

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
WATER RESOURCES DIVISION  
SEPTEMBER 2015

STAFF REPORT

BIOLOGICAL SURVEYS OF THE AU SABLE RIVER AND BLACK RIVER WATERSHEDS  
OTSEGO, CRAWFORD, MONTMORENCY, ROSCOMMON, OGEMAW, OSCODA, IOSCO,  
ALCONA, AND ALPENA COUNTIES, MICHIGAN  
JUNE-SEPTEMBER 2012

## INTRODUCTION

Biological and physical habitat surveys of the Au Sable River (Hydrologic Unit Code [HUC] 04070007) and Black River watersheds (HUC 04070003) were conducted from June to September 2012 as part of the Michigan Department of Environmental Quality (MDEQ), Water Resources Division, Surface Water Assessment Section's (SWAS), five-year rotating basin monitoring design. Macroinvertebrate and habitat surveys were completed at 27 sites following the SWAS Procedure 51 (MDEQ, 1990), and at two sites following the SWAS Procedure 22 (MDEQ, 2013). Five additional sites within the Au Sable River watershed were added to the 2012 sampling design to address targeted monitoring requests (one of which was also a trend site).

Specific monitoring objectives were to:

- Identify nonpoint sources (NPS) of water quality impairment.
- Assess the current status and condition of individual water bodies and determine whether Michigan Water Quality Standards (WQS) are being met.
- Satisfy monitoring requests submitted by internal and external customers.
- Evaluate biological integrity temporal trends.

## STUDY AREA

### Au Sable River Watershed

The Au Sable River is approximately 150 miles long and drains 1,932 square miles in the northeastern Lower Peninsula. It is situated within the Northern Lakes and Forest United States Environmental Protection Agency (USEPA) Level III ecoregion. The Au Sable River is known for its stable base flows and is considered one of the most stable rivers in the United States (Zorn and Sendek, 2001). It is also known for its coldwater fisheries and relatively natural landscape. A 23-mile segment of the Au Sable River between Mio Pond and Alcona Pond is nationally designated as a Scenic River under the National Wild and Scenic Rivers Act (1968), and a large portion of the watershed is protected as a Natural River under Michigan's Natural Rivers Program (Part 305, Natural Rivers, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended). In 2001, the Michigan Department of Natural Resources (MDNR) completed a river assessment of the Au Sable River and surrounding watershed that contains detailed information on the geography, history, geology, hydrology, morphology, water quality, and biological communities of the Au Sable River watershed, and we refer the reader to that document for more background information (Zorn and Sendek, 2001).

## Black River Watershed

The Black River watershed encompasses approximately 200 square miles in the northeastern Lower Peninsula within the Northern Lakes and Forest USEPA Level III Ecoregion. It is situated to the northeast of the Au Sable River watershed and contains two main rivers, the Black River and Devils River. This watershed is almost entirely situated within the Cheboygan Lake Plains USEPA Level IV Ecoregion characterized by flatter topography, longer growing season, increased incidence of wetlands, somewhat reduced occurrence of northern hardwoods, and thinner glacial drift with limestone bedrock near or at the surface (USEPA, 2007). Land use is similar to the Au Sable River watershed with forest dominating the landscape; however, agriculture and urban areas make up a greater portion of the Black River watershed.

### HISTORICAL SAMPLING EFFORTS

## Au Sable River Watershed

The MDEQ's Water Resources Division conducted biological surveys following Procedure 51 within the Au Sable River watershed several times prior to 2012.

- Biological surveys in 1984 and 1992 (Morse, 1994) found macroinvertebrate communities ranging from Fair to Good. Habitat conditions were also decent throughout the watershed with sites ranging from Fair to Excellent. The only exception to this was Tank Creek. Tank Creek was rated as having Poor habitat conditions in 1992 due to high amounts of sedimentation. However, this site was revisited in 2007 and found to be free of large amounts of sedimentation (Cooper, 2008). The 1992 survey also found the presence of some heavy metal contaminants in sediment downstream of Grayling, although water chemistry samples indicated virtually no heavy metal contaminants (Morse, 1994).
- In 1997, 24 biological surveys were conducted within the watershed (Kohlhepp, 2001). Macroinvertebrate communities ranged from Acceptable to Excellent, while habitat conditions ranged from Fair to Excellent. Water chemistry grab samples were examined for nutrients and conventional pollutants at 9 stations and did not exceed WQS. In 1998, water chemistry data from the Au Sable River watershed indicated water quality was generally very good except for PCBs and DDT, which exceeded WQS in some sites tested near the mouth (Kohlhepp, 2001).
- In 2002, 10 sites were surveyed to assess macroinvertebrate communities and 12 sites were surveyed to assess habitat conditions (Kohlhepp, 2003a). Macroinvertebrates were characterized as Acceptable or Excellent, while habitat was rated as Good or Excellent.
- In 2007, Procedure 51 biological surveys were conducted at 29 sites in the Au Sable River watershed (Cooper, 2008). Macroinvertebrate communities ranged from Acceptable to Excellent, while habitat conditions ranged from Good to Excellent.

## Black River Watershed

The MDEQ's Water Resources Division conducted biological surveys following Procedure 51 within the Black River watershed several times prior to 2012.

- In 1989, surveys were conducted in the Black River to determine the extent of NPS pollution inputs as a result of sedimentation in the watershed. It was found that there was no evidence of anthropogenic NPS sedimentation found above the mouth, and the predominance of sand observed at the mouth was due to its predominance on the surrounding Lake Huron coastline (Hull, 1990).
- In 1998 (Kohlhepp, 2000) and 2002 (Kohlhepp, 2003b), biological surveys were conducted on the Black River and Devils River at two sites. In the Black River, macroinvertebrates were found to be Acceptable in both years with very similar communities. Habitat was Fair in 1998 and Good in 2002. In the Devils River, macroinvertebrates were Acceptable in both years, while habitat was Good in 1998 and Excellent in 2002.
- In 2007, biological surveys were completed at seven sites within the Black River watershed. Habitat was Good or Excellent in all sites. Macroinvertebrate communities were Acceptable in five sites, Excellent in one site, and Poor in one site (limited flow, Procedure 51 may not have been appropriate; Schmitt, 2008).

## METHODS

Biological surveys were completed at 29 sites in the Au Sable River (Table 1, Figure 1) and Black River watersheds (Table 2, Figure 2) following Procedure 51, and at two sites in the Au Sable River watershed following Procedure 22 in 2012. Sixteen sites (14 wadeable, 2 nonwadeable) within the Au Sable River watershed and four sites within the Black River watershed were randomly selected using a stratified random site selection method to address statewide and watershed-wide questions following the SWAS's Biological Monitoring Status and Trend Procedure 27 (MDEQ, 2015). Ten trend sites in the Au Sable River watershed and two trend sites within the Black River watershed were chosen to track temporal trends in biological data (three of which overlap with status sites, Table 1; MDEQ, 2015). Five additional sites within the Au Sable River watershed (two sites on Perry Creek, two sites on Antler Creek, and one site on Gimlet Creek) were sampled to fulfill targeted monitoring requests (one of which overlaps with a trend site).

