click Road 7/14/2008 STATION 8	Bear River Howard Street 7/24/2008 STATION 9	Susan Creek US-31 8/20/2008 STATION 10	S Branch Boyne River Two Track Off US 131 7/25/2008 STATION 11
<b>ANNELIDA (segmented worms)</b>				
Hirudinea (leeches)	1			
Oligochaeta (worms)	2	7	14	10
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)	44	75		
Decapoda (crayfish)		10	1	
Isopoda (sowbugs)	1	7	23	
<b>Arachnoidea</b>				
Hydracarina			2	1
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetiscidae	2			1
Baetidae	2	30	1	4
Caenidae	3			
Ephemerellidae	1		1	5
Heptageniidae	10	15	34	
Isonychiidae				1
Leptophlebiidae			16	
Tricorythidae				4
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae	4	2	8	1
Cordulegastridae			1	
Gomphidae	1	3		1
<b>Zygoptera (damselflies)</b>				
Calopterygidae	2	2	7	8
<b>Plecoptera (stoneflies)</b>				
<b>Nemouridae</b>				
Perlidae		3	13	
Pteronarcyidae				1
<b>Hemiptera (true bugs)</b>				
Corixidae		15		
Gerridae	1	3	1	1
<b>Megaloptera</b>				
Corydalidae (dobson flies)	1		5	5
<b>Trichoptera (caddisflies)</b>				
Brachycentridae	23	2		33
Glossosomatidae			1	1
Helicopsychidae	1			
Hydropsychidae	4	9	23	8
Hydroptilidae				2
Lepidostomatidae				1
Leptoceridae	19	6		10
Limnephilidae	3	8	2	1
Molannidae			2	
Philopotamidae				9
Phryganeidae				1
Polycentropodidae	3	1		4
<b>Coleoptera (beetles)</b>				
Dytiscidae (total)			1	
Hydrophilidae (total)			2	
Dryopidae			1	1
Elmidae	29	2	29	1
<b>Diptera (flies)</b>				
Ceratopogonidae			2	
Chironomidae	18	16	56	70
Dixidae		1		
Psychodidae			1	
Simuliidae		6		53
Tabanidae	1	2		
Tipulidae			2	
<b>MOLLUSCA</b>				
<b>Gastropoda (snails)</b>				
Ancylidae (limpets)	8			
Hydrobiidae	7			3
Physidae	7	11		1
Planorbidae	2			
Pleuroceridae	23			
Viviparidae	2			
<b>Pelecypoda (bivalves)</b>				
Pisidiidae	2			
Sphaeriidae (clams)	17		2	1
Unionidae (mussels)	1			
<b>TOTAL INDIVIDUALS</b>	<b>245</b>	<b>236</b>	<b>251</b>	<b>245</b>

Table 3B. Macroinvertebrate metric evaluation of Northwest Lower Peninsula streams, 2008.

METRIC	Bear River Click Road 7/14/2008 STATION 8		Bear River Howard Street 7/24/2008 STATION 9		Susan Creek US-31 8/20/2008 STATION 10		S Branch Boyne River Two Track Off US 131 7/25/2008 STATION 11	
	Value	Score	Value	Score	Value	Score	Value	Score
	TOTAL NUMBER OF TAXA	32	1	23	1	27	1	31
NUMBER OF MAYFLY TAXA	5	1	2	0	4	1	5	1
NUMBER OF CADDISFLY TAXA	6	1	5	0	4	1	10	1
NUMBER OF STONEFLY TAXA	0	-1	1	0	1	0	2	1
PERCENT MAYFLY COMP.	7.35	-1	19.07	0	20.72	0	6.12	-1
PERCENT CADDISFLY COMP.	21.63	0	11.02	-1	11.16	-1	28.57	0
PERCENT DOMINANT TAXON	17.96	1	31.78	0	22.31	1	28.57	0
PERCENT ISOPOD, SNAIL, LEECH	20.82	-1	7.63	-1	9.16	-1	1.63	0
PERCENT SURF. AIR BREATHERS	0.41	1	7.63	-1	1.59	0	0.41	1
TOTAL SCORE		2		-2		2		4
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 3A. Qualitative macroinvertebrate sampling results for Northwest Lower Peninsula streams, 2008.

