

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER RESOURCES DIVISION
APRIL 2011

STAFF REPORT

BIOLOGICAL SURVEY OF THE BLACK, CHEBOYGAN, OCQUEOC, SWAN, AND
THUNDER BAY RIVERS WATERSHEDS
ALCONA, ALPENA, CHEBOYGAN, EMMET, MONTMORENCY, OSCODA, OTSEGO, AND
PRESQUE ISLE COUNTIES, MICHIGAN
AUGUST 16-20 AND AUGUST 24-26, 2010

As part of the point and nonpoint source (NPS) surveillance activities, staff of the Michigan Department of Environmental Quality (MDEQ), Surface Water Assessment Section (SWAS), conducted biological surveys of the Black, Cheboygan, Ocqueoc, Swan, and Thunder Bay Rivers watersheds located in Alcona, Alpena, Cheboygan, Emmet, Montmorency, Oscoda, Otsego, and Presque Isle Counties on August 16-20 and August 24-26, 2010 (Figures 1-3). Qualitative macroinvertebrate and habitat surveys were conducted throughout the watersheds following the SWAS Procedure 51 (MDEQ, 1990; Creal et al., 1996), the nonwadeable assessment protocol (MDEQ, 2009 [Draft]), and the status and trend procedure (MDEQ, 2011 [In preparation]). Visual observations were performed at all locations (Figures 1-3). Fish community composition was provided by the Michigan Department of Natural Resources (MDNR), Fisheries Division, Gaylord Field Office, Gaylord, Michigan.

OBJECTIVES

The biological surveys were conducted to:

- Support water quality-based effluent limit development for National Pollutant Discharge Elimination System (NPDES) permits.
- Identify NPS of water quality impairment.
- Evaluate the effectiveness of specific NPS water quality improvement projects.
- Assess the current status and condition of individual assessment units and determine whether water quality standards (WQS) are being met.
- Evaluate biological integrity temporal trends.
- Support Area of Concern-related beneficial use delisting decisions.
- Satisfy monitoring requests submitted by internal and external customers.
- Support total maximum daily load development for surface waters of nonattainment and address nonattainment listings described in the 2010 Integrated Report (LeSage and Smith, 2010).

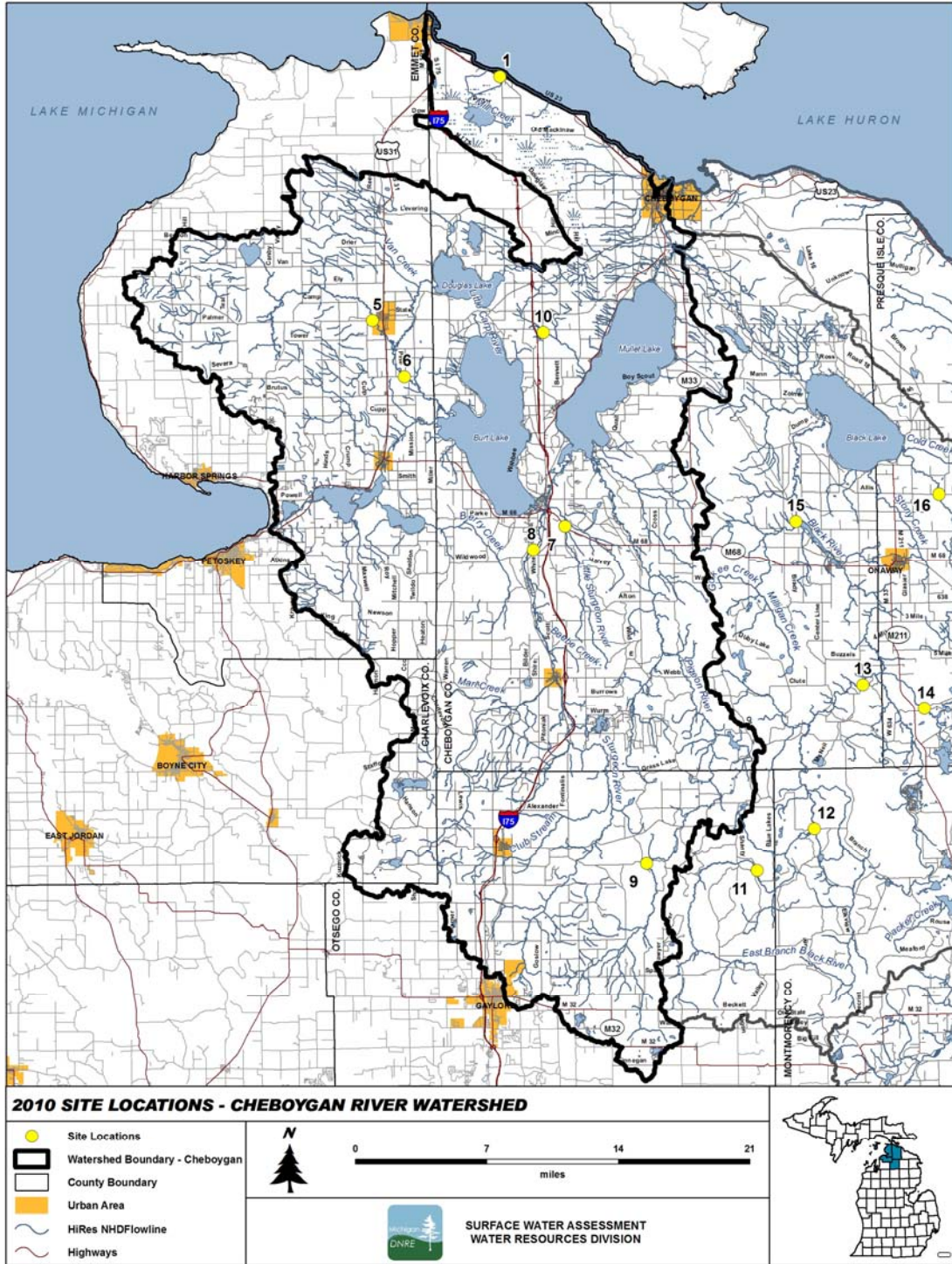


Figure 1. Selected 2010 random and targeted monitoring locations in the Cheboygan River watershed located in Charlevoix, Cheboygan, Emmett, and Otsego Counties, August 2010.

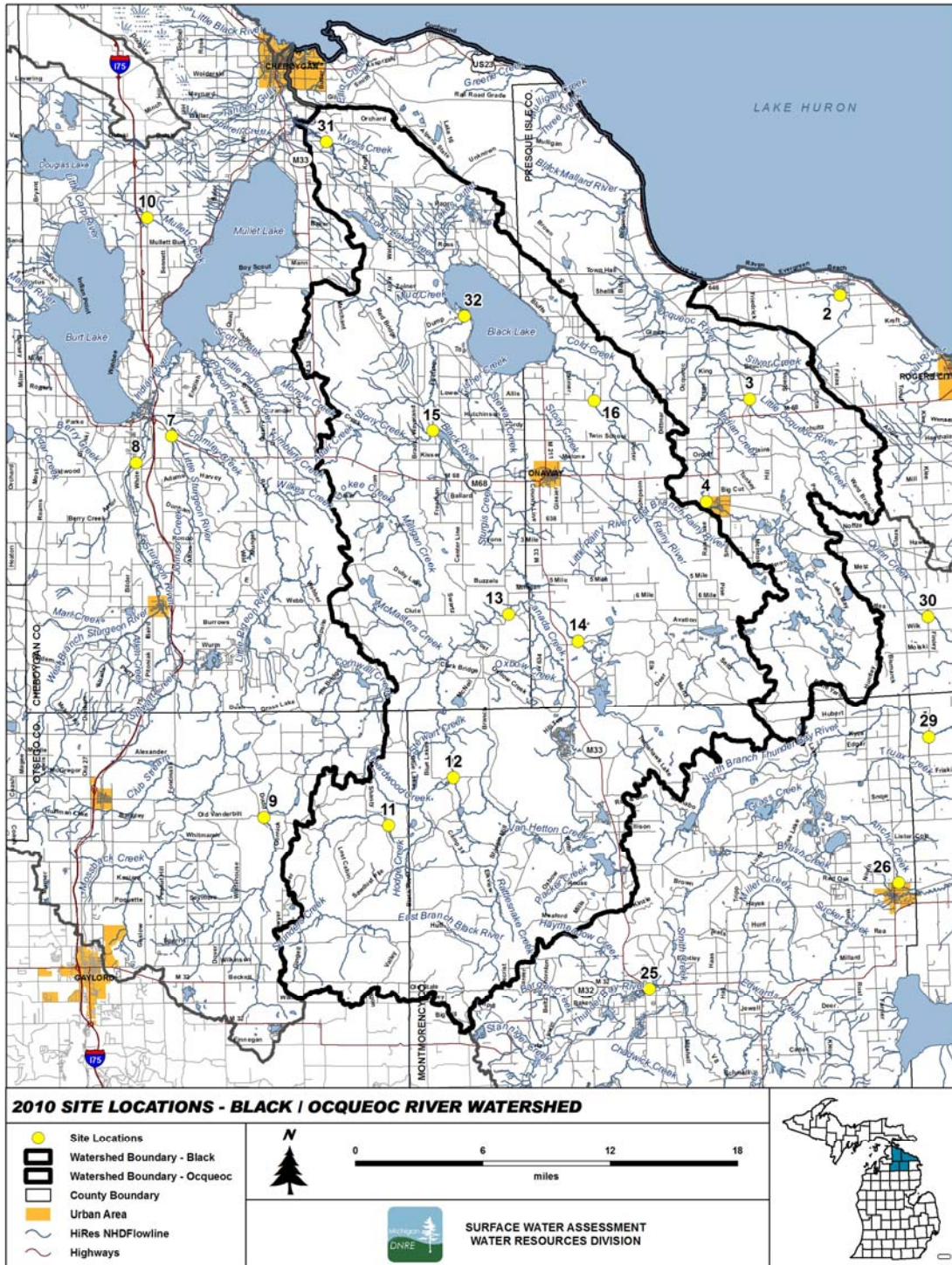


Figure 2. Selected 2010 random and targeted monitoring locations in the Black River watershed located in Cheboygan, Montmorency, Otsego, and Presque Isle Counties, August 2010.

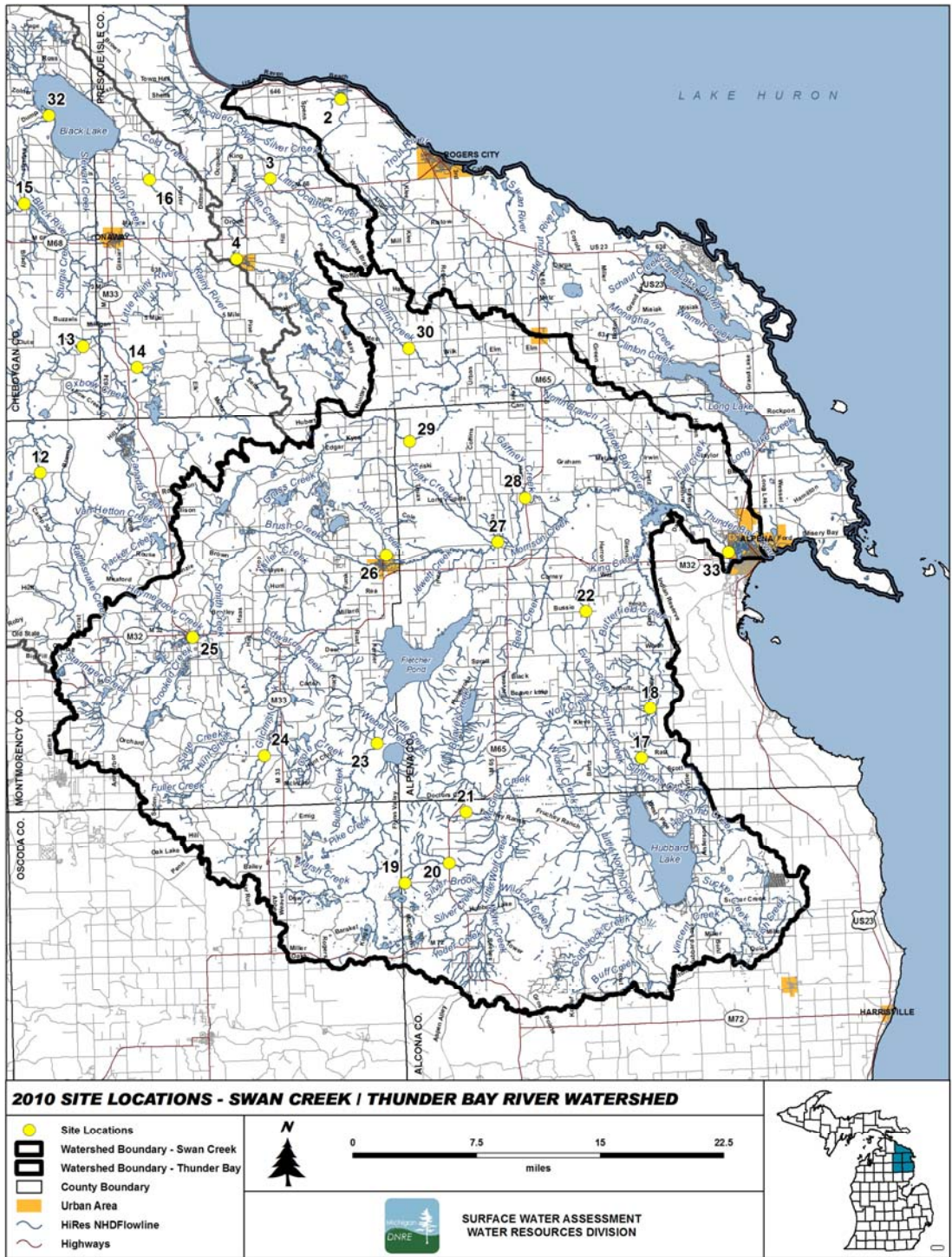


Figure 3. Selected 2010 random and targeted monitoring locations in the Swan River and Thunder Bay River watersheds located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 2010.

BACKGROUND AND HISTORICAL SAMPLING EFFORTS

The Black, Cheboygan, Ocqueoc, Swan, and Thunder Bay Rivers watersheds are all located in the Northern Lakes and Forest ecoregion. These watersheds drain streams that are commonly perennial and originate in lakes or wetlands. The predominant land use consists primarily of forested and agricultural use (Omernik and Gallant, 1988). Over the last 15 years, these watersheds have been surveyed multiple times.

In August 1994, a Procedure 51 biological survey was performed on the Pigeon River and Mullett Creek to assess impacts from land use practices and to collect data prior to best management practices implementation. The fish community rated good at all stations, the macroinvertebrate community rated fair to good, and the habitat quality rated poor to excellent (Morse, 1996a).

In July 1995, biological surveys were conducted on the Little Ocqueoc River, Silver Creek, and an Unnamed Creek as part of point and NPS monitoring activities. Fish communities rated good to excellent, macroinvertebrate communities rated fair to good, and the habitat quality was rated good to excellent. No chemicals were measured at levels above WQS (Morse, 1996b).

In May and August 1995, biological surveys were conducted in the Thunder Bay River watershed. The surveys found that the fish community rated excellent at three sites, the macroinvertebrate community was rated acceptable to excellent at all stations surveyed, and the habitat quality rated poor to excellent. Water chemistry results found no exceedances of WQS with the exception of one site with elevated zinc concentrations (Morse, 1997).

Six years later, in August 2001, the West Branch Sturgeon River was surveyed to collect baseline data prior to road/stream crossing improvements. The macroinvertebrate community was rated acceptable with habitat quality rating excellent. It was found that the impacts from the road/stream crossings may be localized and do not extend long distances (Kohlhepp, 2001).