Procedure 51 assigns a score to macroinvertebrate communities and habitat conditions using metrics that rate macroinvertebrates as Excellent (> 4), Acceptable (+ 4 to - 4), or Poor (< 4) based on the macroinvertebrate community composition and structure, and habitat as Excellent (> 154), Good (105 to 154), Marginal (56 to 104), or Poor (< 56) based on several parameters that describe in-stream and riparian conditions (Creal et al., 1996).

Procedure 22 assigns a score to macroinvertebrate communities using metrics that rate macroinvertebrates as Excellent (76 to 100), Good (51-75), Marginal (26-50), or Poor (0-25) based on several metrics that describe macroinvertebrate community composition and structure, and abundance and diversity of functional feeding groups (MDEQ, 2013). Procedure 22 also characterizes riparian habitat, in-stream cover, substrate, bank stability, and off-channel habitat.

## RESULTS

### Au Sable River Watershed

#### *Status Sites*

The Au Sable River begins at the confluence of Bradford and Kolke Creeks north of Frederic. It flows south to Grayling and then east to southeast, receiving several major tributaries and passing through six hydropower dams before entering Lake Huron near Oscoda. Sixteen random sites were surveyed for macroinvertebrates and habitat in the Au Sable River watershed in 2012. Three of these sites were also trend sites (North Branch Au Sable, Smith Creek, and South Branch Pine River). Overall, sites ranged from Good to Excellent in terms of habitat conditions (Table 3) and Acceptable to Excellent in terms of macroinvertebrate communities (Table 4).

The headwaters of the Au Sable River are characterized as having well drained outwash sands and gravels that create stable, groundwater-dominated flows, and coldwater biological communities. Land use in this region is primarily mixed deciduous and coniferous forest, with intermittent patches of agricultural and urban land use. The furthest site upstream sampled in 2012 was an unnamed tributary to Bradford Creek off of Twin Peaks Road. The stream channel in this area was braided with silt and sand substrate, and was bordered by sedges, tamarack, spruce, and other coniferous trees. Overall, habitat in this section of stream was Excellent (Table 3) and the macroinvertebrate community was considered Acceptable (Table 4) with 33 taxa present, 24% ephemeroptera, 21% tricoptera, and 16% dominant taxa (Baetidae).

The first major tributary to the Au Sable River is the East Branch Au Sable River, which flows southwest to join the mainstem Au Sable River in Grayling. A site on the upper end of the East Branch Au Sable River was sampled in 2012. This site had sand substrate with gravel dispersed throughout and some artificial habitat structures (i.e., old cribs and log jams). Overall, habitat conditions were Excellent with only epifaunal substrate/available cover and pool variability scoring less than Good (Table 3). The macroinvertebrate community was considered Acceptable with 29 taxa present, 25% ephemeroptera, 20% tricoptera, and 38% dominant taxa (Hydrobiidae; Table 4).

As the Au Sable River continues east, it receives three major tributaries: the South Branch Au Sable River, North Branch Au Sable River, and Big Creek (South). This segment is a medium-sized, coldwater stream, with a slightly lower gradient compared to upstream segments, but with similar land use (Zorn and Sendek, 2001). The South Branch Au Sable River flows from Russell Lake through Lake Saint Helen, northwest to Roscommon and then northeast to join the mainstem Au Sable River just downstream of the Wakeley Bridge. One site on the South Branch Au Sable River was sampled in 2012. Habitat in this section was Good with most individual parameters scoring Good or Excellent, and only epifaunal substrate/available cover and pool variability scoring Marginal (Table 3). Macroinvertebrates were considered Acceptable in this site with 38 taxa present, 22% ephemeroptera, 18% tricoptera, 15% dominant taxa (Corrixidae), and 16% surface air breathers (Table 4).

The second major tributary to the Au Sable River, the North Branch Au Sable River, originates south of Gaylord and flows southeast, receiving Big Creek (North) before entering the mainstem. The North Branch Au Sable River (two-track off of McMasters Bridge Road; also a Trend site) was characterized as having Excellent habitat (Table 5) and Excellent macroinvertebrate communities in 2012 (Table 6).

Big Creek (South) is the third major tributary to the Au Sable River. Big Creek (South) is formed by the West Branch Big Creek (South) and East Branch Big Creek (South) in western-central Oscoda County. Habitat in this section was Excellent with all but one individual parameter scoring Excellent (Velocity/depth scored Good; Table 3). Not surprisingly, the macroinvertebrate community was also considered Excellent in this section and was made up of 34 taxa, 14% of which were ephemeroptera, 46% of which were tricoptera, and 15% of which were dominant taxa (Helicopsycidae; Table 4).

Downstream of this point, the river experiences a number of changes as it passes through three hydropower dams, which produce segments with cold to warm water temperatures and corresponding biological communities (Zorn and Sendek, 2001). Sites in this section of the river (Sites 6-9) had Good to Excellent habitat conditions (Table 3) and Acceptable macroinvertebrate communities (Table 4).

The Pine River is a major tributary to the Au Sable River and enters the river approximately two miles upstream of Lake Huron. This tributary and its basin are differentiated from other subbasins of the Au Sable River by its less porous soils, greater agricultural use, and higher density of streams (Zorn and Sendek, 2001). Five probabilistic sites were sampled in this basin in 2012. All probabilistic sites in this basin had Good or Excellent habitat (Table 3) and Acceptable or Excellent macroinvertebrate communities (Table 4).

Two sites on the mainstem Au Sable River downstream of Foote Dam were sampled in 2012 following Procedure 22. The first of these sites was near Pinecrest Trail, approximately 3.8 miles upstream of the confluence with the Pine River. This site had a Good macroinvertebrate community overall (75), with Excellent Functional Feeding Group Diversity (25/25), percent tricoptera composition (20/25), EPT Richness (8/8), Total Richness (7/7), and Percent Dominance (5/5). Habitat was generally good overall, with some unstable banks throughout the reach. The second site was near Mill Street approximately 1.4 miles downstream of the Pine River confluence. This site had lower scores for nearly all metrics compared to the upstream site, and had an overall Marginal macroinvertebrate score (30) with good Functional Feeding Group Diversity (16/25), low Habitat Stability Functional Feeding Group Surrogate ([ratio of scrapers + collector filterers]/[Shredders + collector gatherers]; 0), and low EPT Richness (3/8). This site was located in the town of Oscoda and had little riparian vegetation and riprap lined banks throughout the reach lowering habitat scores and likely influencing the presence and abundance of many macroinvertebrate taxa.