TAXA	Boyer River Park Street 7/25/2008 STATION 12	Warner Creek Korthase Road 8/19/2008 STATION 13	Deer Creek Carson Road 8/19/2008 STATION 14	Jordan River Off South Jordan River Rd 8/19/2008 STATION 15
<b>PLATYHELMINTHES (flatworms)</b>				
Turbellaria				1
<b>ANNELIDA (segmented worms)</b>				
Hirudinea (leeches)			1	
Oligochaeta (worms)	39	6	29	7
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)	21	5	8	1
Decapoda (crayfish)	5		1	
Isopoda (sowbugs)	1	4		
<b>Arachnoidea</b>				
Hydracarina	5		2	
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetiscidae	1		1	1
Baetidae	23	25	42	23
Caenidae	1	1	1	
Ephemerellidae	5	1		3
Ephemeridae	1	1		
Heptageniidae	10	6	8	10
Isonychiidae	21		4	1
Leptophlebiidae	1	3		3
Tricorythidae	4	1	35	16
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae	1	1	1	
Cordulegastridae		4	1	2
Gomphidae		1		
<b>Zygoptera (damselflies)</b>				
Calopterygidae	2	3	10	2
Coenagrionidae			1	
<b>Plecoptera (stoneflies)</b>				
Leuctridae		2		
Nemouridae		5		
Perlidae		7	10	2
Perlodidae				1
Pteronarcyidae	3	1	1	4
<b>Hemiptera (true bugs)</b>				
Corixidae	1	1	1	1
Gerridae		1	1	1
Mesoveliidae		1		2
<b>Megaloptera</b>				
Corydalidae (dobson flies)		1	1	4
Sialidae (alder flies)		4		2
<b>Trichoptera (caddisflies)</b>				
Brachycentridae		8	8	2
Glossosomatidae			2	2
Helicopsychidae	1		12	
Hydropsychidae	14	15	71	16
Hydroptilidae		5		
Lepidostomatidae	1	1	2	1
Leptoceridae	9		1	7
Limnephilidae	1	6	9	6
Molannidae			1	3
Philopotamidae		30	1	2
Phryganeidae			1	
Polycentropodidae		9		1
Rhyacophilidae				4
Uenoidea	1	2	8	
<b>Coleoptera (beetles)</b>				
Gyrinidae (adults)				1
Hydrophilidae (total)		1	1	1
Dryopidae			2	
Elmidae	9	1	24	10
<b>Diptera (flies)</b>				
Athericidae			4	7
Ceratopogonidae		1		3
Chironomidae	25	56	17	75
Dixidae		1		1
Ptychopteridae		1		12
Simuliidae	5	29	20	34
Tabanidae				2
Tipulidae		1		1
<b>MOLLUSCA</b>				
<b>Gastropoda (snails)</b>				
Ancylidae (limpets)		3	3	
Hydrobiidae	1	5		
Physidae		4	20	2
<b>Pelecypoda (bivalves)</b>				
Sphaeriidae (clams)		13		19
<b>TOTAL INDIVIDUALS</b>	<b>212</b>	<b>277</b>	<b>366</b>	<b>299</b>

Table 3B. Macroinvertebrate metric evaluation of Northwest Lower Peninsula streams, 2008.

METRIC	Boyne River Park Street 7/25/2008 STATION 12		Warner Creek Korthase Road 8/19/2008 STATION 13		Deer Creek Carson Road 8/19/2008 STATION 14		Jordan River Off South Jordan River Rd 8/19/2008 STATION 15	
	Value	Score	Value	Score	Value	Score	Value	Score
	TOTAL NUMBER OF TAXA	28	1	43	1	39	1	43
NUMBER OF MAYFLY TAXA	9	1	7	1	6	1	7	1
NUMBER OF CADDISFLY TAXA	6	1	8	1	11	1	10	1
NUMBER OF STONEFLY TAXA	1	0	4	1	2	1	3	1
PERCENT MAYFLY COMP.	31.60	1	13.72	0	24.86	0	19.06	0
PERCENT CADDISFLY COMP.	12.74	-1	27.44	0	31.69	0	14.72	-1
PERCENT DOMINANT TAXON	18.40	1	20.22	1	19.40	1	25.08	0
PERCENT ISOPOD, SNAIL, LEECH	0.94	1	5.78	-1	6.56	-1	0.67	1
PERCENT SURF. AIR BREATHERS	0.47	1	1.81	0	0.82	1	6.02	-1
TOTAL SCORE		6		4		5		3
MACROINV. COMMUNITY RATING		EXCELLENT		ACCEPT.		EXCELLENT		ACCEPT.