In August 2000, the upper Sturgeon River watershed was surveyed to document water quality conditions, identify NPS impairments, and determine attainment status of WQS. The macroinvertebrate community rated acceptable to excellent with habitat quality rating good to excellent. No chemicals were measured at levels above WQS (Taft, 2002).

In June through September 2000, biological surveys were performed in the Thunder Bay River watershed. The macroinvertebrate community rated acceptable to excellent. Water chemistry monitoring found that no chemicals were measured at levels above WQS (Taft, 2003).

In August and September 2000, biological, chemical, and physical habitat surveys were performed at 14 sites in the Ocqueoc, Black, and Pigeon Rivers watersheds. The macroinvertebrate community rated acceptable to excellent, the habitat quality rated good to excellent, and no chemicals were measured above WQS (Lipsey, 2004).

In October 2004, a Procedure 51 biological and water chemistry survey was conducted to assess the impacts associated with the proposed Onaway Wastewater Treatment Plant (WWTP) discharge to Bowen Creek, assess the current status and condition of individual water bodies, and determine whether Michigan WQS were being met. The macroinvertebrate community rated acceptable with good habitat quality. No chemicals were measured at levels above WQS (Schmitt, 2005).

In July and September 2006, biological, chemical, and physical habitat surveys were performed in the Ocqueoc, Trout, Little Trout, and Swan Rivers watersheds. The macroinvertebrate community rated acceptable to excellent, the habitat quality rated marginal to excellent. No chemicals were measured at levels above WQS (Schmitt, 2006).

In September 2006, SWAS staff investigated water quality conditions in Newton Creek near the vicinity of the cement kiln dust pile owned by National Gypsum Company near Alpena, Michigan. Water chemistry and aquatic toxicity monitoring indicate WQS exceedances for pH, cadmium, mercury, molybdenum, selenium, thallium, vanadium, and total dissolved solids. Water from Newton Creek was also found to be acutely toxic to *Daphnia magna* and Fathead minnows (Dimond and Schmitt, 2007).

In July 2005, Procedure 51 biological surveys and water chemistry assessments were performed in the Sturgeon River watershed. The macroinvertebrate community rated acceptable to excellent, habitat quality rated good to excellent, and water chemistry data indicated no chemicals measured above WQS (Walker, 2007).

In October 2007, SWAS staff revisited Newton Creek near the vicinity of the cement kiln dust pile owned by National Gypsum Company. Water chemistry monitoring indicated exceedances of pH, total dissolved solids, and mercury (Schmitt, 2008).

In July 2005, Procedure 51 biological surveys and water chemistry assessments were performed in the Pigeon River watershed. The macroinvertebrate community rated excellent with habitat quality rating good to excellent. No chemicals were measured at levels above WQS (Walker, 2008a).

In July 2005, Procedure 51 biological surveys and water chemistry assessments were performed in the Sturgeon River watershed. The macroinvertebrate community rated acceptable to excellent with habitat quality rating good to excellent. No chemicals were measured at levels above WQS (Walker, 2008b).

In June through July 2005, Procedure 51 biological and water chemistry assessments were performed in the Maple River watershed. The macroinvertebrate community rated acceptable to excellent with habitat quality rating good to excellent. No chemicals were measured at levels above WQS. A fish community assessment at Mullett Creek indicated it was meeting the cold water fishery designated use (Walker, 2008c).

In June through July 2005, Procedure 51 biological and water chemistry assessments were performed in the Black River watershed. The macroinvertebrate community rated acceptable to excellent with habitat quality rating marginal to good. No chemicals were measured at levels above WQS. The fish community was found to be meeting its cold water fishery designation on the Upper Black River (Walker, 2008d).

In September 2008, SWAS staff surveyed the impoundment on the Pigeon River owned and operated by the Song of the Morning Ranch to calculate a preliminary estimate of sediment volume held behind the dam and to determine how much sediment could be lost if the dam was removed (Sunday, 2008).

METHODS

Two site selection methods were used to assess the Black, Cheboygan, Ocqueoc, Swan, and

Thunder Bay Rivers watersheds in 2010. These included targeted site selection and random site selection. Targeted site selection includes sites that are selected to fulfill specific monitoring requests, assess known or potential Areas of Concern where more information is needed, achieve assessment coverage of the watershed, and provide information for NPDES activities. A random probabilistic monitoring approach using stratified random site selection was carried out for the remaining river segments throughout the watersheds.

All rivers in Michigan have been delineated into individual classifications called river segments that are based on flow and temperature characteristics as related to available groundwater and local geology/geomorphology. The Black, Cheboygan, Ocqueoc, Swan, and Thunder Bay Rivers watersheds have been divided into two temperature categories (cold and warm) and four size categories (small, medium, large, and very large). These classifications were based on assemblage of valley segment data provided by the MDNR, Fisheries Division (Wehrly et al., 1997 and 1999; Seelbach and Wiley, 1997; and Baker et al., 2001), and one character type for coastal streams, which has been classified by the MDEQ, SWAS, to assist in the attainment status estimates of Michigan's inland streams (Jeff Cooper, MDEQ, personal communication).

The total channel length, within the Black, Cheboygan, Ocqueoc, Swan, and Thunder Bay Rivers watersheds, was determined using the Reach File 3 database to estimate the total stream miles per classification segment. Based on survey work from previous basin years, it was estimated that approximately 31 biological survey stations would represent an achievable work load as the number of stations that would be necessary to adequately assess the entire watershed. Sampling stations were distributed by the percentage of river miles each classification represented by the total stream miles in the basins.

Individual river segments were randomly chosen within each individually classified river segment chosen representing a survey location. The following percentages were determined for the Black, Cheboygan, Ocqueoc, Swan, and Thunder Bay Rivers watersheds. Each percentage is followed by an estimate of the number of sampling locations to proportionately represent the entire watershed.

- a) Coastal - 6.8% = 2 sampling locations
- b) Small Cold - 41.4% = 12 sampling locations
- c) Small Warm - 4.7% = 1 sampling location
- d) Medium Cold - 19.1% = 6 sampling locations
- e) Medium Warm - 13.7% = 4 sampling locations
- f) Large Cold - 0.5% = 1 sampling location
- g) Large Warm - 12.4% = 4 sampling locations
- h) Very Large Warm - 1.4% = 1 sampling location

Alternate sites were selected to allow for contingencies in the field. Targeted sites were identified prior to random site selection. If targeted sites were subsequently chosen in the random draw, they are considered random. Targeted sites that were not selected in the random selection process were surveyed in addition to the 31 random sites; however, the results of these surveys were not considered for the probabilistic analysis. Two sites were selected as targeted sites totaling 33 total sites (Table 1).

SUMMARY

Stations used for the biological and habitat evaluations, as well as visual observations are shown in Figures 1-3 and Table 1. The macroinvertebrate community and habitat assessments

were performed at 33 locations and the results are presented in Tables 2 and 3, respectively. Water chemistry monitoring was not performed during these assessments.

RANDOMLY SELECTED WADEABLE SITES

LAKE HURON COASTAL TRIBUTARIES

The Unnamed Coastal Stream was surveyed off Old Mackinaw Road (Station 1) and was given a habitat assessment quality rating of excellent, with 6 of the 11 habitat assessment parameters rating excellent (embeddedness, channel flow status-maintained flow volume, channel alteration, bank stability, vegetative protection, and riparian vegetative zone width) and the remaining 5 were rated as good. Macroinvertebrate structure for all structures was sparse except for overhanging vegetation, which was absent from the reach. The macroinvertebrate community rated acceptable with 25 taxa identified, including 3 mayfly, 1 stonefly, and 6 caddisfly taxa. These taxa comprised 25% of the total number of individuals counted. However, scuds (Amphipoda) and blackflies (Simuliidae) were the dominant taxa comprising 53% of the individuals counted.

Schmidt Creek upstream of County Road 646 (Station 2) had a habitat quality rating of good with metrics ranging from excellent to poor. The habitat parameters scoring excellent were channel alteration, vegetative protection, and riparian vegetative zone width. Metrics for channel flow status-maintained flow volume, channel flow status-flashiness, and channel sinuosity scored good, with epifaunal substrate/available cover, pool substrate characterization, and bank stability scoring marginal. Two metrics scored poor; pool variability and sediment deposition. Inorganic substrates were comprised of 80% course sand and 20% fine sand with organic substrates present at 60% of the site (30% organic detritus and 30% muck). This reach was devoid of riffles, with stream morphology dominated by runs, pools, and an occasional depositional area. The macroinvertebrate community rated acceptable with 28 total taxa identified. Four mayfly taxa, 3 caddisfly taxa, and 1 taxon of stoneflies were represented making up approximately 37% of the total numbers of individuals collected.

OCQUEOC RIVER WATERSHED

The Little Ocqueoc River upstream of Silver Creek Road (Station 3, Figures 4 and 5) had a habitat assessment rating of good. Metrics that met the excellent rating were embeddedness, channel alteration, frequency of riffles, and riparian vegetative zone width. Six metrics scored



Figure 4. Little Ocqueoc River downstream of Silver Creek Road.

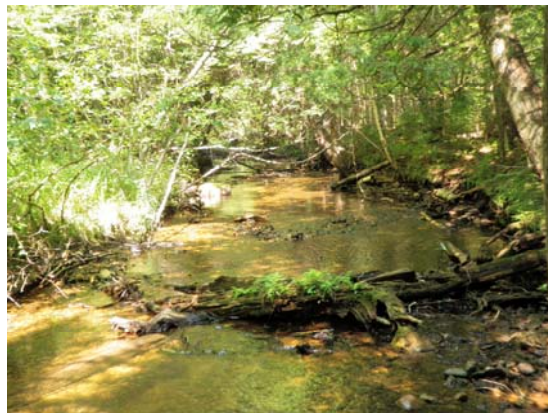


Figure 5. Little Ocqueoc River upstream of Silver Creek Road.



Figure 6. Groundwater seep downstream of Silver Lake Road at the Little Ocqueoc River.

good with channel flow status-flashiness scoring marginal. Substrates were dominated by cobble and gravel with less than 5% dominated by sand and silt. Groundwater seepage was observed as heavy below the bridge (Figure 6). There was moderate availability of large woody debris and undercut banks were sparse with no overhanging vegetation, aquatic macrophytes, or rootwads. The macroinvertebrate community rated excellent with 31 taxa identified including 3 mayfly taxa, 9 caddisfly taxa, and 2 stonefly taxa. These taxa made up 69% of the individuals identified.

The habitat assessment for the Ocqueoc River at Walker Road (Station 4, Figures 7 and 8) was rated good. Individual metrics that met the excellent rating were channel flow status-maintained flow volume, channel flow status-flashiness, channel alteration, vegetative protection and riparian vegetative zone width. No metrics were rated good with 4 metrics scoring marginal. Only 1 metric (pool variability) scored poor. The morphology was dominated by run, pool, and depositional zones with moderate undercut banks, overhanging vegetation, and aquatic macrophytes present. There was also some sparse large woody debris and rootwads present for macroinvertebrate colonization. Inorganic sediments were composed of mainly sand and silt with organics components dominated by muck (Fine Particulate Organic Matter [FPOM]) and detrital material (Coarse Particulate Organic Matter [CPOM]). The macroinvertebrate community rated excellent with 37 taxa collected. Five taxa of mayflies, 6 taxa of caddisflies, and 1 taxon of stoneflies comprising 31% of the total individuals were collected at this site.

The habitat assessment for the Ocqueoc River at Walker Road (Station 4, Figures 7 and 8) was rated good. Individual metrics that met the excellent



Figure 7. Ocqueoc River downstream of Walker Road.



Figure 8. Ocqueoc River upstream of Walker Road.

Both the Little Ocqueoc River and Ocqueoc River have been identified as designated trout streams. Sport fish collected in 2006 by the MDNR, Fisheries Division, included brook trout, rainbow trout, and coho salmon. Other nongame species identified were blacknose dace, longnose dace, creek chub, central mudminnows, and sculpins. In 2007, the Ocqueoc River at Domke Road was surveyed approximately 12.6 miles downstream of the Walker Road location. This survey identified 15 taxa including smallmouth bass, largemouth bass, yellow perch, Chinook salmon, and rainbow trout.

CHEBOYGAN RIVER WATERSHED

The West Branch Maple River (Station 5, Figure 9) habitat assessment, upstream of Mill Street (Figure 10), rated good with 6 metrics meeting the excellent rating (channel flow status-maintained flow volume, channel flow status-flashiness, channel alteration, bank stability, vegetative protection, and riparian vegetative zone width). No metrics were classified as good,



Figure 9. Downstream of the West Branch Maple River at Mill Street.



Figure 10. Upstream of the West Branch Maple River at Mill Street.

while epifaunal substrate/available cover, pool substrate characterization, pool variability, and channel sinuosity were rated as marginal. Sediment deposition was the only metric rated as poor. The 35-foot width of stream was moderately covered in large woody debris and sparsely colonized with undercut banks, overhanging vegetation, aquatic macrophytes, and rootwads. Substrates were comprised of sand, silt, and gravel with the macroinvertebrate community rating acceptable. Forty macroinvertebrate taxa were collected. Six mayfly, 7 caddisfly, and 2 stonefly taxa made up 25% of the total macroinvertebrates collected at this location.

The Maple River upstream of Maple River Road (Station 6, Figures 11 and 12) had a habitat assessment rating of good. Metrics for pool substrate characterization, channel flow status-maintained flow volume, channel flow status-flashiness, and channel alteration were all scored excellent. Bank stability was the only metric rated as good with the remaining metrics rated as marginal. The vegetative protection metric was split by bank with the left bank rating good and the right bank rating excellent. Sediments were composed of sand and gravel with moderate availability of large woody debris and aquatic macrophytes. Undercut banks,



Figure 11. Downstream Maple River at Maple River Road.

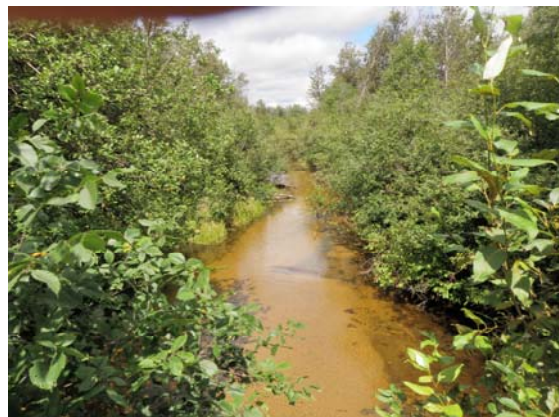


Figure 12. Upstream Maple River at Maple River Road.

overhanging vegetation, and rootwads were sparse throughout this section. The macroinvertebrate assessment was rated as acceptable with 5 mayfly taxa, 10 caddisfly taxa, and 3 stonefly taxa from a total of 42 taxa present. These 3 taxa made up 31% of the total individuals at this site.

Fish collected by the MDNR, Fisheries Division, in the Maple River on July 29, 2002, were dominated by trout (brook, brown, and rainbow) in addition to 10 other species representing both warmwater and cold water habitats. The West Branch of the Maple River is also considered a designated trout stream with good populations of brook trout and brown trout.

The Little Sturgeon River upstream of M-68 (Station 7) had a habitat rating of good. Habitat metrics ranged from excellent to poor with channel flow status-flow volume, channel flow status-flashiness, bank stability, and riparian vegetative zone width all scoring excellent. Two metrics scored good (pool substrate characterization and vegetative protection), 2 metrics scored marginal (pool variability and channel sinuosity), and 2 metrics scored poor (epifaunal substrate/available cover and sediment deposition). Most of the instream habitats were made up of aquatic macrophytes, which were altering the stream flow. There were also undercut banks with sparse amounts of overhanging vegetation, large woody debris, and rootwads within this reach. There was evidence of streambank modifications (rip rap) on the west side of the river and beaver activity upstream from the survey location. Macroinvertebrate evaluations were rated as acceptable with 32 taxa collected at this site including 4 mayfly taxa and 9 caddisfly taxa comprising 23% of the total individuals.