#### *Trend Sites*

As part of an ongoing effort to evaluate temporal changes in biological data, ten trend sites were sampled in 2012. All sites sampled in 2012 had been previously sampled at least once in 2007. Most sites were similar in 2012 when compared to sites in 2007; however, data will not be available to fully evaluate trends until 2017 when three visits to each site have been completed. In 2012, sites had habitat ranging from Marginal to Excellent (Table 5), and macroinvertebrate communities ranging from Acceptable to Excellent (Table 6) with the lowest scoring sites in the lower end of the Pine River subbasin.

Nearly all trend sites within the Au Sable River watershed upstream of the Pine River confluence had Excellent habitat conditions, and were either the same or better than previous surveys. Sites within the Pine River subbasin, however, scored slightly lower in 2012 than they had in 2007. Three trend sites within the Pine River watershed were surveyed in 2012: South Branch Pine River, Pine River, and Duvall Creek.

The South Branch Pine River at Buhl Road is a medium-sized, coldwater river with mixed substrate. In 2007, this site was scored as a riffle/run stream and scored Excellent for most individual habitat parameters, and no less than Good for all parameters. This is in contrast to the sampling in 2012, in which the stream was considered a pool/glide stream and had scores ranging from Marginal to Excellent with an overall rating of Good. There does not appear to be any substantial land use changes in this area from 2007 to 2012 (based on satellite imagery). The differences in habitat scores may be due to variation among observers or differences in sample locations within this segment. Although habitat assessments differed between years, macroinvertebrate communities were scored as Excellent in both years and had very similar communities between years.



South Branch Pine River 2012.

The Pine River at F41 (Somers Road) is a medium-sized, glide/pool river with sand and silt substrate. In 2007, this site had Good habitat conditions and an Excellent macroinvertebrate community. However, in 2012, habitat conditions were considered Marginal with most individual parameters scoring Poor or Marginal (Table 5). In 2012, the Pine River scored lower for bank stability and vegetation protection than it had in 2007. The macroinvertebrate community also scored lower in 2012, but was still considered Acceptable overall (Table 6).



Pine River (F41) 2012.

Duvall Creek at F41 (Somers Road) is a small riffle/run stream with silty sand substrate and some intermittent patches of clay. In 2007, this section of stream had Good habitat and Acceptable macroinvertebrates. Similar to the Pine River, habitat quality was Marginal in 2012 (Table 5) with lower scores for bank stability, vegetative protection, and flashiness than in 2007. However, the macroinvertebrate community remained Acceptable in 2012 (Table 6).



Duvall Creek 2012.

### *Targeted Sites*

Perry Creek (680063 and 680056)

Perry Creek originates in central Oscoda County and flows south into the Au Sable River. A site on Perry Creek was targeted in 2012 to investigate the potential impacts of a contaminated groundwater plume on the biological community of Perry Creek. Two sites on this stream were sampled in 2012, one upstream of the contaminated site, and one downstream. The upstream site (off of Kneeland Road; also a trend site) was a small riffle/run stream with sand substrate, a fair amount of woody debris and Excellent riparian vegetation. Overall, this site had Good habitat with individual parameters ranging from Marginal to Excellent (Table 5), and an Acceptable macroinvertebrate community (Table 6).

The downstream site on Perry Creek (F32) was also a small riffle/run stream, with mixed substrate. This site scored higher overall for habitat conditions and was categorized as Excellent (Table 5). Higher individual parameter scores for substrate and in-stream cover accounted for most of this difference. This site had an Excellent macroinvertebrate community (Table 6) with a greater ephemeroptera composition, lower dominant taxa composition, and lower isopod, snail, leech composition. When compared to the upstream Kneeland Road location, the downstream site data does not indicate any significant impact to the macroinvertebrate community from upstream sources.

#### Antler Creek (680076 and 680077)

Antler Creek is a small tributary to the Au Sable River that originates southwest of Mio and flows into Mio Pond near Camp Ten Bridge. A monitoring request was submitted by the United States Forest Service to evaluate potential impacts of a metal recycling facility located in the headwaters of Antler Creek. To address this concern, two water chemistry samples were taken from Antler Creek, one upstream and one downstream of the metal recycling facility in 2012. Both sites were very similar for all parameters measured and met all applicable WQS (Table 7).

#### Gimlet Creek (010132)

Gimlet Creek was targeted in 2012 to gather assessment data relative to the coldwater fishery designated use component of the Michigan WQS. Gimlet Creek is considered a coldwater stream by the MDNR; however, it is unknown if trout inhabit the stream.

In August of 2012, the fish community of Gimlet Creek at Buhl Road was sampled following SWAS Procedure 51. A total of 111 individuals comprising 13 species were collected (Table 8). Creek Chub were the most abundant species and made up 56% of the fish community, followed by Northern Redbelly Dace (13%) and Blacknose Dace (10%). No trout species were collected during this survey and temperatures taken at three locations (Buhl Road, Mikado Road, and Cruzen Road) suggest marginal habitat conditions for coldwater species (71-73.5 Fahrenheit).

### Black River Watershed

#### *Status Sites*

#### McLary Creek (040191)

McLary Creek is a small glide/pool stream that originates east of Alpena, Michigan, and flows southeast into Mud Lake. It is a silt- and sand-bottomed stream bordered by herbaceous riparian vegetation and mixed deciduous forests in the surrounding watershed. Habitat in this site was considered Marginal overall and most individual habitat parameters were Marginal as well (Table 9). The macroinvertebrate community in this site was characterized as Acceptable (0) with 23 taxa present (Table 10). This site also had relatively low percentages of macroinvertebrates that indicate good habitat and water quality with ephemeroptera making up < 1% of the community and tricoptera making up 4% of the community. The most dominant taxa were Chironomidae (43%) and Amphipoda (25%).

## Devils River (040134)

Devils River is an outlet of Devils Lake in eastern Alpena County that flows southeast into Lake Huron near Ossineke. Devils River at State Road is a wide, shallow, glide/pool river with Marginal habitat and an Acceptable macroinvertebrate community. Most individual habitat parameters ranged from Marginal to Excellent in 2012 with the exception of pool variability, which scored as Poor due to a lack of large or deep pools (Table 9). The macroinvertebrate community in this part of the river was comprised of 26% ephemeroptera, 5% tricoptera, and 29% dominant taxa (Chironomidae; Table 10). This site scored the highest of all sites sampled within the Black River watershed in 2012 for macroinvertebrates.

## Black River (010135 and 010134)

The Black River begins northwest of Harrisville in Alcona County and flows northeast through mixed deciduous forests before it flows east into Lake Huron in the town of Black River. Two headwater sites were sampled on the Black River in 2012, one off of Ritchie Road and one off of Poor Farm Road approximately one mile downstream.

The Black River near Ritchie Road is a small riffle/run stream characterized by sand substrate, silty margins, fair amounts of woody debris, and moderately stable banks. Habitat in this site was considered Good in 2012, although individual parameters ranged from Marginal to Excellent (Table 9). The macroinvertebrate community was characterized as Acceptable with 34 taxa present, 7% ephemeroptera, 13% tricoptera, 21% dominant taxa (amphipods), and 4% surface air breathers (Table 10).