Table 3A. Qualitative macroinvertebrate sampling results for Northwest Lower Peninsula streams, 2008.

TAXA	Green River Green River Road 8/19/2008 STATION 16	Green River M-66 7/15/2008 STATION 17	Green River Penny Bridge Rd 7/15/2008 STATION 18	Whiskey Creek 2 Track N of Norwood 7/23/2008 STATION 19
<b>ANNELIDA (segmented worms)</b>				
Hirudinea (leeches)			1	
Oligochaeta (worms)	5	27	29	4
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)	27	33	18	57
Decapoda (crayfish)			1	
Isopoda (sowbugs)		1	6	3
<b>Arachnoidea</b>				
Hydracarina	3	4		2
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetiscidae	1			
Baetidae	20	38	3	
Caenidae	1			
Ephemerellidae	2	15	68	
Ephemeridae	3			
Heptageniidae	4		18	
Isonychiidae	1			
Leptophlebiidae	2			
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae				1
Cordulegastridae				2
Libellulidae				8
<b>Plecoptera (stoneflies)</b>				
Leuctridae	1			
Nemouridae		6	10	
Pteronarcyidae	2	1	1	
<b>Hemiptera (true bugs)</b>				
Gerridae	1			4
<b>Megaloptera</b>				
<b>Corydalidae (dobson flies)</b>				
Sialidae (alder flies)	1			
<b>Trichoptera (caddisflies)</b>				
Brachycentridae		1	3	1
Glossosomatidae	4	6	40	5
Hydropsychidae	3	5		6
Hydroptilidae		6		
Lepidostomatidae		16	2	11
Leptoceridae				1
Limnephilidae	6	1	1	
Molannidae	1			
Philopotamidae	10	5	22	
Phryganeidae	1			
Polycentropodidae				1
Rhyacophilidae	1	3	10	
Uenoidae				1
<b>Coleoptera (beetles)</b>				
Dytiscidae (total)		1	1	5
Hydrophilidae (total)	1		1	2
Dryopidae				3
Elmidae	6	26	31	1
<b>Diptera (flies)</b>				
Ceratopogonidae	4			
Chironomidae	154	71	9	57
Simuliidae	8	12		2
Tabanidae	1			3
Tipulidae	1	2		16
<b>MOLLUSCA</b>				
<b>Gastropoda (snails)</b>				
Planorbidae				2
<b>Pelecypoda (bivalves)</b>				
Sphaeriidae (clams)	10	6		1
<b>TOTAL INDIVIDUALS</b>	<b>286</b>	<b>287</b>	<b>275</b>	<b>199</b>

Table 3B. Macroinvertebrate metric evaluation of Northwest Lower Peninsula streams, 2008.

METRIC	Green River Green River Road 8/19/2008 STATION 16		Green River M-66 7/15/2008 STATION 17		Green River Penny Bridge Rd 7/15/2008 STATION 18		Whiskey Creek 2 Track N of Norwood 7/23/2008 STATION 19	
	Value	Score	Value	Score	Value	Score	Value	Score
	TOTAL NUMBER OF TAXA	31	1	23	0	20	0	25
NUMBER OF MAYFLY TAXA	8	1	2	-1	3	0	0	-1
NUMBER OF CADDISFLY TAXA	7	1	8	1	6	1	7	1
NUMBER OF STONEFLY TAXA	2	1	2	1	2	1	0	-1
PERCENT MAYFLY COMP.	11.89	0	18.47	0	32.36	1	0.00	-1
PERCENT CADDISFLY COMP.	9.09	-1	14.98	-1	28.36	0	13.07	-1
PERCENT DOMINANT TAXON	53.85	-1	24.74	0	24.73	0	28.64	0
PERCENT ISOPOD, SNAIL, LEECH	0.00	1	0.35	1	2.55	-1	2.51	-1
PERCENT SURF. AIR BREATHERS	0.70	1	0.35	1	0.73	1	5.53	-1
TOTAL SCORE		4		2		3		-4
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 3A. Qualitative macroinvertebrate sampling results for Northwest Lower Peninsula streams, 2008.