The Sturgeon River was surveyed upstream of White Road (Station 8, Figures 13 and 14). The habitat rated excellent. All parameters were rated excellent except for velocity/depth regime, frequency of riffles, and vegetative protection, which were rated as good. Inorganic substrates were dominated by gravel followed by sand cobble and silt. Organic components were comprised of 10% detrital (CPOM) material and 10% muck (FPOM). Other structures used for macroinvertebrate colonization including overhanging vegetation, large woody debris, and aquatic macrophytes were sparse with no undercut banks or rootwads present at this location. Macroinvertebrate assessment rating was excellent. A total of 29 taxa were collected at this location including 4 mayfly taxa, 6 caddisfly taxa, and 2 stonefly taxa.



Figure 13. Downstream Sturgeon River at White Road.



Figure 14. Upstream Sturgeon River at White Road.

Individuals in these 3 taxa made up 45% of the macroinvertebrates sampled at this location, while the dominant taxa were Oligochaeta making up 26% of the total number of individuals.

Fish collected by the MDNR, Fisheries Division, in the Sturgeon River watershed were dominated by brown trout and rainbow trout. In addition, 10 other species comprised the survey carried out on August 14, 2007, including American brook lamprey, brook trout, black bullhead, bluegill, white sucker, mottled sculpin, and pumpkinseed. The Sturgeon River is a designated trout stream and is known as the “Crown Jewel” trout stream for its high gradient and brown trout populations.

Habitat assessment was rated excellent at the Pigeon River above Old Vanderbilt Road (Station 9, Figure 15). All parameters were rated as excellent except velocity/depth regime and frequency of riffles, which were rated as good. Sediments were dominated by gravel and sand with a minor presence of silt and cobble. Large woody debris was moderately available at this location with sparse overhanging and aquatic vegetation. There were no undercut banks or rootwads available. The macroinvertebrate assessment was rated excellent with a total of 40 taxa collected. Seven mayfly taxa, ten caddisfly taxa and two stonefly taxa were identified making up approximately 43% of the total individuals. However, Chironomidae were the dominant taxa composing 23% of the total individuals collected. Fish identified by the MDNR, Fisheries Division’s electrofishing survey indicate 3 trout species (brook trout, brown trout, and rainbow trout) supporting excellent ratings for habitat and macroinvertebrate assessments.



Figure 15. Pigeon River at Old Vanderbilt Road.

The habitat assessment at Mullett Creek upstream of South Extension Road (Station 10, Figures 16 and 17) was rated as good. Excellent ratings were achieved for 6 parameters (channel flow status-flashiness, channel alteration, channel sinuosity, bank stability, vegetative protection, and riparian vegetative zone width) out of 11. Of the other 5 parameters, channel flow status-maintained flow volume was rated good and pool substrate characterization was rated marginal, with the remainder of the metrics rating poor. Sediments were composed



Figure 16. Mullett Creek downstream of South Extension Road.



Figure 17. Mullett Creek upstream of South Extension Road

mainly of clay with a trace of silt. Available structure for macroinvertebrate colonization was moderate for overhanging vegetation but sparse for undercut banks and large woody debris. Aquatic macrophytes and rootwads were absent from the site. The macroinvertebrate

assessment was rated as excellent with 28 taxa collected. Four mayfly taxa, 5 caddisfly taxa, and 3 stonefly taxa were identified making up 51% of the total individuals.

The MDNR, Fisheries Division, 2007 survey indicates that brook trout were abundant in this watershed and historically have shown the presence of central mudminnow, brook stickleback, blackchin shiner, redbelly dace, rockbass, Iowa darter, and American brook lamprey.

BLACK RIVER WATERSHED

The Black River was surveyed at 3 locations. The first location was at Chandler Dam Road (Station 11, Figure 18) where habitat assessment was rated excellent. All metrics were rated excellent except for 3 parameters, epifaunal substrate/available cover, embeddedness, and velocity/depth regime, which were rated good. Sediments were composed of gravel and sand with cobble available occasionally.



Figure 18. Black River at Chandler Dam Road.

Macroinvertebrate habitats were sparse for all structures with flow diversions recently placed in the river to protect the bank and redirect flow. The macroinvertebrate assessment was rated excellent with 38 total taxa identified. Seven Mayfly and 10 caddisfly taxa were found, while only 1 taxon was identified for stoneflies. These 3 taxa comprised 56% of the total individuals collected.

The second location on the Black River, upstream of Blue Lake Road (Station 12, Figure 19), rated excellent for the habitat assessment, with all but 1 parameter meeting the excellent rating. The 1 parameter not to achieve the excellent rating was

sediment deposition, which rated good. Sediment composition was diverse, made up of gravel, cobble, sand, clay, and boulder with inorganic components in low percentages throughout the reach. Macroinvertebrate structure was sparse for all categories even though the macroinvertebrate community assessment rated excellent. The total number of taxa was identified at 39 including 2 stonefly taxa, 7 mayfly taxa, and 12 caddisfly taxa comprising 49% of the sample.

Station 13, the third Black River location, was surveyed upstream of Black River Road and had a habitat assessment rating of excellent. All parameters were rated as excellent except for velocity/depth regime, which scored marginal due to the absence of a deep water regime. There were few pools and depositional areas throughout this riffle section with substrates composed mainly of cobble, gravel, and sand with few areas silt. Colonization structures were sparse. Even with the sparseness of structures, the macroinvertebrate assessment was rated as excellent with 34 taxa identified. Seven mayfly taxa, 10 caddisfly taxa, and 1 stonefly taxon were collected. These 3 taxa consisted of 67% of the total individuals.



Figure 19. Black River at Blue Lake Road.

Tomahawk Creek upstream of County Road 634 (Station 14, Figures 20 and 21) was determined to have a habitat assessment of good. Six habitat parameters scored excellent with 2 parameters scoring good (pool substrate characterization and channel sinuosity). Of the remaining metrics, 2 scored marginal and 2 scored poor.



Figure 20. Tomahawk Creek downstream of County Road 634.



Figure 21. Tomahawk Creek upstream of County Road 634.

Macroinvertebrate colonization structures were moderate for aquatic macrophytes with undercut banks, overhanging vegetation, and rootwads sparsely available. No large woody debris was available in the stream. The macroinvertebrate assessment was rated acceptable, with 27 taxa identified. Three taxa each were collected for mayflies and caddisflies with no stoneflies found at this site. Coenagrionidae were the dominant taxa making up 24% of the total individuals counted.

Milligan Creek off a two-track off Klieber Road (Station 15) rated excellent for habitat assessment for all but 1 parameter, which was rated as good. The 1 parameter rating good was the velocity/depth regime, which was missing the fast-deep flowing water. Sediment compositions were identified as bedrock and cobble with some sand interspersed within the gravel areas. The macroinvertebrate community rated excellent even though macroinvertebrate structures were sparsely available. Thirty-eight taxa were identified at this location, of which 6 were mayflies, 8 were caddisflies, and 1 was a stonefly taxon, making up 55% of the total taxa collected.

The habitat assessment for Rainy River upstream of Allis Highway (Station 16) was rated excellent. Nine of the 11 parameters were rated as excellent while velocity/depth regime and channel flow status-flashiness were rated as good. Substrates were comprised of cobble, boulder, and gravel and with a sparse amount of large woody debris for macroinvertebrate colonization. The macroinvertebrate assessment was determined as acceptable. Thirty-two taxa were identified, of which 6 were mayflies, 5 were caddisflies, and 1 taxon of stoneflies. These 3 taxa made up 59% of the total individuals.

THUNDER BAY RIVER WATERSHED

The lower South Branch Thunder Bay River was surveyed upstream of Hubbard Lake Road (Station 17) and was found to have a good habitat rating. This rating was supported by 4 parameters rated as excellent (channel flow status-maintained flow volume, channel flow status-flashiness, channel alteration, and bank stability), 4 rated as good (epifaunal substrate/available cover, embeddedness, velocity/depth regime, and vegetative protection),

and 2 rated as marginal (frequency of riffles and riparian vegetative zone width). Structure for macroinvertebrate colonization was sparse for all categories at this location. Assessment of macroinvertebrate populations were determined to be acceptable with 36 taxa identified. This diversity represented 6 taxa of mayflies, 4 caddisflies, and 2 stoneflies and made up 50% of the total individuals collected.

Approximately 3.5 miles downstream of Station 17, the lower South Branch Thunder Bay River at Beaver Lake Road (Station 18) was sampled. Tall grass was bordering both sides of the river with wooded lots behind each. The habitat quality rated good as 8 habitat metrics rated excellent, 1 rated good, 1 rated marginal, and 1 rated poor. Macroinvertebrate structures were sparse for all categories; however, the macroinvertebrate community rated excellent. Forty taxa were identified including 6 mayfly taxa, 7 caddisfly taxa, and 2 stonefly taxa making up approximately 29% of the total individuals.

Two locations on McGinn Creek were surveyed. The first was at McCollum Lake Road (Station 19) where the habitat assessment rated excellent. Six habitat metrics were rated excellent, 3 rated good, and 2 rated marginal. Sediments were composed mainly of impacted sand and silt with some cobble and gravel. Organic substrates were dominated by fine particulates with some detrital material present. Large woody debris and aquatic vegetation were the only structures available in this reach, but were sparse. The macroinvertebrate community rated acceptable with 25 taxa identified at this location including 2 mayfly taxa and 4 caddisfly taxa. Sphaeriidae were the dominant taxa making up approximately 28% of the total identified.

McGinn Creek at M-65 (Station 20) was the second McGinn Creek survey location and the furthest downstream. The habitat quality rated excellent. Frequency of riffles, sediment composition, and velocity/depth regime were the only parameters to rate good; the rest were rated as excellent. The surrounding land was predominately forest with 1 dwelling to the west. Structure for macroinvertebrate colonization in the stream was sparse. The macroinvertebrate community rated excellent with 39 taxa collected at this location. Five of the taxa were mayflies, 10 were caddisflies, and 2 stoneflies were identified making up 58% of the total individuals collected.

McGinn Creek is a designated trout stream in the Thunder Bay River watershed. Three species of fish were found in the survey carried out by the MDNR, Fisheries Division: brook trout, green sunfish, and slimy sculpin. Brook trout and slimy sculpin are typical cold water species supporting the excellent habitat rating at both locations.

Indian Creek, a designated top quality cold water stream, was surveyed upstream of VanWagoner Road (Station 21) below the convergence where a historic mill was located. Habitat quality within this reach was rated as good. Habitat metrics for sediment deposition scored marginal and metrics for epifaunal substrate/available cover, pool substrate characterization, sediment deposition, and channel sinuosity scored good. The rest of the habitat metrics scored excellent. The majority of the instream vegetation was overhanging vegetation with all other structure sparse in this reach. The macroinvertebrate community rated excellent with 28 taxa identified. Four mayfly taxa, 8 caddisfly taxa, and 2 stonefly taxa were present making up 53% of the total number of individuals. Two species of fish were found in the survey carried out by the MDNR, Fisheries Division: brook trout and slimy sculpin. Both of these species are typical cold water species supporting the good habitat rating and the excellent macroinvertebrate rating of this cold water stream.

King Creek, a designated top quality warmwater stream for its entire course, was surveyed upstream of Bussie Road (Station 22). The river at this reach was determined to have a habitat rating of good and had sparsely available undercut banks, overhanging vegetation, and large woody debris. Sediments were comprised of cobble, gravel, and sand with thick trees and shrubs along its margin. The macroinvertebrate community rated acceptable with 26 taxa identified, including 2 mayfly taxa and 5 caddisfly taxa. Dominant taxa were Amphipoda making up approximately 43% of the total number identified. Fish surveyed in King Creek by the MDNR, Fisheries Division, were found to be comprised entirely of minnows, suckers, dace, chubs, sticklebacks, darters, and mudminnows. Blacknose and longnose dace dominated the catch and prefer clean, somewhat flowing water with gravel bottoms (Scott and Crossman, 1979) supporting the fact that King Creek is a healthy ecosystem. No game fish were captured in this tributary.

Gilchrist Creek, a blue ribbon trout stream and tributary to the mainstream Thunder Bay River, was surveyed upstream of CR-612 (Station 24). The habitat metric rated excellent at this location with channel sinuosity rating marginal. Four metrics were rated as good and the remaining metrics rated excellent. Aquatic macrophyte growth at this location was extensive. The other macroinvertebrate structures available were undercut banks, overhanging vegetation, and rootwads in moderate availability with large woody debris sparse. Macroinvertebrate assessments were acceptable. A total of 48 taxa were identified with 7 mayfly taxa, 9 caddisfly taxa, and 3 stonefly taxa. These 3 taxa comprised 34% of the total individuals identified. Brown trout have been collected by the MDNR, Fisheries Division, in previous surveys as well as maintaining a blue ribbon trout stream classification. To meet this classification, a stream must produce diverse macroinvertebrate life and have high water quality as well as having residential trout populations (Cwalinski et al., 2006).

Anchor Creek was surveyed upstream of Carrier Road (Station 26) and was found to have a marginal habitat assessment. Only 2 metrics were rated as excellent (channel alteration and riparian vegetation zone width) and 2 were rated poor (sediment deposition and vegetative protection). The remaining metrics rated marginal. In this reach of stream there was very little macroinvertebrate structure with undercut banks, large woody debris, and rootwads sparse, and overhanging vegetation and aquatic macrophytes completely absent. The sediment composition was made up mainly of sand (92%) with less than 8% cobble, gravel, and silt combined. Macroinvertebrates were rated as excellent with 29 total taxa identified. Three taxa of mayflies, 7 taxa of caddisflies, and 1 taxon of stoneflies made up 37% of all macroinvertebrates identified. This stream is managed as a top-quality warmwater stream, but has never been surveyed for fish species (Cwalinski et al., 2006).

The Thunder Bay River was surveyed at 2 locations. The first location was upstream of Salina Road (Station 27). The habitat quality rated good as the habitat metric for sediment deposition rated poor. Four metrics rated marginal and good with only 2 metrics for channel alteration and riparian vegetative zone width scoring excellent. Lots of soft substrates were present mainly consisting of sand and silt with sparse macroinvertebrate colonization structures and no aquatic macrophytes. Macroinvertebrate assessments scored excellent with 38 taxa present. Five mayflies, 7 caddisflies, and 1 stonefly taxon were identified making up 45% of the total individuals collected at this location.

The second location (Station 28) on the Thunder Bay River was surveyed approximately 5.5 miles downstream of Station 27, upstream of the M-65 crossing, within a forested portion of the watershed. The habitat quality rated good with metrics for pool variability and channel sinuosity scoring marginal. Five metrics scored good and the remaining metrics scored

excellent. This run was mainly composed of cobble and gravel with minor portions of boulder and silt. The pool and depositional areas had minor amounts of detrital material (CPOM) and muck (FPOM) with macroinvertebrate structures absent except for some sparsely distributed large woody debris throughout the reach. The macroinvertebrate community was rated acceptable with 32 taxa identified, which were composed of 6 taxa of mayflies, 2 taxa of caddisflies, and 1 taxon of stoneflies. The dominant macroinvertebrate at this location was Oligochaeta, which comprised 33% of the total identified.