The Black River off of Poor Farm Road is a narrow, shallow, glide/pool stream with Good habitat and an Acceptable macroinvertebrate community. Individual habitat parameters ranged from Poor to Excellent with parameters characterizing substrate and in-stream cover scoring lowest, and parameters characterizing riparian and bank structure scoring highest (Table 9). The macroinvertebrate community was comprised of 29 taxa, 7% ephemeroptera, 10% tricoptera, and 26% dominant taxa (Sphaeriidae; Table 10).

## *Trend Sites*

Two Trend sites were sampled within the Black River watershed in 2012, South Branch Devils River and Berlinski Creek. Both sites were rated similar to, or better than, previous sampling events. However, Berlinski Creek has only been sampled once prior to 2012.

South Branch Devils River originates in northeast Alcona County and flows northeast to Ossineke where it joins the Devils River. This site at Nicholson Road had been previously sampled in 2002 and 2007. In both years habitat was considered Excellent. In 2002, macroinvertebrates were Acceptable, whereas in 2007, macroinvertebrates were Excellent. In 2012, this site retained its Excellent status for both habitat (Table 11) and macroinvertebrates (Table 12).



South Branch Devils River 2012.



Berlinski Creek is a small riffle/run stream that flows into Devils Lake near the outlet of Devils River. This site, off of Carriveau Road, had been sampled in 2007 and had Excellent habitat and an Acceptable macroinvertebrate community. In 2012, habitat in Berlinski Creek was rated Excellent (Table 11), as was its macroinvertebrate community (Table 12).



Berlinski Creek 2012.

## NPS WATER QUALITY IMPAIRMENTS

No severe NPS impairments were observed or noted during the surveys described in this report or during travel between stations. Riprap-lined banks on the lower Au Sable River near Mill Street were observed and may be a minor NPS concern. Banks at this site were stabilized by riprap and retaining walls, preventing growth of riparian vegetation and homogenizing available habitat along the river's margins. This likely influenced the macroinvertebrate scores at this site and may have led to lower scores in this section of the river.

## WATERSHED ATTAINMENT

In 2014, 16 randomly selected sites within the Au Sable River watershed were sampled to support attainment status calculation. Based on the probabilistic monitoring aspect of this watershed survey,  $100\% \pm 17\%$  of the randomly selected sites supported the other indigenous aquatic life and wildlife designated use using biological monitoring procedures (MDEQ, 2015). Percent attainment was calculated by dividing the number of random sites that meet WQS by the total number of random locations ( $(16/16)100=100\%$ ). This value is coupled with a 95% confidence interval to provide our estimation of certainty (MDEQ, 2015), meaning there is 95% certainty that the true proportion of attainment in the Au Sable River watershed is between 83% and 100%.

In 2014, four randomly selected sites within the Black River watershed were sampled to support attainment status calculation. Based on the probabilistic monitoring aspect of this watershed survey,  $100\% \pm 53\%$  of the randomly selected sites supported the other indigenous aquatic life and wildlife designated use using biological monitoring procedures (MDEQ, 2015). Percent attainment was calculated by dividing the number of random sites that meet WQS by the total number of random locations ( $(4/4)100=100\%$ ). This value is coupled with a 95% confidence interval to provide our estimation of certainty (MDEQ, 2015), meaning there is 95% certainty that the true proportion of attainment in the Black River watershed is between 47% and 100%.

Field Work By: Kevin Goodwin, Aquatic Biologist  
John Matousek, Aquatic Biologist  
Marcy Knoll, Aquatic Biologist  
Tom Alwin, Aquatic Biologist  
Dawn Roush, Aquatic Biologist  
Surface Water Assessment Section  
Water Resources Division

Report By: Kelly Turek, Aquatic Biologist  
Surface Water Assessment Section  
Water Resources Division

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Figure 1. Status and trend site locations during the 2012 biological survey of the Au Sable River watershed.

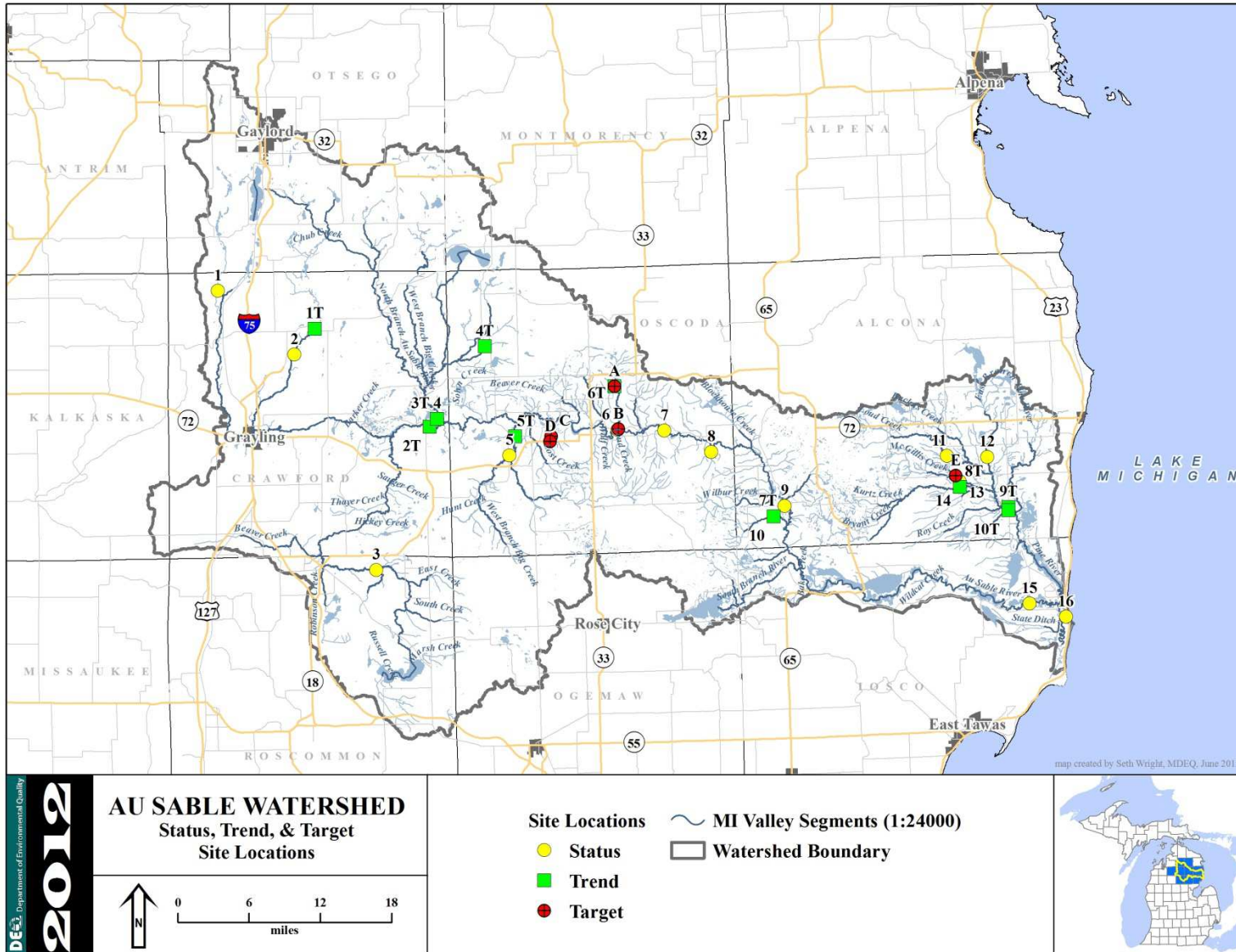


Figure 2. Status and trend site locations during the 2012 biological survey of the Black River watershed.