TAXA	Antrim Creek D/S Old Dixie Highway 7/23/2008 STATION 20	Yuba Creek US 131 7/15/2008 STATION 21	NB Boardman River US 131 7/21/2008 STATION 22	NB Boardman River Off of 2 Track off 131 7/21/2008 STATION 23
ANNELIDA (segmented worms)				
Oligochaeta (worms)	5	45	8	14
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	15	58	5	1
Decapoda (crayfish)	1	20	1	1
Arachnoidea				
Hydracarina	4			
Insecta				
Ephemeroptera (mayflies)				
Baetidae	33	5	19	8
Caenidae			1	
Ephemerellidae			10	32
Ephemeridae			31	2
Heptageniidae	1	12	4	1
Isonychiidae				1
Tricorythidae			7	26
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	1	1	8	3
Zygoptera (damselflies)				
Calopterygidae		12	1	
Coenagrionidae			1	
Plecoptera (stoneflies)				
Nemouridae	2		1	
Perlidae		1	9	1
Hemiptera (true bugs)				
Corixidae				1
Gerridae	4	1		
Megaloptera				
Corydalidae (dobson flies)		5		3
Trichoptera (caddisflies)				
Brachycentridae			7	28
Glossosomatidae		23		
Helicopsychidae				1
Hydropsychidae	44	9	28	15
Hydroptilidae	1			1
Lepidostomatidae				1
Leptoceridae			9	1
Limnephilidae	1	2	4	
Philopotamidae	11	1	1	5
Polycentropodidae		1	5	1
Uenoidae		1		1
Coleoptera (beetles)				
Dytiscidae (total)	1			
Dryopidae	1			
Elmidae		28	10	22
Diptera (flies)				
Athericidae		2		14
Ceratopogonidae			5	
Chironomidae	73	18	45	90
Dixidae			2	
Simuliidae	41	12	9	33
Tabanidae				6
Tipulidae	6	2	1	4
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)		1	1	1
Lymnaeidae				1
Physidae	1		2	
Planorbidae			2	
Pelecypoda (bivalves)				
Sphaeriidae (clams)			9	1
TOTAL INDIVIDUALS	246	260	246	320



Table 3B. Macroinvertebrate metric evaluation of Northwest Lower Peninsula streams, 2008.

METRIC	Antrim Creek D/S Old Dixie Highway in Nature Center 7/23/2008 STATION 20		Yuba Creek US 131 7/15/2008 STATION 21		NB Boardman River US 131 7/21/2008 STATION 22		NB Boardman River Off of 2 Track off 131 7/21/2008 STATION 23	
	Value	Score	Value	Score	Value	Score	Value	Score
	TOTAL NUMBER OF TAXA	19	1	22	0	30	1	31
NUMBER OF MAYFLY TAXA	2	1	2	-1	6	1	6	1
NUMBER OF CADDISFLY TAXA	4	0	6	1	6	1	9	1
NUMBER OF STONEFLY TAXA	1	0	1	0	2	1	1	0
PERCENT MAYFLY COMP.	13.82	0	6.54	-1	29.27	0	21.88	0
PERCENT CADDISFLY COMP.	23.17	0	14.23	-1	21.95	0	16.88	-1
PERCENT DOMINANT TAXON	29.67	0	22.31	1	18.29	1	28.13	0
PERCENT ISOPOD, SNAIL, LEECH	0.41	1	0.38	1	2.03	-1	0.63	1
PERCENT SURF. AIR BREATHERS	2.03	-1	0.38	1	0.00	1	0.31	1
TOTAL SCORE		2		1		5		4
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		EXCELLENT		ACCEPT.