Fish communities within the Thunder Bay River watershed were surveyed during the summer of 2009, by the MDNR, Fisheries Division, from Atlanta Hill Pond to the Hillman Impoundment finding brown trout, rainbow trout, creek chubs, hornyhead chubs, white suckers, blacknose dace, common shiner, rainbow darter, blackside darter, Johnny darter, longnose dace, burbot, smallmouth bass, mottled sculpin, and several other species found in minor numbers. Further downstream below the Ninth Street Dam fish species were less diverse finding rock bass, smallmouth bass, freshwater drum, carp, logperch, round goby, and black bullhead.

The habitat at North Branch Thunder Bay River at Truax Road (Station 29) was rated good. One habitat metric was rated as excellent (riparian vegetative zone width), 2 were rated as poor, and 1 was rated as marginal. The sediments within this reach were impacted completely by sand with sparse structure available for macroinvertebrate colonization. No aquatic vegetation was present at this location, but a thin layer of algae was detected on a majority of the stream bottom. The macroinvertebrate assessment rating was excellent with 33 taxon identified. Six mayfly and caddisfly taxa were recorded. The dominant macroinvertebrate was Calopterygidae, which comprised 24% of the total macroinvertebrates identified.

Quinn Creek surveyed upstream of Finley Road (Station 30) had habitat quality rated as good. The reach assessed had 3 metrics scoring excellent (riparian vegetative zone width, channel alteration, and pool variability) and 2 scoring marginal (channel sinuosity and bank stability). Sediments were composed of mainly sand with minor traces of gravel and cobble. Macroinvertebrate habitat was sparse with no overhanging vegetation present within the reach. This lack of variability proved a macroinvertebrate community that rated acceptable. Thirty-five taxa were identified at this location with 5 mayfly taxa and 4 caddisfly taxa present making up 16% of the total individuals. Quinn Creek is a designated top-quality warmwater stream and was last surveyed in 2000 by the MDNR, Fisheries Division. Game fish were absent in the reach sampled with the entire catch comprised of chubs, shiners, darters, suckers, and dace. Tumors were recorded as common on creek chubs and common shiners (Cwalinski et al., 2006).

RANDOMLY SELECTED NONWADEABLE SITES

Two sites on the Black River (Stations 31 and 32) and 1 site on the Thunder Bay River (Station 33) were found to exceed the channel depth limitations for Procedure 51. These sites were assessed using the rapid bioassessment procedure for nonwadeable rivers (MDEQ, 2009 [draft]).

The sections surveyed on Black River at Ver Hulst Road (Station 31) and Upper Black River at Black River Road (Station 32) were generally found to have moderately sloping stable banks with some areas of erosion that were protected by aquatic macrophytes and riparian vegetation. Macroinvertebrate ratings were found to be rated from marginal to good, respectively, with both sites dominated by Amphipods, which composed 68% taxa identified at Ver Hulst Road and 39% of the taxa identified at Black River Road. Taxa richness ranged from 29 at Black River

Road to 25 at Ver Hulst Road, where at both locations, substrates were predominately sand and muck with macroinvertebrate habitats consisting of fair amounts of large woody debris and aquatic macrophytes and fewer overhanging/undercut banks.

Thunder Bay River at Bagley Road (Station 33) was the third nonwadeable site to be surveyed. This site was approximately 2000 feet upstream of Lake Besser, an impounded lake created by the Ninth Street Dam in downtown Alpena, Michigan. Taxa richness was low with 12 taxa identified. The dominant taxon was Amphipoda making up 74% of collected individuals. Instream habitat of large woody debris and aquatic macrophytes were present throughout the reach with overhanging banks occurring occasionally. This site, in spite of its availability of vegetative cover, relatively high bank stability rating, available riparian cover, and sandy/course substrates, recorded a macroinvertebrate rating of poor. This poor macroinvertebrate rating indicates that the Thunder Bay River may not be attaining the “other indigenous aquatic life and wildlife” designated use. Since the river at this location is being impacted by the Ninth Street Dam, creating a potential lentic community, the nonwadeable procedure used to evaluate the macroinvertebrate stream communities may not be an effective tool of assessment as the stream loses all perception of flow. Therefore, more data is needed to determine final designated use of this site.

TARGETED SITES

The following sites were selected for assessment due to insufficient information in determining specific designated use attainment status in the 2010 Section 303(d), 305(b), and 314 Integrated Report.

The upper South Branch Thunder Bay River was surveyed upstream of Turtle Lake Road (Station 23, Figures 22 and 23) inside the Turtle Lake Hunt Club property (a private hunt club). Permission was granted by Mr. Wayne Sitton, the facilities manager of the club. The habitat quality rated excellent with 3 of the metrics falling outside of the excellent range, resulting in a good assessment. Flow in the reach was good with extensive aquatic vegetation. Undercut banks and overhanging vegetation were moderate with large woody debris and rootwads sparse for macroinvertebrate colonization. These habitats were found to support a macroinvertebrate community that was rated as acceptable with 39 taxa identified. Six mayfly taxa, 8 caddisfly taxa, and 3 stonefly taxa were found to comprise 24% of the total macroinvertebrates collected.



Figure 22. Upper South Branch Thunder Bay River downstream of Turtle Lake Road.



Figure 23. Upper South Branch Thunder Bay River upstream of Turtle Lake Road.

The habitat assessment of Haymeadow Creek upstream of M-23 (Station 25), in the town of Atlanta, was rated good. Epifaunal substrate/available cover and pool substrate characterization were 2 metrics found to be rated marginal at this reach, while 4 were rated good. The remaining 5 metrics were all rated as excellent. Sediments within the pool, located at this reach of stream, were dominated by sand with minor contributions of cobble and gravel. There were moderate structures available for macroinvertebrate colonization including overhanging vegetation and aquatic macrophytes and sparse availability of large woody debris and rootwads. The macroinvertebrate assessment was scored as acceptable with 29 taxa identified, of which 5 were mayflies and 4 were caddisflies. These 2 taxa comprised 25% of the total individuals identified.

NONPOINT SOURCE SUMMARY

There were no open improvement projects or best management practice implementations identified in these watersheds at the time of this survey.

WATERSHED ATTAINMENT STATUS

Summary statistics were calculated from the probabilistic monitoring results to address regional attainment status for the Black, Cheboygan, Ocqueoc, Swan, and Thunder Bay Rivers watersheds. Results for the watersheds were derived from 31 aquatic macroinvertebrate stream samples collected in 8 valley segment types described earlier in the report. The results indicate the following:

- Ninety-seven +/- 7% of the watershed was supporting the other indigenous aquatic life designated use component of R 323.1100(e) of Michigan's WQS.
- One station (Station 33), Thunder Bay River at Bagley Road, scored poor according to the nonwadeable metrics. However, due to the impounded environment, more data is needed to determine support for the "other indigenous aquatic life" designated use.
- There is a 95% confidence that no less than 91% of the Black, Cheboygan, Ocqueoc, Swan, and Thunder Bay Rivers watersheds support the other indigenous aquatic life component of R 323.1100(e) of Michigan's WQS.

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Table 1. Station locations and survey results for the Black, Cheboygan, Ocqueoc, Swan and Thunder Bay River Watersheds located in Alcona, Alpena, Cheboygan, Emmet, Montmorency, Oscoda, Otsego and Presque Isle Counties, August 2010. * denotes nonwadeable sites.

SITE #	AUID	STORET	STREAM NAME	LOCATION	LATITUDE	LONGITUDE	SITE SELECTION TYPE	HABITAT QUALITY RATING	MACRO QUALITY RATING	MACRO SCORE	COLLECTED WATER CHEMISTRY
1	040700030309-NA	160258	Unnamed Coastal	Old Mackinaw Road	45.73823	-84.65209	Random	Excellent	Acceptable	4	No
2	040700030301-NA	710158	Schmidt Creek	646 Highway	45.47622	-83.93858	Random	Good	Acceptable	4	No
3	040700030203-01	710081	Little Ocqueoc River	Silver Creek Road	45.40731	-84.02871	Random	Good	Excellent	6	No
4	040700030204-01	710083	Ocqueoc River	Walker Highway	45.33767	-84.07298	Random	Good	Excellent	5	No
5	040700040206-01	240200	West Branch Maple River	Mill Street	45.55093	-84.79648	Random	Good	Acceptable	3	No
6	040700040207-01	240167	Maple River	Maple River Road	45.50765	-84.76237	Random	Good	Acceptable	4	No
7	040700040401-01	160222	Little Sturgeon River	M-68	45.38989	-84.58945	Random	Good	Acceptable	1	No
8	040700040107-01	160183	Sturgeon River	White Road	45.37203	-84.62426	Random	Excellent	Excellent	5	No
9	040700040302-01	690145	Pigeon River	Old Vanderbilt Road	45.12810	-84.50660	Random	Excellent	Excellent	6	No
10	040700040402-01	160180	Mullett Creek	S Road	45.53964	-84.60955	Random	Good	Excellent	5	No
11	040700050202-01	690161	Black River	off Chandler Dam Road	45.12100	-84.38663	Random	Excellent	Excellent	5	No
12	040700050204-01	600057	Black River	Blue Lakes Road	45.15244	-84.32322	Random	Excellent	Excellent	6	No
13	040700050209-01	160216	Black River	Black River Road	45.26320	-84.26683	Random	Excellent	Excellent	9	No
14	040700050208-02	710157	Tomahawk Creek	County Road 634	45.24384	-84.20024	Random	Good	Acceptable	-1	No
15	040700050212-01	160257	Milligan Creek	2-Track off Klieber Road	45.39025	-84.33642	Random	Excellent	Excellent	7	No
16	040700050104-01	710088	Rainy River	Allis Highway	45.40877	-84.17922	Random	Excellent	Acceptable	4	No
17	040700060505-01	40186	Lower South Branch Thunder Bay River	Hubbard Lake Road	44.88824	-83.58732	Random	Good	Acceptable	4	No
18	040700060505-01	40185	Lower South Branch Thunder Bay River	Beaver Lake Road	44.93182	-83.57477	Random	Good	Excellent	5	No
19	040700060102-01	10127	McGinn Creek	McColum Lake Road	44.78419	-83.88352	Random	Excellent	Acceptable	1	No
20	040700060102-01	10128	McGinn Creek	M-65	44.80058	-83.82836	Random	Excellent	Excellent	8	No
21	040700060101-01	10129	Indian Creek	Van Wagoner Road	44.84553	-83.80598	Random	Good	Excellent	5	No
22	040700060507-01	40187	King Creek	Bussie Road	45.01878	-83.65073	Random	Good	Acceptable	0	No
23	040700060203-01	600048	Upper South Branch Thunder Bay River	u/s of Turtle Lake Road	44.90758	-83.91351	Targeted	Excellent	Acceptable	3	No
24	040700060305-01	600079	Gilchrist Creek	County Road 612	44.89917	-84.05326	Random	Excellent	Acceptable	4	No
25	040700060302-03	600078	Haymeadow Creek	u/s of M-33	45.00508	-84.13888	Targeted	Good	Acceptable	2	No
26	040700060310-01	600077	Anchor Creek	Carrier Road	45.07346	-83.89644	Random	Marginal	Excellent	5	No
27	040700060603-01	40042	Thunder Bay River	Salina Road	45.08249	-83.75754	Random	Good	Excellent	5	No
28	040700060603-01	40184	Thunder Bay River	M-65	45.12056	-83.72233	Random	Good	Acceptable	-2	No
29	040700030403-01	40183	North Branch Thunder Bay River	Truax Road	45.17237	-83.86364	Random	Good	Excellent	5	No
30	040700060402-01	710159	Quinn Creek	Finley Road	45.25475	-83.86155	Random	Good	Acceptable	1	No
31	040700050304-01	160139	Black River*	off end of VerHulst Road	45.58921	-84.43395	Random	N/A	Marginal	53	No
32	040700050213-02	160166	Upper Black River*	Black River Road	45.46795	-84.30330	Random	N/A	Good	34	No
33	040700060605-02	40123	Thunder Bay River *	Bagley Street	45.06762	-83.47205	Random	N/A	Poor	5	No

Table 2A. Qualitative macroinvertebrate sampling results for selected streams in the Ocqueoc River watershed located in Alpena, Cheboygan, Montmorency, and Presque Isle Counties, August 18-24, 2010.

TAXA	SITE 1 Unnamed Coastal Old Mackinaw Road 8/24/2010	SITE 2 Schmidt Creek County Road 646 8/18/2010	SITE 3 Little Ocqueoc River upstream Silver Creek Road 8/18/2010	SITE 4 Ocqueoc River Walker Highway 8/18/2010
PORIFERA (sponges)				4
ANNELIDA (segmented worms)				
Oligochaeta (worms)	1		15	11
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	85	43		15
Decapoda (crayfish)		2		
Isopoda (sowbugs)		2		
Arachnoidea				
Hydracarina	1		1	5
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae				1
Baetidae	5	1	1	17
Caenidae				4
Ephemeridae		4		
Heptageniidae	6	34	21	40
Isonychiidae				3
Leptophlebiidae	3	4	2	
Odonata				
Anisoptera (dragonflies)				
Aeshmidae	1	12	3	2
Cordulegastridae	1	6		
Gomphidae		1		6
Macromiidae				3
Zygoptera (damselflies)				
Calopterygidae		18	1	9
Coenagrionidae	1			9
Plecoptera (stoneflies)				
Leuctridae			1	
Nemouridae	8			
Perlidae		5	14	1
Hemiptera (true bugs)				
Gerridae	1	1	1	1
Pleidae				1
Saldidae			1	1
Velidae			1	
Megaloptera				
Corydalidae (dobson flies)		13	5	1
Sialidae (alder flies)		1		
Neuroptera (spongilla flies)				
Sisyridae				1
Trichoptera (caddisflies)				
Brachycentridae		1	1	
Glossosomatidae	4		69	
Helicopsychidae				1
Hydropsychidae	18	1	25	11
Hydroptilidae		1		1
Lepidostomatidae			2	1
Leptoceridae			16	3
Limnephilidae	11	9	7	5
Molannidae		5	17	
Philopotamidae	10	36	26	
Polycentropodidae		1		
Psychomyiidae	1		2	
Uenoidae	4			
Coleoptera (beetles)				
Gyrinidae (adults)				1
Hydrophilidae (total)			1	
Dryopidae	1	5	3	
Elmidae	3		9	3
Diptera (flies)				
Athericidae			6	
Ceratopogonidae		2	1	2
Chironomidae	12	29	24	44
Culicidae				2
Simuliidae	64		3	1
Tabanidae	1			
Tipulidae	3		9	

MOLLUSCA				
Gastropoda (snails)				
		3		4
				16
	33	11		4
				2
Pelecypoda (bivalves)				
	3	28	7	16
<hr/>				
TOTAL INDIVIDUALS	281	279	295	252

Table 2B. Macroinvertebrate metric evaluation of selected streams in the Ocqueoc River watershed located in Alpena, Cheboygan, Montmorency, and Presque Isle Counties, August 18-24, 2010.

METRIC	SITE 1		SITE 2		SITE 3		SITE 4	
	Unnamed Coastal		Schmidt Creek		Little Ocqueoc River		Ocqueoc River	
	Old Mackinaw Road		County Road 646		upstream Silver Creek Road		Walker Highway	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	25	1	28	1	31	1	37	1
NUMBER OF MAYFLY TAXA	3	1	4	0	3	0	5	1
NUMBER OF CADDISFLY TAXA	6	1	7	1	9	1	6	1
NUMBER OF STONEFLY TAXA	1	1	1	0	2	1	1	0
PERCENT MAYFLY COMP.	4.98	0	15.41	0	8.14	0	25.79	1
PERCENT CADDISFLY COMP.	17.08	0	19.35	0	55.93	1	7.73	0
PERCENT DOMINANT TAXON	30.25	-1	15.41	1	23.39	0	17.46	0
PERCENT ISOPOD, SNAIL, LEECH	11.74	0	5.73	0	0.00	1	10.32	0
PERCENT SURF. AIR BREATHERS	0.36	1	0.36	1	1.36	1	2.38	1
TOTAL SCORE		4		4		6		5
MACROINV. COMMUNITY RATING		ACCEPTABLE		ACCEPTABLE		EXCELLENT		EXCELLENT

Table 2A. Qualitative macroinvertebrate sampling results for selected streams in the Cheboygan River watershed located in Charlevoix, Cheboygan, Emmet, and Otsego Counties, August 16, 2010.