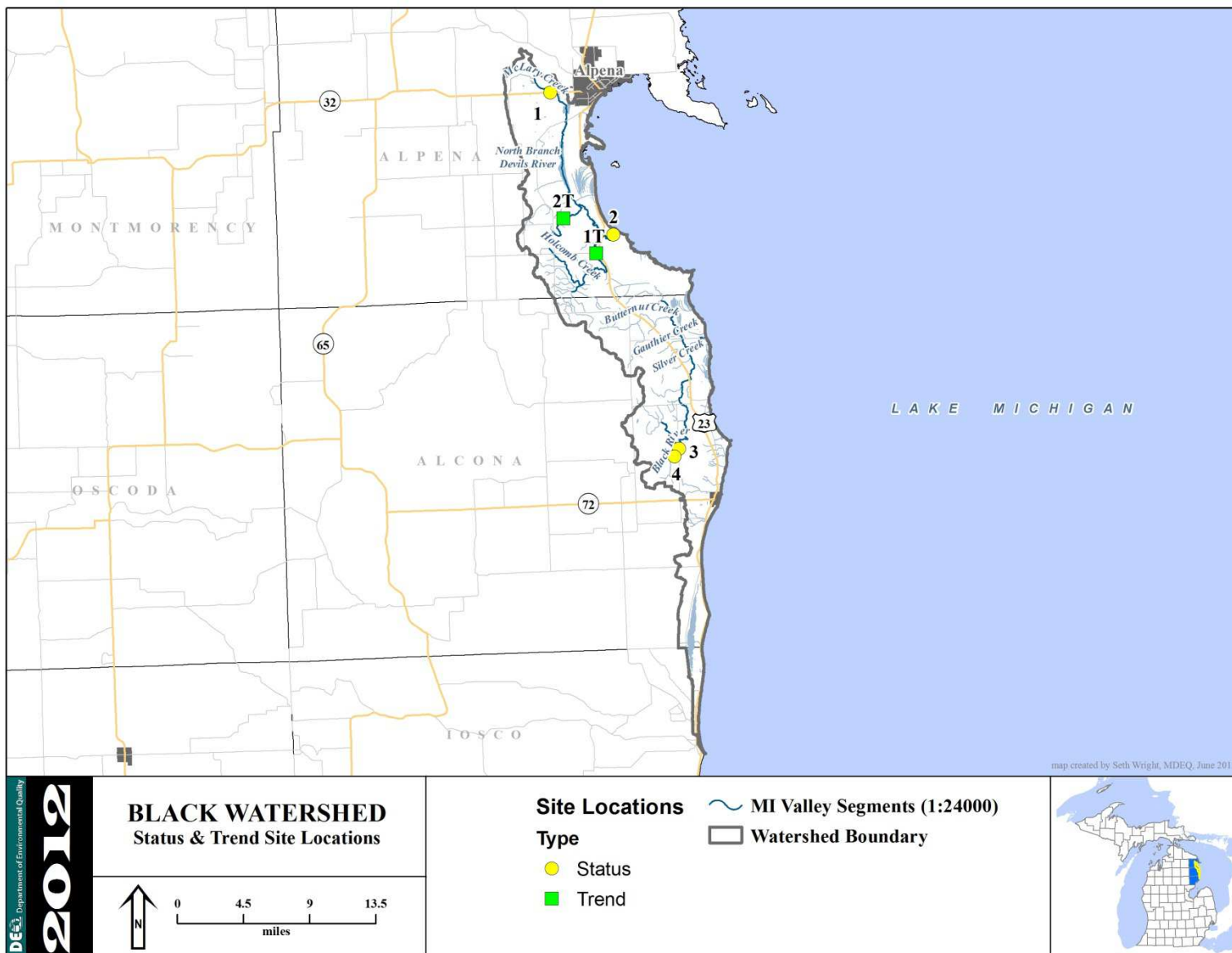


Table 1. Status and trend site locations during the 2012 biological survey of the Au Sable River watershed.