Table 3A. Qualitative macroinvertebrate sampling results for Northwest Lower Peninsula streams, 2008.

TAXA	North Branch Boardman	South Branch Boardman	Twenty Two Creek	Jackson Creek
	Boardman River Road 7/21/2008 STATION 24	Powerline off South Branch Road 7/15/2008 STATION 25	Two Track Off Mayfield Road 8/20/2008 STATION 26	Downstream Wood Road 7/15/2008 STATION 27
PLATYHELMINTHES (flatworms)				
Turbellaria	1			
ANNELIDA (segmented worms)				
Hirudinea (leeches)		1		
Oligochaeta (worms)	8	13	9	2
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	7	1		42
Isopoda (sowbugs)	1		1	
Arachnoidea				
Hydracarina	4	1	1	6
Insecta				
Ephemeroptera (mayflies)				
Baetidae	13	7	29	4
Caenidae		2		
Ephemerellidae	39	47	3	
Ephemeridae		1	6	30
Heptageniidae	4	1	4	
Leptophlebiidae			4	1
Tricorythidae	27	5	56	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	5		1	1
Cordulegastridae			4	1
Gomphidae	1			
Zygoptera (damselflies)				
Calopterygidae			3	
Plecoptera (stoneflies)				
Chloroperlidae				1
Leuctridae	2		5	
Nemouridae			29	4
Perlidae			3	
Pteronarcyidae	1	1		
Hemiptera (true bugs)				
Gerridae			2	8
Megaloptera				
Corydalidae (dobson flies)	2	1	1	
Sialidae (alder flies)		1		
Trichoptera (caddisflies)				
Brachycentridae	23	15	5	3
Glossosomatidae			6	
Helicopsychidae	2			
Hydropsychidae	20		10	8
Hydroptilidae	4	18		
Lepidostomatidae	7	2	4	37
Leptoceridae	1		1	5
Limnephilidae	1	3	7	11
Molannidae		1	2	1
Philopotamidae	14		44	1
Phryganeidae			1	
Polycentropodidae	1		3	
Uenoidae	1	1		
Coleoptera (beetles)				
Dytiscidae (total)				1
Gyrinidae (adults)			1	
Halplidae (adults)	1			
Hydrophilidae (total)			1	4
Elmidae	11	7	3	
Diptera (flies)				
Athericidae	5	21		2
Ceratopogonidae		1	3	1
Chironomidae		73	29	46
Dixidae	1			
Empididae		6		1
Ptychopteridae			5	
Simuliidae	12	3	32	21
Stratiomyidae		1		
Tabanidae	4		3	
Tipulidae	1	3	2	3
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	1			
Physidae		3		3
Planorbidae				3
Pelecypoda (bivalves)				
Sphaeriidae (clams)	5	20	11	
TOTAL INDIVIDUALS	230	260	334	251

Table 3B. Macroinvertebrate metric evaluation of Northwest Lower Peninsula streams, 2008.

METRIC	North Branch Boardman		South Branch Boardman		Twenty Two Creek		Jackson Creek	
	Boardman River Road		Powerline off South Branch		Two Track Off Mayfield		Downstream Wood Road	
	7/21/2008		7/15/2008		8/20/2008		7/15/2008	
	STATION 24	STATION 25	STATION 26	STATION 27	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	33	1	29	1	37	1	28	1
NUMBER OF MAYFLY TAXA	4	0	6	1	6	1	3	1
NUMBER OF CADDISFLY TAXA	10	1	6	1	10	1	7	1
NUMBER OF STONEFLY TAXA	2	1	1	0	3	1	2	1
PERCENT MAYFLY COMP.	36.09	1	24.23	0	30.54	1	13.94	0
PERCENT CADDISFLY COMP.	32.17	0	15.38	-1	24.85	0	26.29	0
PERCENT DOMINANT TAXON	16.96	1	28.08	0	16.77	1	18.33	1
PERCENT ISOPOD, SNAIL, LEECH	0.87	1	1.54	0	0.30	1	2.39	-1
PERCENT SURF. AIR BREATHERS	0.43	1	0.38	1	2.69	-1	5.18	-1
TOTAL SCORE	7		3		6		3	
MACROINV. COMMUNITY RATING	EXCELLENT		ACCEPT.		EXCELLENT		ACCEPT.	