TAXA	SITE 5 West Branch Maple River Mill Street 8/16/2010	SITE 6 Maple River Maple River Road 8/16/2010	SITE 7 Little Sturgeon River M-68 8/16/2010
PORIFERA (sponges)		1	
PLATYHELMINTHES (flatworms)			
Turbellaria		1	
BRYOZOA (moss animals)	1	1	
ANNELIDA (segmented worms)			
Oligochaeta (worms)	23	71	2
ARTHROPODA			
Crustacea			
Amphipoda (scuds)		8	36
Decapoda (crayfish)	1	3	
Isopoda (sowbugs)	16	31	
Arachnoidea			
Hydracarina	2		
Insecta			
Ephemeroptera (mayflies)			
Baetiscidae	5	1	
Baetidae	14	19	9
Ephemerellidae	1	7	
Ephemeridae			1
Heptageniidae	6	2	1
Isonychiidae	1		
Leptophlebiidae			1
Tricorythidae	24	8	
Odonata			
Anisoptera (dragonflies)			
Aeshnidae	2	4	1
Cordulegastridae	1		
Gomphidae	1	1	
Zygoptera (damselflies)			
Calopterygidae	5	9	2
Coenagrionidae		1	
Plecoptera (stoneflies)			
Perlidae	1	1	
Perlodidae		1	
Pteronarcyidae	1	1	
Hemiptera (true bugs)			
Corixidae	1		1
Gerridae	1	1	1
Nepidae	1	1	
Pleidae	1		
Megaloptera			
Corydalidae (dobson flies)	2	2	
Sialidae (alder flies)	1		2
Trichoptera (caddisflies)			
Brachycentridae	2	24	13
Glossosomatidae		1	
Helicopsychidae			1
Hydropsychidae	24	20	31
Hydroptilidae			3
Leptoceridae		1	
Limnephilidae	5	22	4
Molannidae	1	6	1
Philopotamidae	3	4	3
Phryganeidae		1	1
Polycentropodidae	4	2	2
Uenoidae	3	8	
Coleoptera (beetles)			
Dytiscidae (total)		1	1
Gyrinidae (adults)	2		
Hydrophilidae (total)	1		1
Elmidae	2	9	1

Diptera (flies)			
Athericidae		1	
Ceratopogonidae		2	1
Chironomidae	26	19	24
Culicidae			3
Ptychopteridae		1	
Simuliidae	26	22	28
Tabanidae	1		
Tipulidae	2		
MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)	1	1	1
Lymnaeidae			1
Physidae	120	92	98
Planorbidae			2
Pelecypoda (bivalves)			
Sphaeriidae (clams)	38	7	27
TOTAL INDIVIDUALS	373	419	304

Table 2B. Macroinvertebrate metric evaluation of selected streams in the Cheboygan River watershed in Charlevoix, Cheboygan, Emmet, and Otsego Counties, August 16, 2010.

METRIC	SITE 5 West Branch Maple River Mill Street 8/16/2010		SITE 6 Maple River Maple River Road 8/16/2010		SITE 7 Little Sturgeon River M-68 8/16/2010	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	40	1	42	1	32	1
NUMBER OF MAYFLY TAXA	6	1	5	1	4	1
NUMBER OF CADDISFLY TAXA	7	1	10	1	9	1
NUMBER OF STONEFLY TAXA	2	1	3	1	0	-1
PERCENT MAYFLY COMP.	13.67	0	8.83	0	3.95	0
PERCENT CADDISFLY COMP.	11.26	0	21.24	0	19.41	0
PERCENT DOMINANT TAXON	32.17	-1	21.96	0	32.24	-1
PERCENT ISOPOD, SNAIL, LEECH	36.73	-1	29.59	-1	33.55	-1
PERCENT SURF. AIR BREATHERS	1.88	1	0.95	1	2.30	1
TOTAL SCORE		3		4		1
MACROINV. COMMUNITY RATING		ACCEPTABLE		ACCEPTABLE		ACCEPTABLE

Table 2A. Qualitative macroinvertebrate sampling results for selected streams in the Cheboygan River watershed located in Charlevoix, Cheboygan, Emmet, and Otsego Counties, August 16-17, 2010.

TAXA	SITE 8 Sturgeon River White Road 8/16/2010	SITE 9 Pigeon River Old Vanderbilt Road 8/17/2010	SITE 10 Mullett Creek S. Ext Rd 8/16/2010
BRYOZOA (moss animals)	1		
ANNELIDA (segmented worms)			
Oligochaeta (worms)	70	13	2
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	4		1
Decapoda (crayfish)		1	
Isopoda (sowbugs)		6	2
Arachnoidea			
Hydracarina	3	1	2
Insecta			
Ephemeroptera (mayflies)			
Baetiscidae		1	
Baetidae	7	16	36
Ephemerellidae		2	
Ephemeridae	1	1	1
Heptageniidae	28	6	3
Isonychiidae		1	
Leptophlebiidae			5
Tricorythidae	1	7	
Odonata			
Anisoptera (dragonflies)			
Aeshnidae	2	1	
Cordulegastridae	1	1	1
Gomphidae		1	
Zygoptera (damselflies)			
Calopterygidae	2	2	
Plecoptera (stoneflies)			
Nemouridae			82
Perlidae	10	1	1
Perlodidae			3
Pteronarcyidae	1	3	
Hemiptera (true bugs)			
Gerridae	1	1	6
Veliidae		1	
Megaloptera			
Corydalidae (dobson flies)	3	3	
Sialidae (alder flies)		1	1
Trichoptera (caddisflies)			
Brachycentridae	20	36	22
Glossosomatidae	16	17	
Helicopsychidae		5	
Hydropsychidae	24	24	10
Leptoceridae			2
Limnephilidae	4	12	11
Molannidae		1	
Philopotamidae	1	7	2
Phryganeidae		4	
Polycentropodidae	9	4	
Uenoidae		7	
Coleoptera (beetles)			
Dytiscidae (total)			1
Hydrophilidae (total)		1	4
Dryopidae			2
Elmidae	6	6	
Diptera (flies)			
Athericidae	2		
Ceratopogonidae	1		1
Chironomidae	24	84	90
Simuliidae	9	32	54
Tabanidae	2	1	1

Tipulidae		3	2
MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)		6	
Physidae	9	15	
Pelecypoda (bivalves)			
Sphaeriidae (clams)	8	24	3
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TOTAL INDIVIDUALS	270	359	351

Table 2B. Macroinvertebrate metric evaluation of selected streams in the Cheboygan River watershed located in Charlevoix, Cheboygan, Emmet, and Otsego Counties, August 16-17, 2010.

METRIC	SITE 8 Sturgeon River White Road 8/16/2010		SITE 9 Pigeon River Old Vanderbilt Road 8/17/2010		SITE 10 Mullett Creek S. Ext Rd 8/16/2010	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	29	1	40	1	28	1
NUMBER OF MAYFLY TAXA	4	0	7	1	4	1
NUMBER OF CADDISFLY TAXA	6	1	10	1	5	0
NUMBER OF STONEFLY TAXA	2	1	2	1	3	1
PERCENT MAYFLY COMP.	13.70	0	9.47	0	12.82	0
PERCENT CADDISFLY COMP.	27.41	0	32.59	1	13.39	0
PERCENT DOMINANT TAXON	25.93	0	23.40	0	25.64	0
PERCENT ISOPOD, SNAIL, LEECH	3.33	1	7.52	0	0.57	1
PERCENT SURF. AIR BREATHERS	0.37	1	0.84	1	3.13	1
TOTAL SCORE		5		6		5
MACROINV. COMMUNITY RATING		EXCELLENT		EXCELLENT		EXCELLENT

Table 2A. Qualitative macroinvertebrate sampling results for selected streams in the Black River watershed located in Cheboygan, Montmorency, Otsego, and Presque Isle Counties, August 17, 2010.

TAXA	SITE 11 Black River Chandler Dam Road 8/17/2010	SITE 12 Black River Blue Lakes Rd 8/17/2010	SITE 13 Black River 0.1 Mile upstream of Black River Road 8/17/2010
ANNELIDA (segmented worms)			
Oligochaeta (worms)	15	12	12
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	3		
Decapoda (crayfish)	1	1	
Isopoda (sowbugs)	32	6	1
Arachnoidea			
Hydracarina			1
Insecta			
Ephemeroptera (mayflies)			
Baetiscidae	1	1	
Baetidae	13	9	26
Ephemerellidae	29	6	1
Ephemeridae	4	1	1
Heptageniidae	2	18	36
Isonychiidae	2	7	38
Metretopodidae			1
Tricorythidae	59	3	
Odonata			
Anisoptera (dragonflies)			
Aeshnidae		1	1
Cordulegastridae	1	1	1
Gomphidae	1		
Zygoptera (damselflies)			
Calopterygidae	3	10	8
Plecoptera (stoneflies)			
Perlidae	5	1	1
Pteronarcyidae		1	1
Hemiptera (true bugs)			
Corixidae	10	31	
Gerridae	1		1
Notonectidae		1	
Pleidae		1	
Veliidae		3	
Megaloptera			
Corydalidae (dobson flies)	3	2	9
Trichoptera (caddisflies)			
Brachycentridae	11	12	10
Glossosomatidae	8	4	4
Helicopsychidae	17	1	5
Hydropsychidae	21	13	32
Hydroptilidae		25	
Leptoceridae	2	5	4
Limnephilidae	1	4	1
Molannidae	1	2	
Philopotamidae		22	30
Phryganeidae	3	4	
Polycentropodidae	3	3	1
Psychomyiidae			3
Rhyacophilidae			1
Uenoidae	3	6	3
Coleoptera (beetles)			
Hydrophilidae (total)	1		1
Elmidae	19	21	11
Diptera (flies)			
Athericidae	6	12	1
Chironomidae	21	20	34
Simuliidae	1	1	10
Tabanidae	1		
Tipulidae	1	1	

MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)	2		1
Physidae	5	7	
Pelecypoda (bivalves)			
Sphaeriidae (clams)	17	22	4
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TOTAL INDIVIDUALS	329	301	295

Table 2B. Macroinvertebrate metric evaluation of selected streams in the Black River watershed located in Cheboygan, Montmorency, Otsego, and Presque Isle Counties, August 17, 2010.

METRIC	SITE 11 Black River Chandler Dam Road 8/17/2010		SITE 12 Black River Blue Lakes Rd 8/17/2010		SITE 13 Black River 0.1 Mile upstream of Black River Road 8/17/2010	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	38	1	39	1	34	1
NUMBER OF MAYFLY TAXA	7	1	7	1	6	1
NUMBER OF CADDISFLY TAXA	10	1	12	1	11	1
NUMBER OF STONEFLY TAXA	1	0	2	1	2	1
PERCENT MAYFLY COMP.	33.43	1	14.95	0	34.92	1
PERCENT CADDISFLY COMP.	21.28	0	33.55	1	31.86	1
PERCENT DOMINANT TAXON	17.93	0	10.30	1	12.88	1
PERCENT ISOPOD, SNAIL, LEECH	11.85	0	4.32	0	0.68	1
PERCENT SURF. AIR BREATHERS	3.65	1	11.96	0	0.68	1
TOTAL SCORE		5		6		9
MACROINV. COMMUNITY RATING		EXCELLENT		EXCELLENT		EXCELLENT

Table 2A. Qualitative macroinvertebrate sampling results for selected streams in the Black River watershed located in Cheboygan, Montmorency, Otsego, and Presque Isle Counties, August 17-24, 2010.

TAXA	SITE 14 Tomahawk Creek County Road 634 8/17/2010	SITE 15 Milligan Creek two-track off Klieber Road 8/24/2010	SITE 16 Rainy River Allis Hwy 8/24/2010
PORIFERA (sponges)	1		
NEMATOMORPHA (roundworms)			1
ANNELIDA (segmented worms)			
Hirudinea (leeches)	1		
Oligochaeta (worms)	2	16	1
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	19	1	
Decapoda (crayfish)		1	3
Arachnoidea			
Hydracarina	1	2	1
Insecta			
Ephemeroptera (mayflies)			
Baetiscidae			6
Baetidae	8	22	5
Caenidae	21	1	
Ephemerellidae		3	4
Heptageniidae	1	38	94
Isonychiidae		27	8
Leptophlebiidae		1	1
Odonata			
Anisoptera (dragonflies)			
Aeshnidae	1	1	1
Gomphidae	16	12	1
Zygoptera (damselflies)			
Calopterygidae	2	26	5
Coenagrionidae	71		
Plecoptera (stoneflies)			
Perlidae		17	30
Hemiptera (true bugs)			
Gerridae	2		1
Mesoveliidae		1	
Notonectidae	1		
Veliidae		4	2
Megaloptera			
Corydalidae (dobson flies)		1	8
Trichoptera (caddisflies)			
Glossosomatidae		3	6
Helicopsychidae		4	6
Hydropsychidae		14	21
Hydroptilidae	2	20	
Leptoceridae	4	3	
Limnephilidae	3	7	1
Philopotamidae		4	1
Uenoidea		2	
Lepidoptera (moths)			
Pyalidae		3	1
Coleoptera (beetles)			
Dytiscidae (total)		1	
Gyrinidae (adults)	1		
Dryopidae		1	
Elmidae	7	34	32
Psephenidae (larvae)			1
Diptera (flies)			
Athericidae		1	10
Ceratopogonidae	1	2	3
Chironomidae	45	9	19
Culicidae	2		
Dixidae	1		
Simuliidae		6	6
Tabanidae		1	4

Tipulidae		2	2
MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)		1	
Hydrobiidae	67		
Physidae	4	3	
Planorbidae	9		
Pelecypoda (bivalves)			
Sphaeriidae (clams)	6	7	23
TOTAL INDIVIDUALS	299	302	308

Table 2B. Macroinvertebrate metric evaluation of selected streams in the Black River watershed located in Cheboygan, Montmorency, Otsego, and Presque Isle Counties, August 17-24, 2010.

METRIC	SITE 14 Tomahawk Creek County Road 634 8/17/2010		SITE 15 Milligan Creek two-track off Klieber Road 8/24/2010		SITE 16 Rainy River Allis Hwy 8/24/2010	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	27	0	38	1	32	1
NUMBER OF MAYFLY TAXA	3	0	6	1	6	1
NUMBER OF CADDISFLY TAXA	3	0	8	1	5	0
NUMBER OF STONEFLY TAXA	0	-1	1	0	1	0
PERCENT MAYFLY COMP.	10.03	0	30.46	1	38.31	1
PERCENT CADDISFLY COMP.	3.01	0	18.87	0	11.36	0
PERCENT DOMINANT TAXON	23.75	0	12.58	1	30.52	-1
PERCENT ISOPOD, SNAIL, LEECH	27.09	-1	1.32	1	0.00	1
PERCENT SURF. AIR BREATHERS	2.01	1	1.99	1	0.97	1
TOTAL SCORE		-1		7		4
MACROINV. COMMUNITY RATING		ACCEPTABLE		EXCELLENT		ACCEPTABLE

Table 2A. Qualitative macroinvertebrate sampling results for selected streams in the Thunder Bay River watershed located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 19-25, 2010.