<b>Au Sable River Watershed 2012</b>												
<b>Status</b>												
	Site	Location	Watershed	Latitude	Longitude	STORET	Stream Type	Habitat	Score	Macro	Score	
	1	Unnamed Tributary to Bradford Creek	Twin Peaks / West Mt. Frederic downstream	Au Sable River	44.83599	-84.76172	200137	Coldwater	Excellent	173	Acceptable	3
	2	East Branch Au Sable River	Vista Drive	Au Sable River	44.75701	-84.63271	200172	Coldwater	Excellent	158	Acceptable	2
	3	South Branch Au Sable River	AuSable River Trail / Curnalia Trail	Au Sable River	44.49335	-84.50000	720172	Coldwater	Good	143	Acceptable	4
	4	North Branch Au Sable River (also Trend)	2 Track off McMasters Bridge Road	Au Sable River	44.67569	-84.39149	200161	Coldwater	Excellent	179	Excellent	5
	5	West Branch Big Creek	County Road 489	Au Sable River	44.62950	-84.26970	680062	Coldwater	Excellent	178	Excellent	5
	6	Au Sable River	McKinley Road / F32	Au Sable River	44.65741	-84.08400	680074	Coldwater	Excellent	183	Acceptable	2
	7	Au Sable River	US 4350 Cathedral Pines	Au Sable River	44.65527	-84.00461	680073	Coldwater	Excellent	183	Acceptable	4
	8	Ninemile Creek	South River Road	Au Sable River	44.62799	-83.92553	680075	Coldwater	Good	125	Acceptable	3
	9	Au Sable River	Bamfield Road downstream	Au Sable River	44.56002	-83.80266	10131	Coldwater	Good	149	Acceptable	-1
	10	Smith Creek (also Trend)	2 Track off from Aldrich	Au Sable River	44.54760	-83.82210	10108	Coldwater	Excellent	161	Acceptable	1
	11	West Branch Pine River	Hubbard Lake Rd	Au Sable River	44.61514	-83.52406	10077	Coldwater	Excellent	172	Excellent	6
	12	East Branch Pine River	Procurier Rd	Au Sable River	44.61250	-83.45528	10066	Warmwater	Good	108	Acceptable	4
	13	South Branch Pine River (also Trend)	Buhl Road	Au Sable River	44.57713	-83.50319	10115	Coldwater	Good	147	Excellent	9
	14	McGills Creek	Buhl Road	Au Sable River	44.58353	-83.50355	10133	Coldwater	Good	133	Excellent	5
	15	Au Sable River (non-wadeable)	Pinecrest Trail	Au Sable River	44.43252	-83.39128	350255	Coldwater	Good	75	NA	NA
	16	Au Sable River (non-wadeable)	Mill St.	Au Sable River	44.41514	-83.33046	350058	Coldwater	Marginal	30	NA	NA
<b>Trend</b>												
	Site	Location	Watershed	Latitude	Longitude	STORET	Stream Type	Habitat	Score	Macro	Score	
	1T	East Branch Au Sable	Downstream from County Road 612	Au Sable River	44.78794	-84.59722	200165	Coldwater	Excellent	161	Acceptable	4
	2T	AuSable River	Wiseman Trail West of McMaster Bridge Road	Au Sable River	44.66635	-84.40427	200160	Coldwater	Excellent	178	Excellent	5
	3T	North Branch Au Sable River (also Status)	2 Track off McMasters Bridge Road	Au Sable River	44.67569	-84.39149	200161	Coldwater	Excellent	179	Excellent	5
	4T	Wright Creek	Bear Lake Road	Au Sable River	44.76252	-84.30752	680066	Warmwater	Excellent	164	Acceptable	2
	5T	Big Creek	Brown Cabin Road	Au Sable River	44.65220	-84.25860	680008	Coldwater	Excellent	167	Excellent	6
	6T	Perry Creek (also Targeted)	Kneeland Road	Au Sable River	44.71050	-84.08740	680063	Coldwater	Good	120	Acceptable	3
	7T	Smith Creek (also Status)	2 Track off from Aldrich	Au Sable River	44.54760	-83.82210	10108	Coldwater	Excellent	161	Acceptable	1
	8T	South Branch Pine River (also Status)	Buhl Road	Au Sable River	44.57713	-83.50319	10115	Coldwater	Good	147	Excellent	9
	9T	Pine River	F-41 (Somers Road)	Au Sable River	44.55070	-83.42210	10109	Warmwater	Marginal	102	Acceptable	4
	10T	Duvall Creek	downstream F41 (Somers Road)	Au Sable River	44.54680	-83.42190	10110	Warmwater	Marginal	99	Acceptable	4
<b>Targeted</b>												
	Site	Location	Watershed	Latitude	Longitude	STORET	Stream Type	Habitat	Score	Macro	Score	
	A	Perry Creek (also Trend)	Kneeland Road	Au Sable River	44.71050	-84.08740	680063	Coldwater	Good	120	Acceptable	3
	B	Perry Creek	F32 Road	Au Sable River	44.65830	-84.08280	680056	Coldwater	Excellent	176	Excellent	6
	C	Antler Creek	1/2 mile downstream of M-72	Au Sable River	44.65153	84.19706	680076	Coldwater	NA	NA	NA	NA
	D	Antler Creek	at M-72	Au Sable River	44.64518	84.19968	680077	Coldwater	NA	NA	NA	NA
	E	Gimlet Creek	Buhl Road	Au Sable River	44.59073	-83.50990	10132	Coldwater	NA	NA	NA	NA

Table 2. Status and trend site locations during the 2012 biological survey of the Black River watershed.

Black River Watershed 2012											
Status											
	Site	Location	Watershed	Latitude	Longitude	STORET	Stream Type	Habitat	Score	Macro	Score
1	McLary Creek	M-32	Black River	45.06164	-83.50359	40191	Warmwater	Marginal	83	Acceptable	0
2	Devils River	State Street	Black River	44.91977	-83.42230	40134	Coldwater	Marginal	101	Acceptable	4
3	Black River	Poor Farm Road	Black River	44.70730	-83.34106	10134	Coldwater	Good	120	Acceptable	3
4	Black River	Ritchie Road	Black River	44.69981	-83.34756	10135	Coldwater	Good	110	Acceptable	3
Trend											
	Site	Location	Watershed	Latitude	Longitude	STORET	Stream Type	Habitat	Score	Macro	Score
1T	South Branch Devils River	Nicholson Hill Rd	Black River	44.90207	-83.44683	40132	Coldwater	Excellent	162	Excellent	5
2T	Berlinski Creek	Off Carriveau Road	Black River	44.93745	-83.49062	40172	Coldwater	Excellent	167	Excellent	6

Table 3. Habitat evaluation for the Au Sable River watershed probabilistic sites, June-September 2012.

	Unnamed Tributary to Bradford Creek Twin Peaks / West Mt. Frederic downstream GLIDE/POOL SITE 1	East Branch AuSable River Vista Drive GLIDE/POOL SITE 2	South Branch AuSable River AuSable River Trail / Cumalia Trail GLIDE/POOL SITE 3	West Branch Big Creek County Road 489 RIFFLE/RUN SITE 5
<b>HABITAT METRIC</b>				
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	15	10	9	18
Embeddedness (20)*				10
Velocity/Depth Regime (20)*				15
Pool Substrate Characterization (20)**	16	16	14	
Pool Variability (20)**	9	9	10	
<b>Channel Morphology</b>				
Sediment Deposition (20)	18	15	11	18
Flow Status - Maint. Flow Volume (10)	10	9	10	10
Flow Status - Flashiness (10)	10	8	8	10
Channel Alteration (20)	20	19	20	20
Frequency of Riffles/Bends (20)*				18
Channel Sinuosity (20)**	15	16	19	
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	10	9	8	10
Bank Stability (R) (10)	10	9	8	10
Vegetative Protection (L) (10)	10	9	8	10
Vegetative Protection (R) (10)	10	9	8	10
Riparian Veg. Zone Width (L) (10)	10	10	10	9
Riparian Veg. Zone Width (R) (10)	10	10	10	10
<b>TOTAL SCORE (200):</b>	<b>173</b>	<b>158</b>	<b>153</b>	<b>178</b>
<b>HABITAT RATING:</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>