Table 3A. Qualitative macroinvertebrate sampling results for Northwest Lower Peninsula streams, 2008.

TAXA	Jackson Creek Marsh Road 8/20/2008 STATION 28	East Creek Mayfield Road 7/22/2008 STATION 29	Boardman River Private Road across from Sleights Road 7/22/2008 STATION 30
PLATYHELMINTHES (flatworms)			
Turbellaria			1
ANNELIDA (segmented worms)			
Hirudinea (leeches)			1
Oligochaeta (worms)	49	6	11
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	10	8	
Decapoda (crayfish)			1
Arachnoidea			
Hydracarina	1	2	6
Insecta			
Ephemeroptera (mayflies)			
Baetidae	47	20	10
Caenidae		1	
Ephemerellidae	1	10	16
Ephemeridae		1	
Heptageniidae	1	9	3
Isonychiidae			1
Leptophlebiidae	1		
Tricorythidae		25	
Odonata			
Anisoptera (dragonflies)			
Aeshnidae		3	1
Cordulegastridae	1		
Gomphidae			1
Zygoptera (damselflies)			
Calopterygidae	1	3	1
Plecoptera (stoneflies)			
Leuctridae		4	1
Nemouridae	2	3	
Perlidae			1
Pteronarcyidae		1	
Hemiptera (true bugs)			
Gerridae	1	1	
Megaloptera			
Corydalidae (dobson flies)	1	1	
Trichoptera (caddisflies)			
Brachycentridae	17	25	59
Glossosomatidae	8		
Helicopsychidae			5
Hydropsychidae	49	3	22
Hydroptilidae		1	1
Lepidostomatidae		4	15
Leptoceridae		3	1
Limnephilidae	2	1	9
Molannidae	2		
Philopotamidae	14	2	
Phryganeidae	1		
Polycentropodidae	3		
Uenoidae		1	
Coleoptera (beetles)			
Dytiscidae (total)		1	
Gyrinidae (adults)		1	
Hydrophilidae (total)	1	2	
Dryopidae		1	
Elmidae	4	5	8
Diptera (flies)			
Athericidae	1	7	1
Chironomidae	69	74	36
Simuliidae	14	44	92
Tabanidae	13	1	
Tipulidae	4	2	
MOLLUSCA			
Gastropoda (snails)			
Physidae	2		3
Planorbidae		1	
Pelecypoda (bivalves)			
Sphaeriidae (clams)	4	1	4
TOTAL INDIVIDUALS	324	278	311

Table 3B. Macroinvertebrate metric evaluation of Northwest Lower Peninsula streams, 2008.

METRIC	Jackson Creek		East Creek		Boardman River	
	Marsh Road		Mayfield Road		Private Road across from	
	8/20/2008		7/22/2008		Sleights Road	
	STATION 28		STATION 29		STATION 30	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	29	1	36	1	27	0
NUMBER OF MAYFLY TAXA	4	1	6	1	4	0
NUMBER OF CADDISFLY TAXA	8	1	8	1	7	1
NUMBER OF STONEFLY TAXA	1	0	3	1	2	1
PERCENT MAYFLY COMP.	15.43	0	23.74	0	9.65	-1
PERCENT CADDISFLY COMP.	29.63	0	14.39	-1	36.01	0
PERCENT DOMINANT TAXON	21.30	1	26.62	0	29.58	0
PERCENT ISOPOD, SNAIL, LEECH	0.62	1	0.36	1	1.29	0
PERCENT SURF. AIR BREATHERS	0.62	1	1.80	0	0.00	1
TOTAL SCORE		6		4		2
MACROINV. COMMUNITY RATING		EXCELLENT		ACCEPT.		ACCEPT.

Table 3A. Qualitative macroinvertebrate sampling results for Northwest Lower Peninsula streams, 2008.