TAXA	SITE 17 Lower South Branch Thunder Bay River Hubbard Lake Road 8/19/2010	SITE 18 Lower South Branch Thunder Bay River Beaver Lake Road 8/19/2010	SITE 19 McGinn Creek McCollum Lake Road 8/20/2010	SITE 20 McGinn Creek M68 8/25/2010
PORIFERA (sponges)		1		
BRYOZOA (moss animals)		1		
ANNELIDA (segmented worms)				
Hirudinea (leeches)		1		
Oligochaeta (worms)	6	5		5
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	13	41		
Decapoda (crayfish)	2	4		
Isopoda (sowbugs)	12	7		
Arachnoidea				
Hydracarina	2	2	1	1
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae	1	3		
Baetidae	3	3		26
Caenidae	10	7		
Ephemerellidae				8
Ephemeridae	1	5		
Heptageniidae	77	8	15	6
Isonychiidae	15	1		
Leptophlebiidae			13	7
Tricorythidae				11
Odonata				
Anisoptera (dragonflies)				
Aeshnidae		2	7	1
Cordulegastridae			7	2
Gomphidae	16	11	9	
Zygoptera (damselflies)				
Calopterygidae	11	23	31	1
Coenagrionidae	4	13		
Plecoptera (stoneflies)				
Nemouridae				3
Perlidae	3	4		4
Perlodidae	1			
Pteronarcyidae		1		
Hemiptera (true bugs)				
Gerridae	1	1	2	1
Mesoveliidae				2
Saldidae	1			
Megaloptera				
Corydalidae (dobson flies)	2	1	9	1
Sialidae (alder flies)			2	2
Trichoptera (caddisflies)				
Brachycentridae				9
Glossosomatidae				41
Helicopsychidae	1	12	59	2
Hydropsychidae	45	3	8	21
Leptoceridae		2		1
Limnephilidae	1	12	5	17
Molannidae			21	2
Philopotamidae				5
Phryganeidae		1		
Polycentropodidae		2		
Rhyacophilidae				1
Uenoidae	3	20		1
Coleoptera (beetles)				
Gyrinidae (adults)				1
Halplidae (adults)				1
Hydrophilidae (total)				3
Psephenidae (adults)	1	9		
Elmidae	6	19	2	20
Diptera (flies)				
Athericidae				3
Ceratopogonidae	2		1	5
Chironomidae	15	13	42	35
Dixidae			1	2
Ptychopteridae			1	1
Simuliidae				7
Tabanidae	4	2	4	1
Tipulidae			3	4
MOLLUSCA				
Gastropoda (snails)				
Ancyliidae (limpets)	3	2	15	
Hydrobiidae	2	1		
Physidae	5	3	7	

Planorbidae	1			
Pleuroceridae	36	26		
Viviparidae			4	
Pelecypoda (bivalves)				
Dreissenidae	11	5		
Sphaeriidae (clams)	4	10	107	19
Unionidae (mussels)	1	2		
TOTAL INDIVIDUALS	322	289	376	283

Table 2B. Macroinvertebrate metric evaluation of selected streams in the Thunder Bay River watershed located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 19-25, 2010.

METRIC	SITE 17		SITE 18		SITE 19		SITE 20	
	Lower South Branch Thunder Bay River		Lower South Branch Thunder Bay River		McGinn Creek		McGinn Creek	
	Hubbard Lake Road		Beaver Lake Road		McCollum Lake Road		M68	
	8/19/2010	Score	8/19/2010	Score	8/20/2010	Score	8/25/2010	Score
TOTAL NUMBER OF TAXA	36	1	40	1	25	1	39	1
NUMBER OF MAYFLY TAXA	6	1	6	1	2	1	5	1
NUMBER OF CADDISFLY TAXA	4	0	7	1	4	0	10	1
NUMBER OF STONEFLY TAXA	2	1	2	1	0	-1	2	1
PERCENT MAYFLY COMP.	33.23	1	9.34	0	7.45	0	20.49	0
PERCENT CADDISFLY COMP.	15.53	0	17.99	0	24.73	0	35.34	1
PERCENT DOMINANT TAXON	23.91	0	14.19	1	28.46	-1	14.49	1
PERCENT ISOPOD, SNAIL, LEECH	18.32	-1	13.84	-1	6.91	0	0.00	1
PERCENT SURF. AIR BREATHERS	0.93	1	3.46	1	0.80	1	3.18	1
TOTAL SCORE		4		5		1		8
MACROINV. COMMUNITY RATING		ACCEPTABLE		EXCELLENT		ACCEPTABLE		EXCELLENT

Table 2A. Qualitative macroinvertebrate sampling results for selected streams in the Thunder Bay River watershed located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 19-26, 2010.

TAXA	SITE 21 Indian Creek VanWagoner Road 8/25/2010	SITE 22 King Creek Bussie Road 8/19/2010	SITE 23 Upper South Branch Thunder Bay Turtle Lake 8/26/2010	SITE 24 Gilchrist Creek County Road 612 8/25/2010
NEMATOMORPHA (roundworms)	1			
ANNELIDA (segmented worms)				
Hirudinea (leeches)			1	
Oligochaeta (worms)	1	3	4	57
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	1	121	8	7
Decapoda (crayfish)		1	2	1
Isopoda (sowbugs)		4		
Arachnoidea				
Hydracarina	4		1	6
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae			1	5
Baetidae	32	3	10	10
Ephemerellidae	3			2
Ephemeridae			1	2
Heptageniidae	1	16	14	1
Isonychiidae			1	
Leptophlebiidae	10			3
Tricorythidae			6	19
Odonata				
Anisoptera (dragonflies)				
Aeshnidae		3	1	3
Cordulegastridae		1	1	1
Gomphidae				1
Zygoptera (damselflies)				
Calopterygidae		27	12	8
Coenagrionidae			1	
Plecoptera (stoneflies)				
Capniidae	13			
Nemouridae	15		1	1
Perlidae			3	2
Pteronarcyidae			1	1
Hemiptera (true bugs)				
Corixidae	1		45	4
Gerridae	1	3		1
Mesoveliidae			1	
Pleidae				4
Saldidae		1		
Megaloptera				
Corydalidae (dobson flies)		4	1	1
Sialidae (alder flies)	2	4	1	1
Trichoptera (caddisflies)				
Brachycentridae	1		13	6
Helicopsychidae		1	1	2
Hydropsychidae	32	2	4	2
Leptoceridae				2
Limnephilidae	25	11	3	3
Molannidae	1			4
Philopotamidae	4		1	1
Phryganeidae	1	3	1	2
Polycentropodidae	1		1	14
Rhyacophilidae	5			
Uenoidae		5	2	
Coleoptera (beetles)				
Gyrinidae (adults)		1		1
Haliplidae (adults)				1
Hydrophilidae (total)		1		1
Scirtidae (adults)				1
Elmidae		3	3	4
Diptera (flies)				
Ceratopogonidae	5		1	1
Chironomidae	80	8	25	14
Culicidae				1
Dixidae	2	1		7
Ptychopteridae				2

Simuliidae	12		26	5
Tabanidae	1			3
Tipulidae	1			1
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)		1	3	1
Hydrobiidae			15	
Physidae			41	18
Planorbidae			1	
Viviparidae		16		
Pelecypoda (bivalves)				
Sphaeriidae (clams)	16	37	10	16
TOTAL INDIVIDUALS	272	281	268	254

Table 2B. Macroinvertebrate metric evaluation of selected streams in the Thunder Bay River watershed located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 19-26, 2010.

METRIC	SITE 21 Indian Creek VanWagoner Road 8/25/2010		SITE 22 King Creek Bussie Road 8/19/2010		SITE 23 Upper South Branch Thunder Bay Turtle Lake 8/26/2010		SITE 24 Gilchrist Creek County Road 612 8/25/2010	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	28	1	26	1	39	1	48	1
NUMBER OF MAYFLY TAXA	4	1	2	0	6	1	7	1
NUMBER OF CADDISFLY TAXA	8	1	5	0	8	1	9	1
NUMBER OF STONEFLY TAXA	2	1	0	-1	3	1	3	1
PERCENT MAYFLY COMP.	16.91	0	6.76	0	12.31	0	16.54	0
PERCENT CADDISFLY COMP.	25.74	0	7.83	0	9.70	0	14.17	0
PERCENT DOMINANT TAXON	29.41	-1	43.06	-1	16.79	1	22.44	0
PERCENT ISOPOD, SNAIL, LEECH	0.00	1	7.47	0	22.76	-1	7.48	0
PERCENT SURF. AIR BREATHERS	0.74	1	2.14	1	17.16	-1	6.30	0
TOTAL SCORE		5		0		3		4
MACROINV. COMMUNITY RATING		EXCELLENT		ACCEPTABLE		ACCEPTABLE		ACCEPTABLE

Table 2A. Qualitative macroinvertebrate sampling results for selected streams in the Thunder Bay River watershed located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 17-25, 2010.

TAXA	SITE 25 Haymeadow Creek M33 8/25/2010	SITE 26 Anchor Creek Carrier Road 8/17/2010	SITE 27 Thunder Bay River Salina Road 8/19/2010
PORIFERA (sponges)			1
PLATYHELMINTHES (flatworms)			
Turbellaria	1		
ANNELIDA (segmented worms)			
Hirudinea (leeches)	1		
Oligochaeta (worms)	6	12	3
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	1	23	7
Decapoda (crayfish)	2	2	3
Arachnoidea			
Hydracarina	1		
Insecta			
Ephemeroptera (mayflies)			
Baetiscidae			1
Baetidae	16	5	28
Caenidae	2		1
Ephemerellidae	2		
Heptageniidae	7	59	10
Isonychiidae			14
Leptophlebiidae	17	6	
Odonata			
Anisoptera (dragonflies)			
Aeshnidae	1	2	4
Cordulegastridae		1	
Gomphidae		3	3
Zygoptera (damselflies)			
Calopterygidae	47	4	42
Coenagrionidae			10
Plecoptera (stoneflies)			
Perlidae		11	18
Hemiptera (true bugs)			
Corixidae	6		
Gerridae	1	1	1
Mesoveliidae	4	1	
Pleidae			2
Megaloptera			
Corydalidae (dobson flies)		3	1
Sialidae (alder flies)	11	5	3
Trichoptera (caddisflies)			
Brachycentridae			1
Helicopsychidae		10	
Hydropsychidae	3	2	15
Hydroptilidae			2
Leptoceridae	7		10
Limnephilidae	9	5	7
Molannidae		4	
Philopotamidae		5	
Phryganeidae			1
Polycentropodidae		2	
Psychomyiidae	1		
Rhyacophilidae			3
Uenoidae		5	
Coleoptera (beetles)			
Dytiscidae (total)			1
Hydrophilidae (total)			9
Dryopidae		1	1
Elmidae	9	20	16
Diptera (flies)			
Athericidae			5
Ceratopogonidae	1	1	

Chironomidae	46	27	26
Dixidae	11		
Simuliidae			4
Tabanidae		8	1
Tipulidae			1
MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)	14	5	10
Physidae	4		1
Planorbidae			3
Viviparidae	1		
Pelecypoda (bivalves)			
Sphaeriidae (clams)	16	50	3
<hr/> <hr/>			
TOTAL INDIVIDUALS	248	283	272

Table 2B. Macroinvertebrate metric evaluation of selected streams in the Thunder Bay River watershed located in Alpena, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 17-25, 2010.

METRIC	SITE 25		SITE 26		SITE 27	
	Haymeadow Creek		Anchor Creek		Thunder Bay River	
	M33		Carrier Road		Salina Road	
	8/25/2010		8/17/2010		8/19/2010	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	29	1	29	1	38	1
NUMBER OF MAYFLY TAXA	5	1	3	0	5	1
NUMBER OF CADDISFLY TAXA	4	0	7	1	7	1
NUMBER OF STONEFLY TAXA	0	-1	1	0	1	0
PERCENT MAYFLY COMP.	17.74	0	24.73	1	19.85	0
PERCENT CADDISFLY COMP.	8.06	0	11.66	0	14.34	0
PERCENT DOMINANT TAXON	18.95	0	20.85	0	15.44	1
PERCENT ISOPOD, SNAIL, LEECH	8.06	0	1.77	1	5.15	0
PERCENT SURF. AIR BREATHERS	4.44	1	0.71	1	4.78	1
TOTAL SCORE		2		5		5
MACROINV. COMMUNITY RATING		ACCEPTABLE		EXCELLENT		EXCELLENT

Table 2A. Qualitative macroinvertebrate sampling results for selected streams in the Thunder Bay River watershed located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 18-19, 2010.

TAXA	SITE 28 Thunder Bay River M65 8/19/2010	SITE 29 North Branch Thunder Bay River Truax Road 8/18/2010	SITE 30 Quinn Creek Finley Road 8/19/2010
ANNELIDA (segmented worms)			
Hirudinea (leeches)			1
Oligochaeta (worms)	99	5	4
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	6	1	6
Decapoda (crayfish)	20	2	13
Isopoda (sowbugs)			3
Insecta			
Ephemeroptera (mayflies)			
Baetiscidae		6	
Baetidae	3	17	2
Caenidae	7	2	1
Ephemeridae	1		1
Heptageniidae	19	41	39
Isonychiidae	1		
Leptophlebiidae	4	1	2
Metretopodidae		1	
Odonata			
Anisoptera (dragonflies)			
Aeshnidae		1	5
Gomphidae	1	2	
Zygoptera (damselflies)			
Calopterygidae	1	61	39
Coenagrionidae		1	3
Plecoptera (stoneflies)			
Perlidae	4		
Hemiptera (true bugs)			
Belostomatidae		1	
Corixidae	47	1	5
Gerridae	2	1	1
Nepidae			1
Notonectidae	1		1
Megaloptera			
Corydalidae (dobson flies)	1		1
Sialidae (alder flies)	1	1	1
Trichoptera (caddisflies)			
Brachycentridae		1	
Helicopsychidae		8	
Hydropsychidae		1	2
Leptoceridae		5	
Limnephilidae	3	1	18
Molannidae			1
Phryganeidae			1
Polycentropodidae		1	
Uenoidae	1		
Coleoptera (beetles)			
Dytiscidae (total)	4	2	
Gyrinidae (adults)	2		3
Haliplidae (adults)	2		
Hydrophilidae (total)	2	1	1
Psephenidae (adults)	1		
Elmidae		15	17
Gyrinidae (larvae)		1	
Diptera (flies)			
Ceratopogonidae	2		1
Chironomidae	22	55	10
Culicidae		2	1
Dixidae	2		
Tabanidae	9	9	9
Tipulidae			3

MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)	3	4	10
Physidae	17	2	18
Planorbidae			4
Pelecypoda (bivalves)			
Sphaeriidae (clams)	8	5	27
Unionidae (mussels)	1		
TOTAL INDIVIDUALS	297	258	255

Table 2B. Macroinvertebrate metric evaluation of selected streams in the Thunder Bay River watershed located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 18-19, 2010.