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

Date:	9/12/2012	9/12/2012	9/13/2012	9/12/2012
Weather:	Sunny	Sunny	Cloudy	Sunny
Air Temperature:	72 Deg. F.	75 Deg. F.	65 Deg. F.	87 Deg. F.
Water Temperature:	55 Deg. F.	70 Deg. F.	66 Deg. F.	64 Deg. F.
Ave. Stream Width:	15 Feet	18 Feet	20 Feet	15 Feet
Ave. Stream Depth:	0.75 Feet	1 Feet	1.5 Feet	1 Feet
Surface Velocity:	0.6 Ft./Sec.	0.5 Ft./Sec.	0.7 Ft./Sec.	1.75 Ft./Sec.
Estimated Flow:	6.75 CFS	9 CFS	21 CFS	26.25 CFS
Stream Modifications:	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N
Report Number:				
<b>STORET No.:</b>	<b>200137</b>	<b>200172</b>	<b>720172</b>	<b>680062</b>
<b>Stream Name:</b>	<b>Unnamed Tributary to Bradford Creek Twin Peaks / West Mt. Frederic downstream</b>	<b>East Branch AuSable River Vista Drive</b>	<b>South Branch AuSable River AuSable River Trail / Cumalia Trail</b>	<b>West Branch Big Creek County Road 489</b>
<b>Road Crossing/Location:</b>	<b>Frederic downstream</b>	<b>Vista Drive</b>	<b>Cumalia Trail</b>	<b>County Road 489</b>
<b>County Code:</b>	<b>20</b>	<b>20</b>	<b>72</b>	<b>68</b>
<b>TRS:</b>	<b>28N04W11</b>	<b>27N03W02</b>	<b>24N02W12</b>	<b>26N01E23</b>
<b>Latitude (dd):</b>	<b>44.835991</b>	<b>44.75701</b>	<b>44.49335</b>	<b>44.6295</b>
<b>Longitude (dd):</b>	<b>-84.761721</b>	<b>-84.63271</b>	<b>-84.5</b>	<b>-84.2697</b>
<b>Ecoregion:</b>	<b>NLAF</b>	<b>NLAF</b>	<b>NLAF</b>	<b>NLAF</b>
<b>Stream Type:</b>	<b>Coldwater</b>	<b>Coldwater</b>	<b>Coldwater</b>	<b>Coldwater</b>
<b>USGS Basin Code:</b>	<b>4070007</b>	<b>4070007</b>	<b>4070007</b>	<b>4070007</b>

\* Applies only to Riffle/Run stream Surveys

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

Table 3 cont. Habitat evaluation for the Au Sable River watershed probabilistic sites, June-September 2012.

	AuSable River McKinley Road / F32  RIFFLE/RUN SITE 6	AuSable River US 4350 Cathedral Pines GLIDE/POOL SITE 7	Ninemile Creek South River Road  RIFFLE/RUN SITE 8	AuSable River Bamfield Road downstream RIFFLE/RUN SITE 9
<b>HABITAT METRIC</b>				
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	16	15	9	4
Embeddedness (20)*	19		12	16
Velocity/Depth Regime (20)*	16		9	15
Pool Substrate Characterization (20)**		16		
Pool Variability (20)**		18		
<b>Channel Morphology</b>				
Sediment Deposition (20)	18	19	5	16
Flow Status - Maint. Flow Volume (10)	10	9	8	10
Flow Status - Flashiness (10)	10	10	3	8
Channel Alteration (20)	20	20	18	16
Frequency of Riffles/Bends (20)*	15		17	8
Channel Sinuosity (20)**		18		
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	10	9	5	9
Bank Stability (R) (10)	10	9	5	9
Vegetative Protection (L) (10)	10	10	7	9
Vegetative Protection (R) (10)	10	10	7	9
Riparian Veg. Zone Width (L) (10)	9	10	10	10
Riparian Veg. Zone Width (R) (10)	10	10	10	10
<b>TOTAL SCORE (200):</b>	<b>183</b>	<b>183</b>	<b>125</b>	<b>149</b>
<b>HABITAT RATING:</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>

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

Date:	8/21/2012	8/21/2012	8/20/2012	8/20/2012
Weather:	Sunny	Cloudy	Partly Cloudy	Partly Cloudy
Air Temperature:	Deg. F.	75 Deg. F.	Deg. F.	75 Deg. F.
Water Temperature:	70 Deg. F.	70 Deg. F.	65 Deg. F.	66 Deg. F.
Ave. Stream Width:	160 Feet	100 Feet	2.5 Feet	120 Feet
Ave. Stream Depth:	2.5 Feet	3 Feet	0.25 Feet	3.5 Feet
Surface Velocity:	1.75 Ft./Sec.	1.75 Ft./Sec.	0.5 Ft./Sec.	1.4 Ft./Sec.
Estimated Flow:	700 CFS	525 CFS	0.3125 CFS	588 CFS
Stream Modifications:	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N
Report Number:				
STORET No.:	680074	680073	680075	10131
Stream Name:	AuSable River McKinley Road / F32	AuSable River US 4350 Cathedral Pines	Ninemile Creek South River Road	AuSable River Bamfield Road downstream
Road Crossing/Location:				
County Code:	68	68	68	01
TRS:	26N03E09	26N04E07	26N04E23	25N05E14
Latitude (dd):	44.657406	44.655271	44.627988	44.560021
Longitude (dd):	-84.0840008	-84.004605	-83.925525	-83.802664
Ecoregion:	NLAF	NLAF	NLAF	NLAF
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4070007	4070007	4070007	4070007

\* Applies only to Riffle/Run stream Surveys

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



Table 3 cont. Habitat evaluation for the Au Sable River watershed probabilistic sites, June-September 2012.

	West Branch Pine River Hubbard Lake Rd RIFFLE/RUN SITE 11	East Branch Pine River Proconier Rd RIFFLE/RUN SITE 12	McGillis Creek  Buhl Road RIFFLE/RUN SITE 14
<b>HABITAT METRIC</b>			
<b>Substrate and Instream Cover</b>			
Epifaunal Substrate/ Avail Cover (20)	16	10	10
Embeddedness (20)*	16	6	10
Velocity/Depth Regime (20)*	13	12	14
Pool Substrate Characterization (20)**			
Pool Variability (20)**			
<b>Channel Morphology</b>			
Sediment Deposition (20)	16	14	13
Flow Status - Maint. Flow Volume (10)	10	9	9
Flow Status - Flashiness (10)	9	2	4
Channel Alteration (20)	20	15	15
Frequency of Rifles/Bends (20)*	18	6	11
Channel Sinuosity (20)**			
<b>Riparian and Bank Structure</b>			
Bank Stability (L) (10)	9	4	7
Bank Stability (R) (10)	9	4	7
Vegetative Protection (L) (10)	9	5	9
Vegetative Protection (R) (10)	9	7	9
Riparian Veg. Zone Width (L) (10)	9	6	8
Riparian Veg. Zone Width (R) (10)	9	8	7
<b>TOTAL SCORE (200):</b>	<b>172</b>	<b>108</b>	<b>133</b>
<b>HABITAT RATING:</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>

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

Date:	8/1/2012	9/13/2012	8/1/2012
Weather:	Cloudy	Sunny	Partly Cloudy
Air Temperature:	63 Deg. F.	65 Deg. F.	72 Deg. F.
Water Temperature:	63 Deg. F.	57 Deg. F.	64 Deg. F.
Ave. Stream Width:	15 Feet	20 Feet	12 Feet
Ave. Stream Depth:	0.75 Feet	1 Feet	0.5 Feet
Surface Velocity:	1 Ft./Sec.	0.8 Ft./Sec.	0.75 Ft./Sec.
Estimated Flow:	11.25 CFS	16 CFS	4.5 CFS
Stream Modifications:	None	None	None
Nuisance Plants (Y/N):	N	N	N
Report Number:			
STORET No.:	10077	10066	10133
Stream Name:	West Branch Pine River	East Branch Pine River	McGillis Creek
Road Crossing/Location:	Hubbard Lake Rd	Proconier Rd	Buhl Road
County Code:	01	01	01
TRS:	26N07E25	26N08E27	25N08E06
Latitude (dd):	44.615141	44.6125	44.583529
Longitude (dd):	-83.524056	-83.455277	-83.503552
Ecoregion:	NLAF	NLAF	NLAF
Stream Type:	Coldwater	Warmwater	Coldwater
USGS Basin Code:	4070007	4070007	4070007

\* Applies only to Riffle/Run stream Surveys

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

Table 4. Qualitative macroinvertebrate sampling results for the Au Sable River watershed probabilistic sites June-September 2012.