TAXA	Kids Creek US31/M37 7/23/2008 STATION 31		Kids Creek Upstream Silver Lake Road 7/22/2008 STATION 32	
	ANNELIDA (segmented worms)			
Oligochaeta (worms)	49		314	
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	32		2	
Decapoda (crayfish)			1	
Isopoda (sowbugs)	6		12	
Arachnoidea				
Hydracarina	4		3	
Insecta				
Ephemeroptera (mayflies)				
Baetidae	21		23	
Odonata				
Zygoptera (damselflies)				
Calopterygidae			1	
Plecoptera (stoneflies)				
Nemouridae	17			
Hemiptera (true bugs)				
Corixidae			1	
Gerridae	1			
Mesoveliidae			1	
Trichoptera (caddisflies)				
Brachycentridae	8			
Hydropsychidae	13			
Hydroptilidae	2			
Lepidostomatidae	2		1	
Limnephilidae	1			
Coleoptera (beetles)				
Dytiscidae (total)			1	
Dryopidae	5			
Elmidae	6			
Diptera (flies)				
Chironomidae	98		26	
Simuliidae	15		12	
Tabanidae	2			
Tipulidae	4		7	
MOLLUSCA				
Gastropoda (snails)				
Physidae	1		2	
Pleuroceridae			1	
Pelecypoda (bivalves)				
Sphaeriidae (clams)			1	
TOTAL INDIVIDUALS	287		407	

Table 3B. Macroinvertebrate metric evaluation of Northwest Lower Peninsula streams, 2008.

METRIC	Kids Creek US31/M37 7/23/2008 STATION 31		Kids Creek Upstream Silver Lake Road 7/22/2008 STATION 32	
	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	19	1	17	1
NUMBER OF MAYFLY TAXA	1	0	1	0
NUMBER OF CADDISFLY TAXA	5	1	1	-1
NUMBER OF STONEFLY TAXA	1	0	0	-1
PERCENT MAYFLY COMP.	7.32	-1	5.62	-1
PERCENT CADDISFLY COMP.	9.06	-1	0.24	-1
PERCENT DOMINANT TAXON	34.15	0	76.77	-1
PERCENT ISOPOD, SNAIL, LEECH	2.44	-1	3.67	-1
PERCENT SURF. AIR BREATHERS	0.35	1	0.73	1
TOTAL SCORE		0		-4
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.

Table 4. Qualitative fish sampling results for northwest Lower Peninsula streams, 2008.

TAXA	Tannery Creek Country Club Road 7/24/2008 STATION 1	Tannery Creek Downstream US 31, behind Glens 7/24/2008 STATION 2
	Salmonidae (trouts)	
<i>Oncorhynchus mykiss</i> (Rainbow trout)		1
<i>Salvelinus fontinalis</i> (Brook trout)	55	42
<b>TOTAL INDIVIDUALS</b>	<b>55</b>	<b>43</b>
Number of hybrid sunfish	0	0
Number of anomalies	0	0
Percent anomalies	0.000	0.000
Percent salmonids	100.000	100.000
Reach sampled (ft)	120	150
Area sampled (sq ft)	840	1,500
Density (# fish/sq ft)	0.065	0.029
Gear	bps	bps

Table 1B. Fish metric evaluation of Northwest Lower Peninsula streams, 2008.

METRIC	Tannery Creek Country Club Road 7/24/2008 STATION 1		Tannery Creek Downstream US 31, behind Glens 7/24/2008 STATION 2	
	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	1	0	2	0
NO. OF DARTER, SCULPIN, MADTOM TAXA	0	0	0	0
NUMBER OF SUNFISH TAXA	0	0	0	0
NUMBER OF SUCKER TAXA	0	0	0	0
NUMBER OF INTOLERANT TAXA	1	0	2	0
PERCENT TOLERANT	0.00	0	0.00	0
PERCENT OMNIVOROUS TAXA	0.00	0	0.00	0
PERCENT INSECTIVOROUS TAXA	0.00	0	0.00	0
PERCENT PISCIVOROUS TAXA	0.00	0	0.00	0
% SIMPLE LITHOPHILIC SPAWNER TAXA	0.00	0	0.00	0

Comments:  
Sampling Time:  
25 Minutes

Comments:  
Sampling Time:  
30 Minutes