METRIC	SITE 28 Thunder Bay River M65 8/19/2010		SITE 29 North Branch Thunder Bay River Truax Road 8/18/2010		SITE 30 Quinn Creek Finley Road 8/19/2010	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	32	1	33	1	35	1
NUMBER OF MAYFLY TAXA	6	1	6	1	5	1
NUMBER OF CADDISFLY TAXA	2	-1	6	1	4	0
NUMBER OF STONEFLY TAXA	1	0	0	-1	0	-1
PERCENT MAYFLY COMP.	11.78	0	26.36	1	17.65	0
PERCENT CADDISFLY COMP.	1.35	-1	6.59	0	8.63	0
PERCENT DOMINANT TAXON	33.33	-1	23.64	0	15.29	1
PERCENT ISOPOD, SNAIL, LEECH	6.73	0	2.33	1	14.12	-1
PERCENT SURF. AIR BREATHERS	20.54	-1	3.10	1	5.10	0
TOTAL SCORE		-2		5		1
MACROINV. COMMUNITY RATING		ACCEPTABLE		EXCELLENT		ACCEPTABLE

Table 2A. Qualitative macroinvertebrate sampling results for selected streams in the Black River and Thunder Bay River watershed located in Alcona, Alpena, Cheboygan, Montmorency, Oscoda, Otsego, and Presque Isle Counties, in June, July and September 2010.

TAXA	SITE 31 Black River Black River Road 9/28/10	SITE 32 Black River VerHulst Road 7/28/10	SITE 33 Thunder Bay River Bagley Road 6/25/10
ANNELIDA (segmented worms)			
Hirudinea (leeches)		1	1
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	167	812	449
Isopoda (sowbugs)	7	13	59
Arachnoidea			
Hydracarina	15	122	4
Insecta			
Ephemeroptera (mayflies)			
Baetiscidae	70		
Baetidae	51	25	9
Caenidae	21	1	4
Ephemerellidae		5	
Heptageniidae	1		
Leptohyphidae (Trico.)		28	
Odonata			
Anisoptera (dragonflies)			
Aeshnidae	3	1	5
Corduliidae		1	
Zygoptera (damselflies)			
Calopterygidae	8		
Coenagrionidae	8	14	4
Plecoptera (stoneflies)			
Perlodidae	2		
Hemiptera (true bugs)			
Belostomatidae	1		
Corixidae			5
Gerridae		1	
Mesoveliidae		1	
Megaloptera			
Corydalidae (dobson flies)		1	
Trichoptera (caddisflies)			
Brachycentridae	4		
Hydropsychidae	1		
Hydroptilidae		1	
Leptoceridae		67	1
Limnephilidae	7		
Polycentropodidae	9		
Lepidoptera (moths)			
Noctuidae	2		
Coleoptera (beetles)			
Gyrinidae (adults)	1		
Haliplidae (adults)	10	13	3
Hydrophilidae (total)	1		
Elmidae (total)	1	1	6
Diptera (flies)			
Ceratopogonidae	5	14	4
Chironomidae	7	10	4
Simuliidae	1		
Tipulidae	1		
MOLLUSCA			
Gastropoda (snails)			
Hydrobiidae	1	23	29

Lymnaeidae			3
Physidae	9	3	11
Planorbidae	1	2	4
Pelecypoda (bivalves)			
Dreissenidae (zebra)		35	
Pisidiidae	8	2	1
TOTAL INDIVIDUALS	423	1197	606

Table 2B. Macroinvertebrate metric evaluation of selected streams in the Black River and Thunder Bay River watershed located in Alcona, Alpena, Cheboygan, Montmorency, Oscoda, Otsego, and Presque Isle Counties, in June, July and September 2010.

METRIC	SITE 31	SITE 32	SITE 33
	Black River Road	VerHulst Road	Bagley Road
	Value	Value	Value
TOTAL ABUNDANCE	423	1197	606
TOTAL RICHNESS	29	25	19
NUMBER OF EPHEMEROPTERA FAMILIES	4	4	2
NUMBER OF PLECOPTERA FAMILIES	1	0	0
NUMBER OF TRICHOPTERA FAMILIES	4	2	1
NUMBER OF DIPTERA TAXA	4	2	2
TRICHOPTERA ABUNDANCE	21	68	1
ABUNDANCE OF DOMINANT TAXON	167	812	449
SHREDDER ABUNDANCE	193	905	512
SCRAPER ABUNDANCE	12	34	47
COLL-FILTERER ABUNDANCE	6	35	0
COLL-GATH ABUNDANCE	159	67	29
PREDATOR ABUNDANCE	53	156	18

METRIC	Metric Score	Metric Score	Metric Score
FFG DIVERSITY (25)	16	8	0
HABITAT STABILITY FFG SURROGATE (25)	0	0	0
% TRICHOPTERA (20)	14	14	0
EPT RICHNESS (8)	6	3	0
TOTAL RICHNESS (7)	7	7	0
DIPTERA RICHNESS (5)	4	2	0
PLECOPTERA RICHNESS (5)	2	0	0
% DOMINANCE (5)	4	0	5

TOTAL SCORE (100)	53	34	5
MACROINVERTEBRATE COMMUNITY RATING	GOOD	MARGINAL	POOR

Table 3. Habitat evaluation for selected streams located in the Ocqueoc River watershed, located in Alpena, Cheboygan, Montmorency, and Presque Isle Counties, August 18-24, 2010.

	SITE 1 Unnamed Coastal Old Mackinaw Road RIFFLE/RUN	SITE 2 Schmidt Creek County Road 646 GLIDE/POOL	SITE 3 Little Ocqueoc River Silver Creek Road downstream bridge RIFFLE/RUN	SITE 4 Ocqueoc River Walker Highway GLIDE/POOL
HABITAT METRIC				
Substrate and Instream Cover				
Epifaunal Substrate/ Avail Cover (20)	14	9	12	6
Embeddedness (20)*	16		18	
Velocity/Depth Regime (20)*	14		14	
Pool Substrate Characterization (20)**		7		7
Pool Variability (20)**		2		3
Channel Morphology				
Sediment Deposition (20)	12	5	15	16
Flow Status - Maint. Flow Volume (10)	10	6	6	10
Flow Status - Flashiness (10)	8	7	4	10
Channel Alteration (20)	20	19	20	19
Frequency of Riffles/Bends (20) [§]	15		18	
Channel Sinuosity (20)**		13		8
Riparian and Bank Structure				
Bank Stability (L) (10)	9	5	6	5
Bank Stability (R) (10)	9	5	6	5
Vegetative Protection (L) (10)	10	9	6	9
Vegetative Protection (R) (10)	10	9	6	9
Riparian Veg. Zone Width (L) (10)	10	10	10	10
Riparian Veg. Zone Width (R) (10)	10	10	10	10
TOTAL SCORE (200):	167	116	151	127
HABITAT RATING:	EXCELLENT (NON- IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s)				
Date:	8/24/2010	8/18/2010	8/18/2010	8/18/2010
Weather:	Partly Cloudy	Sunny	Sunny	Sunny
Air Temperature:	72 Deg. F.	75 Deg. F.	72 Deg. F.	78 Deg. F.
Water Temperature:	63 Deg. F.	63 Deg. F.	61 Deg. F.	76 Deg. F.
Ave. Stream Width:	6 Feet	10 Feet	15 Feet	20 Feet
Ave. Stream Depth:	0.5 Feet	0.8 Feet	0.33 Feet	4 Feet
Surface Velocity:	0.5 Ft./Sec.	0.3 Ft./Sec.	0.7 Ft./Sec.	0.3 Ft./Sec.
Estimated Flow:	1.5 CFS	2.4 CFS	3.465 CFS	24 CFS
Stream Modifications:	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N
Report Number:	MI/MDNR/WRD-11/###	MI/MDNR/WRD-11/###	MI/MDNR/WRD-11/###	MI/MDNR/WRD-11/###
STORET No.:	160258	710158	710081	710083
Stream Name:	Unnamed Coastal	Schmidt Creek	Little Ocqueoc River	Ocqueoc River
Road Crossing/Location:	Old Mackinaw Road	County Road 646	Silver Creek Road downstream bridge	Walker Highway
County Code:	16	71	71	71
TRS:	T39N/R03W/Sec. 27	T36N/R04E/Sec. 27	T35N/R03E/Sec. 23	T34N/R03E/Sec. 16
Latitude (dd):	45.73823	45.47622	45.40708	45.33734
Longitude (dd):	-84.65209	-83.93858	-84.02893	-84.07274
Ecoregion:	NLAF	NLAF	NLAF	NLAF
Stream Type:	Warmwater	Warmwater	Warmwater	Coldwater
USGS Basin Code:	4070003	4070003	4070003	4070003

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

COMMENTS:

Surveyed in 2005, Large volume of groundwater flow at downstream side of road crossing, Culvert replaced

Surveyed in 2005

Table 3. Habitat evaluation for selected streams located in the Cheboygan River watershed located in Charlevoix, Cheboygan, Emmet, and Otsego Counties, August 16, 2010.

	SITE 5 West Branch Maple River Mill Street GLIDE/POOL	SITE 6 Maple River Maple River Road GLIDE/POOL	SITE 7 Little Sturgeon River M-68 GLIDE/POOL
HABITAT METRIC			
Substrate and Instream Cover			
Epifaunal Substrate/ Avail Cover (20)	7	8	5
Embeddedness (20)*			
Velocity/Depth Regime (20)*			
Pool Substrate Characterization (20)**	7	17	12
Pool Variability (20)**	6	8	8
Channel Morphology			
Sediment Deposition (20)	2	9	5
Flow Status - Maint. Flow Volume (10)	9	9	9
Flow Status - Flashiness (10)	9	9	9
Channel Alteration (20)	19	20	15
Frequency of Riffles/Bends (20)*			
Channel Sinuosity (20)**	7	7	10
Riparian and Bank Structure			
Bank Stability (L) (10)	10	8	9
Bank Stability (R) (10)	10	8	9
Vegetative Protection (L) (10)	10	6	8
Vegetative Protection (R) (10)	10	9	8
Riparian Veg. Zone Width (L) (10)	10	5	10
Riparian Veg. Zone Width (R) (10)	10	5	10
TOTAL SCORE (200):	126	128	127
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s)			
Date:	8/16/2010	8/16/2010	8/16/2010
Weather:	Partly Cloudy	Partly Cloudy	Partly Cloudy
Air Temperature:	70 Deg. F.	70 Deg. F.	70 Deg. F.
Water Temperature:	61 Deg. F.	64 Deg. F.	68 Deg. F.
Ave. Stream Width:	35 Feet	45 Feet	8 Feet
Ave. Stream Depth:	1 Feet	1 Feet	1.5 Feet
Surface Velocity:	0.5 Ft./Sec.	0.5 Ft./Sec.	0.4 Ft./Sec.
Estimated Flow:	17.5 CFS	22.5 CFS	4.8 CFS
Stream Modifications:	None	None	Bank Stabilization
Nuisance Plants (Y/N):	N	N	N
Report Number:	MI/MDNRE/WRD-11/###	MI/MDNRE/WRD-11/###	MI/MDNRE/WRD-11/###
STORET No.:	240200	240167	160222
Stream Name:	West Branch Maple River	Maple River	Little Sturgeon River
Road Crossing/Location:	Mill Street	Maple River Road	M-68
County Code:	24	24	16
TRS:	T37N/R04W/Sec. 33	T36N/R04W/Sec. 14	T35N/R02W/Sec. 29
Latitude (dd):	45.55093	45.50772	45.38982
Longitude (dd):	-84.79648	-84.7621	-84.58972
Ecoregion:	NLAF	NLAF	NLAF
Stream Type:	Warmwater	Coldwater	Coldwater
USGS Basin Code:	4070004	4070004	4070004
* Applies only to Riffle/Run stream Survey:			
** Applies only to Glide/Pool stream Survey:			
COMMENTS:		Surveyed in 2005	Surveyed in 2005 Beaver activity present

Table 3. Habitat evaluation for selected streams located in the Cheboygan River watershed located in Charlevoix, Cheboygan, Emmet, and Otsego Counties, August 16-17, 201

	SITE 8 Sturgeon River White Road RIFFLE/RUN	SITE 9 Pigeon River Old Vanderbilt Road RIFFLE/RUN	SITE 10 Mullett Creek S. Ext Rd GLIDE/POOL
HABITAT METRIC			
Substrate and Instream Cover			
Epifaunal Substrate/ Avail Cover (20)	18	17	2
Embeddedness (20)*	13	14	
Velocity/Depth Regime (20)*	18	19	
Pool Substrate Characterization (20)**			6
Pool Variability (20)**			4
Channel Morphology			
Sediment Deposition (20)	17	17	3
Flow Status - Maint. Flow Volume (10)	10	9	8
Flow Status - Flashiness (10)	10	9	9
Channel Alteration (20)	20	20	19
Frequency of Riffles/Bends (20)*	15	15	
Channel Sinuosity (20)**			16
Riparian and Bank Structure			
Bank Stability (L) (10)	10	9	9
Bank Stability (R) (10)	10	9	9
Vegetative Protection (L) (10)	8	9	9
Vegetative Protection (R) (10)	8	9	9
Riparian Veg. Zone Width (L) (10)	10	10	9
Riparian Veg. Zone Width (R) (10)	10	10	9
TOTAL SCORE (200):	177	176	121
HABITAT RATING:	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
<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:	8/16/2010	8/17/2010	8/16/2010
Weather:	Partly Cloudy	Sunny	Sunny
Air Temperature:	70 Deg. F.	54 Deg. F.	70 Deg. F.
Water Temperature:	65 Deg. F.	58 Deg. F.	58 Deg. F.
Ave. Stream Width:	75 Feet	35 Feet	9 Feet
Ave. Stream Depth:	1.5 Feet	1 Feet	0.417 Feet
Surface Velocity:	2.5 Ft./Sec.	2 Ft./Sec.	0.4 Ft./Sec.
Estimated Flow:	281.25 CFS	70 CFS	1,5012 CFS
Stream Modifications:	None	None	None
Nuisance Plants (Y/N):	N	N	N
Report Number:	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###
STORET No.:	160183	690145	160180
Stream Name:	Sturgeon River	Pigeon River	Mullett Creek
Road Crossing/Location:	White Road	Old Vanderbilt Road	S. Ext Rd
County Code:	16	69	16
TRS:	T34N/R03W/Sec. 01	T32N/R02W/Sec. 25	T36N/R02W/Sec. 06
Latitude (dd):	45.37179	45.12815	45.5399
Longitude (dd):	-84.62407	-84.5068	-84.6092
Ecoregion:	NLAF	NLAF	NLAF
Stream Type:	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4070004	4070004	4070004
* Applies only to Riffle/Run stream Survey:			
** Applies only to Glide/Pool stream Survey:			
COMMENTS:	Surveyed in 2000	Surveyed in 2005 and 2008	Surveyed in 1994

Table 3. Habitat evaluation for selected streams located in the Black River watershed located in Cheboygan, Montmorency, Otsego, and Presque Isle Counties, August 17, 2010.

	SITE 11 Black River Chandler Dam Road RIFFLE/RUN	SITE 12 Black River Blue Lakes Rd RIFFLE/RUN	SITE 13 Black River 0.1 Mile upstream of Black River Road RIFFLE/RUN
HABITAT METRIC			
Substrate and Instream Cover			
Epifaunal Substrate/ Avail Cover (20)	14	16	17
Embeddedness (20)*	14	16	17
Velocity/Depth Regime (20)*	13	14	10
Pool Substrate Characterization (20)**			
Pool Variability (20)**			
Channel Morphology			
Sediment Deposition (20)	16	17	19
Flow Status - Maint. Flow Volume (10)	9	9	10
Flow Status - Flashiness (10)	10	9	10
Channel Alteration (20)	19	20	20
Frequency of Riffles/Bends (20)*	18	17	19
Channel Sinuosity (20)**			
Riparian and Bank Structure			
Bank Stability (L) (10)	10	10	10
Bank Stability (R) (10)	10	10	10
Vegetative Protection (L) (10)	10	10	10
Vegetative Protection (R) (10)	10	10	10
Riparian Veg. Zone Width (L) (10)	10	9	10
Riparian Veg. Zone Width (R) (10)	10	10	10
TOTAL SCORE (200):	173	177	182
HABITAT RATING:	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)
Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s)			
Date:	8/17/2010	8/17/2010	8/17/2010
Weather:	Sunny	Sunny	Partly Cloudy
Air Temperature:	60 Deg. F.	65 Deg. F.	65 Deg. F.
Water Temperature:	60 Deg. F.	64 Deg. F.	64 Deg. F.
Ave. Stream Width:	30 Feet	30 Feet	65 Feet
Ave. Stream Depth:	1 Feet	1.5 Feet	1 Feet
Surface Velocity:	2 Ft./Sec.	2 Ft./Sec.	2.5 Ft./Sec.
Estimated Flow:	60 CFS	90 CFS	162.5 CFS
Stream Modifications:	None	None	None
Nuisance Plants (Y/N):	N	N	N
Report Number:	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###
STORET No.:	690161	600057	160216
Stream Name:	Black River	Black River	Black River
Road Crossing/Location:	Chandler Dam Road	Blue Lakes Rd	0.1 Mile upstream of Black River Road
County Code:	69	60	16
TRS:	T32N/R1W/Sec. 36	T32N/R01E/Sec. 21	T33N/R01E/Sec. 11
Latitude (dd):	45.121	45.15267	45.26116
Longitude (dd):	-84.38663	-84.32304	-84.27004
Ecoregion:	NLAF	NLAF	NLAF
Stream Type:	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4070005	4070005	4070005
* Applies only to Riffle/Run stream Surveys			
** Applies only to Glide/Pool stream Surveys			
COMMENTS:	Stream had recently placed flow diversion structures	Surveyed in 2000 and 2005	Surveyed in 2005

Table 3. Habitat evaluation for selected streams located in the Black River watershed located in Cheboygan, Montmorency, Otsego, and Presque Isle Counties, August 17-24, 2010

	SITE 14 Tomahawk Creek County Road 634 GLIDE/POOL	SITE 15 Milligan Creek two-track off Klieber Road RIFFLERUN	SITE 16 Rainy River Allis Hwy RIFFLERUN
HABITAT METRIC			
Substrate and Instream Cover			
Epifaunal Substrate/ Avail Cover (20)	6	18	16
Embeddedness (20)*		19	19
Velocity/Depth Regime (20)*		11	11
Pool Substrate Characterization (20)**	11		
Pool Variability (20)**	1		
Channel Morphology			
Sediment Deposition (20)	2	20	19
Flow Status - Maint. Flow Volume (10)	10	10	9
Flow Status - Flashiness (10)	10	10	8
Channel Alteration (20)	16	19	20
Frequency of Riffles/Bends (20)*		18	17
Channel Sinuosity (20)**	12		
Riparian and Bank Structure			
Bank Stability (L) (10)	9	10	9
Bank Stability (R) (10)	9	10	9
Vegetative Protection (L) (10)	9	10	9
Vegetative Protection (R) (10)	9	10	9
Riparian Veg. Zone Width (L) (10)	10	10	10
Riparian Veg. Zone Width (R) (10)	10	10	10
TOTAL SCORE (200):	124	185	175

HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)
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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)

	8/17/2010	8/24/2010	8/24/2010
Date:	8/17/2010	8/24/2010	8/24/2010
Weather:	Sunny	Partly Cloudy	Cloudy
Air Temperature:	70 Deg. F.	72 Deg. F.	72 Deg. F.
Water Temperature:	74 Deg. F.	68 Deg. F.	68 Deg. F.
Ave. Stream Width:	12 Feet	27 Feet	30 Feet
Ave. Stream Depth:	0.5 Feet	1 Feet	1 Feet
Surface Velocity:	0.01 Ft./Sec.	1 Ft./Sec.	1 Ft./Sec.
Estimated Flow:	0.06 CFS	27 CFS	30 CFS
Stream Modifications:	None	None	None
Nuisance Plants (Y/N):	N	N	N
Report Number:	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###
STORET No.:	710157	160257	710088
Stream Name:	Tomahawk Creek	Milligan Creek	Rainy River
Road Crossing/Location:	County Road 634	two-track off Klieber Road	Allis Hwy
County Code:	71	16	71
TRS:	T33N/R02E/Sec. 16	T35N/R01E/Sec. 29	T35N/R02E/Sec. 22
Latitude (dd):	45.24384	45.39025	45.40793
Longitude (dd):	-84.20024	-84.33642	-84.17916
Ecoregion:	NLAF	NLAF	NLAF
Stream Type:	Warmwater	Coldwater	Coldwater
USGS Basin Code:	4070005	4070005	4070005

* Applies only to Riffle/Run stream Survey;
** Applies only to Glide/Pool stream Survey;

COMMENTS: Surveyed in 2000 and 2005

Table 3. Habitat evaluation for selected streams located in the Thunder Bay River watershed located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 19-25, 2011

	SITE 17 Lower South Branch Thunder Bay Rive Hubbard Lake Road RIFFLE/RUN	SITE 18 Lower South Branch Thunder Bay Rive Beaver Lake Road GLIDE/POOL	SITE 19 McGinn Creek McCollum Lake Road GLIDE/POOL	SITE 20 McGinn Creek M68 RIFFLE/RUN	SITE 21 Indian Creek VanWagoner Road GLIDE/POOL
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	14	13	14	16	12
Embeddedness (20)*	14			17	
Velocity/Depth Regime (20)*	13			14	
Pool Substrate Characterization (20)**		16	12		11
Pool Variability (20)**		3	9		9
Channel Morphology					
Sediment Deposition (20)	15	17	14	14	11
Flow Status - Maint. Flow Volume (10)	9	9	5	10	10
Flow Status - Flashiness (10)	9	9	9	10	10
Channel Alteration (20)	18	18	19	20	16
Frequency of Riffles/Bends (20)'	7			12	
Channel Sinuosity (20)**		7	17		14
Riparian and Bank Structure					
Bank Stability (L) (10)	9	9	9	10	10
Bank Stability (R) (10)	9	9	9	10	10
Vegetative Protection (L) (10)	6	9	9	10	10
Vegetative Protection (R) (10)	6	9	9	10	10
Riparian Veg. Zone Width (L) (10)	9	9	10	10	10
Riparian Veg. Zone Width (R) (10)	3	9	10	10	10
TOTAL SCORE (200):	141	146	155	173	153

HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
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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)

	8/19/2010	8/19/2010	8/20/2010	8/25/2010	8/25/2010
Date:	8/19/2010	8/19/2010	8/20/2010	8/25/2010	8/25/2010
Weather:	Partly Cloudy	Cloudy	Sunny	Partly Cloudy	Partly Cloudy
Air Temperature:	72 Deg. F.	72 Deg. F.	58 Deg. F.	70 Deg. F.	70 Deg. F.
Water Temperature:	70 Deg. F.	72 Deg. F.	58 Deg. F.	59 Deg. F.	58 Deg. F.
Ave. Stream Width:	100 Feet	100 Feet	4 Feet	10 Feet	6 Feet
Ave. Stream Depth:	1.5 Feet	1.5 Feet	0.2 Feet	0.83 Feet	0.5 Feet
Surface Velocity:	0.7 Ft./Sec.	0.7 Ft./Sec.	0.5 Ft./Sec.	4.15 Ft./Sec.	0.5 Ft./Sec.
Estimated Flow:	105 CFS	105 CFS	0.4 CFS	4.15 CFS	1.5 CFS
Stream Modifications:	None	None	None	None	Impounded
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###
STORET No.:	40186	40185	10127	10128	10129
Stream Name:	Lower South Branch Thunder Bay Rive	Lower South Branch Thunder Bay Rive	McGinn Creek	McGinn Creek	Indian Creek
Road Crossing/Location	Hubbard Lake Road	Beaver Lake Road	McCollum Lake Roac	M68	VanWagoner Road
County Code:	04	04	01	01	01
TRS:	T29N/R07E/Sec. 28	T29N/R07E/Sec. 10	T28N/R05E/Sec. 31	T28N/R05E/Sec. 21	T28N/R05E/Sec. 02
Latitude (dd):	44.88824	44.93182	44.78419	44.80058	44.84553
Longitude (dd):	-83.58732	-83.57477	-83.88352	-83.82836	-83.80598
Ecoregion:	NLAF	NLAF	NLAF	NLAF	NLAF
Stream Type:	Warmwater	Warmwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4070006	4070006	4070006	4070006	4070006

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

COMMENTS: Historic Water Mill upstream of road crossing

Table 3. Habitat evaluation for selected streams located in the Thunder Bay River watershed located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 19-26, 2010

	SITE 22 King Creek Bussie Road GLIDE/POOL	SITE 23 Upper South Branch Thunder Bay River Turtle Lake Road GLIDE/POOL	SITE 24 Gilchrist Creek County Road 612 GLIDE/POOL	SITE 25 Haymeadow Creek M33 GLIDE/POOL	SITE 26 Anchor Creek Carrier Road RIFFLE/RUN
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	12	13	11	8	7
Embeddedness (20)*					10
Velocity/Depth Regime (20) ⁴					8
Pool Substrate Characterization (20)**	8	16	14	9	
Pool Variability (20)**	4	16	14	13	
Channel Morphology					
Sediment Deposition (20)	13	12	13	15	4
Flow Status - Maint. Flow Volume (10)	4	10	10	9	4
Flow Status - Flashiness (10)	9	10	10	10	4
Channel Alteration (20)	19	16	20	20	18
Frequency of Riffles/Bends (20) ⁴					7
Channel Sinuosity (20)**	11	13	10	13	
Riparian and Bank Structure					
Bank Stability (L) (10)	9	10	10	10	4
Bank Stability (R) (10)	9	10	10	10	4
Vegetative Protection (L) (10)	9	10	10	10	2
Vegetative Protection (R) (10)	9	10	10	10	2
Riparian Veg. Zone Width (L) (10)	7	10	10	6	10
Riparian Veg. Zone Width (R) (10)	8	10	10	6	10
TOTAL SCORE (200):	131	166	162	149	94
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON-IMPAIRED)	EXCELLENT (NON-IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)
Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s)					
Date:	8/19/2010	8/26/2010	8/25/2010	8/25/2010	8/17/2010
Weather:	Partly Cloudy	Sunny	Partly Cloudy	Sunny	Partly Cloudy
Air Temperature:	72 Deg. F.	65 Deg. F.	70 Deg. F.	70 Deg. F.	65 Deg. F.
Water Temperature:	72 Deg. F.	55 Deg. F.	58 Deg. F.	68 Deg. F.	72 Deg. F.
Ave. Stream Width:	6 Feet	30 Feet	15 Feet	15 Feet	10 Feet
Ave. Stream Depth:	0.25 Feet	2 Feet	2 Feet	1.5 Feet	0.33 Feet
Surface Velocity:	0.3 Ft./Sec.	1.3 Ft./Sec.	1.3 Ft./Sec.	0.5 Ft./Sec.	0.3 Ft./Sec.
Estimated Flow:	0.45 CFS	78 CFS	39 CFS	11.25 CFS	0.99 CFS
Stream Modifications:	None	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###
STORET No.:	40187	600048	600079	600078	600077
Stream Name:	King Creek	Upper South Branch Thunder Bay River	Gilchrist Creek	Haymeadow Creek	Anchor Creek
Road Crossing/Location:	Bussie Road	Turtle Lake Road	County Road 612	M33	Carrier Road
County Code:	04	60	60	60	60
TRS:	T30N/R06E/Sec. 12	T29N/R04E/Sec. 14	T29N/R03E/Sec. 22	T30N/R02E/Sec. 12	T31N/R04E/Sec. 24
Latitude (dd):	45.01878	44.9070946	44.89917	45.0050776	45.07346
Longitude (dd):	-83.65073	-83.9138162	-84.05326	-84.1388756	-83.89644
Ecoregion:	NLAF	NLAF	NLAF	NLAF	NLAF
Stream Type:	Warmwater	Warmwater	Coldwater	Warmwater	Warmwater
USGS Basin Code:	4070006	4070006	4070006	4070006	4070006
* Applies only to Riffle/Run stream Survey					
** Applies only to Glide/Pool stream Survey					
COMMENTS:		Surveyed in 2000 Small, low-head dam on downstream side of bridge Site is on Turtle Lake Hunt Club Property	Surveyed in 2000		Empty Unionidae shells present

Table 3. Habitat evaluation for selected streams located in the Thunder Bay River watershed located in Alcona, Alpena, Montmorency, Oscoda, and Presque Isle Counties, August 18-19, 2010

	SITE 27 Thunder Bay River Salina Road GLIDE/POOL	SITE 28 Thunder Bay River M65 GLIDE/POOL	SITE 29 North Branch Thunder Bay River Truax Road GLIDE/POOL	SITE 30 Quinn Creek Finley Road GLIDE/POOL
HABITAT METRIC				
Substrate and Instream Cover				
Epifaunal Substrate/ Avail Cover (20)	7	11	2	12
Embeddedness (20)*				
Velocity/Depth Regime (20)*				
Pool Substrate Characterization (20)**	6	15	6	11
Pool Variability (20)**	2	8	2	16
Channel Morphology				
Sediment Deposition (20)	8	12	12	12
Flow Status - Maint. Flow Volume (10)	8	9	8	7
Flow Status - Flashiness (10)	7	8	7	6
Channel Alteration (20)	18	18	15	16
Frequency of Riffles/Bends (20)*				
Channel Sinuosity (20)**	9	7	6	10
Riparian and Bank Structure				
Bank Stability (L) (10)	7	9	8	4
Bank Stability (R) (10)	7	9	8	7
Vegetative Protection (L) (10)	7	8	8	8
Vegetative Protection (R) (10)	7	8	8	8
Riparian Veg. Zone Width (L) (10)	10	10	10	10
Riparian Veg. Zone Width (R) (10)	10	10	10	10
TOTAL SCORE (200):	113	142	110	137

HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
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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)

	8/19/2010	8/19/2010	8/18/2010	8/19/2010
Date:	8/19/2010	8/19/2010	8/18/2010	8/19/2010
Weather:	Rainy	Rainy	Sunny	Sunny
Air Temperature:	65 Deg. F.	65 Deg. F.	72 Deg. F.	72 Deg. F.
Water Temperature:	71 Deg. F.	70 Deg. F.	74 Deg. F.	70 Deg. F.
Ave. Stream Width:	100 Feet	100 Feet	50 Feet	12 Feet
Ave. Stream Depth:	3.5 Feet	3 Feet	1 Feet	1 Feet
Surface Velocity:	0.4 Ft./Sec.	0.3 Ft./Sec.	0.3 Ft./Sec.	0.3 Ft./Sec.
Estimated Flow:	140 CFS	90 CFS	15 CFS	3.6 CFS
Stream Modifications:	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N
Report Number:	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###	MI/DNRE/WRD-11/###
STORET No.:	40042	40184	40183	710159
Stream Name:	Thunder Bay River	Thunder Bay River	North Branch Thunder Bay River	Quinn Creek
Road Crossing/Location:	Salina Road	M65	Truax Road	Finley Road
County Code:	04	04	04	71
TRS:	T31N/R05E/Sec.13	T32N/R06E/Sec. 32	T32N/R05E/Sec. 18	T33N/R05E/Sec. 18
Latitude (dd):	45.08249	45.12058	45.17237	45.25475
Longitude (dd):	-83.75754	-83.72233	-83.86364	-83.86155
Ecoregion:	NLAF	NLAF	NLAF	NLAF
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4070006	4070006	4070006	4070006

* Applies only to Riffle/Run stream Survey:

** Applies only to Glide/Pool stream Survey:

COMMENTS:	Surveyed at Long Rapids Park	Low macroinvertebrate densities Empty Unionidae shells
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