TAXA	Unnamed Tributary to Bradford Creek Twin Peaks 9/12/2012 SITE 1	East Branch AuSable River Vista Drive 9/12/2012 SITE 2	South Branch AuSable River AuSable River Trail 9/13/2012 SITE 3	West Branch Big Creek County Road 489 9/12/2012 SITE 5
<b>PLATYHELMINTHES (flatworms)</b>				
Turbellaria				2
<b>ANNELIDA (segmented worms)</b>				
Hirudinea (leeches)	2		1	
Oligochaeta (worms)	8		1	3
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)	24	3	11	7
Decapoda (crayfish)		1	2	
Isopoda (sowbugs)				4
<b>Arachnoidea</b>				
Hydracarina	2	6		1
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetiscidae	1	6	33	1
Baetidae	42	12	14	10
Caenidae		59		
Ephemerellidae	4		1	18
Ephemeridae		2	1	
Heptageniidae	12	2	8	6
Leptophlebiidae	5		4	
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae	1	1	1	2
Gomphidae		1	3	1
<b>Zygoptera (damselflies)</b>				
Calopterygidae		10	36	4
Coenagrionidae			11	
<b>Plecoptera (stoneflies)</b>				
Perlidae				5
<b>Hemiptera (true bugs)</b>				
<b>Belostomatidae</b>				
Corixidae	7		42	
Gerridae	1	1		
Mesoveliidae	2	1		
Nepidae			1	
Notonectidae			1	
<b>Megaloptera</b>				
Corydalidae (dobson flies)	4	1		
Sialidae (alder flies)			1	
<b>Trichoptera (caddisflies)</b>				
Brachycentridae		7	10	12
Glossosomatidae				22
Helicopsychidae		31		38
Hydropsychidae	25	14	8	21
Hydroptilidae	10		2	
Leptoceridae	1	5	7	
Limnephilidae	4	4	7	20
Molannidae	7			1
Philopotamidae	1			1
Phryganeidae	8		15	
Polycentropodidae		2	3	1
Rhyacophilidae				2
Uenoidae				1
<b>Lepidoptera (moths)</b>				
Pyalidae			1	
<b>Coleoptera (beetles)</b>				
Gyrinidae (adults)	1		1	
Hydrophilidae (total)	2			1
Dryopidae				1

Elmidae	4	8	3	18
Diptera (flies)				
Athericidae				1
Ceratopogonidae	6		2	
Chironomidae	31	8	14	20
Dixidae	4		1	1
Ephydriidae				1
Ptychopteridae	1			
Simuliidae	6	4	1	7
Tabanidae			1	
Tipulidae	1	1		
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)		5		5
Hydrobiidae		122	5	
Lymnaeidae				6
Physidae	36	1	1	12
Planorbidae	2	3		
Viviparidae			4	
Pelecypoda (bivalves)				
Sphaeriidae (clams)	2	1	23	
<b>TOTAL INDIVIDUALS</b>	<b>267</b>	<b>322</b>	<b>282</b>	<b>256</b>

METRIC	Unnamed Tributary to Twin Peaks / West Mt. 9/12/2012 SITE 1		East Branch AuSable River Vista Drive 9/12/2012 SITE 2		South Branch AuSable AuSable River Trail / 9/13/2012 SITE 3		West Branch Big Creek County Road 489 9/12/2012 SITE 5	
	Value	Score	Value	Score	Value	Score	Value	Score
	TOTAL NUMBER OF TAXA	33	1	29	1	38	1	34
NUMBER OF MAYFLY TAXA	5	1	5	1	6	1	4	0
NUMBER OF CADDISFLY TAXA	7	1	6	1	7	1	10	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	1	0
PERCENT MAYFLY COMP.	23.97	1	25.16	1	21.63	1	13.67	0
PERCENT CADDISFLY COMP.	20.97	0	19.57	0	18.44	0	46.48	1
PERCENT DOMINANT TAXON	15.73	1	37.89	-1	14.89	1	14.84	1
PERCENT ISOPOD, SNAIL, LEECH	14.98	-1	40.68	-1	3.90	1	10.55	0
PERCENT SURF. AIR BREATHERS	5.24	0	0.62	1	16.31	-1	0.39	1
<b>TOTAL SCORE</b>		<b>3</b>		<b>2</b>		<b>4</b>		<b>5</b>
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		EXCELLENT

Table 4 cont. Qualitative macroinvertebrate sampling results for the Au Sable River watershed probabilistic sites June-September 2012.

TAXA	AuSable River McKinley Road / F32 8/21/2012 SITE 6	AuSable River US 4350 Cathedral Pines 8/21/2012 SITE 7	Ninemile Creek South River Road 8/20/2012 SITE 8	AuSable River Banfield Road downstream 8/20/2012 SITE 9
PORIFERA (sponges)	1			1
PLATYHELMINTHES (flatworms)				
Turbellaria	8	1		6
BRYOZOA (moss animals)	1			
ANNELIDA (segmented worms)				
Hirudinea (leeches)	2			
Oligochaeta (worms)	13	6	3	1
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	6	15		18
Decapoda (crayfish)	1	1		1
Isopoda (sowbugs)		1		8
Insecta				
Ephemeroptera (mayflies)				
Baetidae	12	7		5
Caenidae		2		
Ephemerellidae	5	4		
Ephemeridae	1	5		
Heptageniidae	16	42		4
Isonychiidae	3	13		
Leptophlebiidae			3	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	2		13	1
Cordulegastridae			15	
Gomphidae	6	1	8	7
Zygoptera (damselflies)				
Calopterygidae	3	1	12	2
Coenagrionidae				1
Plecoptera (stoneflies)				
Perlidae	1			5
Perlodidae		5		
Hemiptera (true bugs)				
Corixidae	21	6		
Gerridae				1
Veliidae			1	
Megaloptera				
Corydalidae (dobson flies)	1	3	4	
Sialidae (alder flies)			2	
Trichoptera (caddisflies)				
Brachycentridae	8			
Glossosomatidae			5	
Helicopsychidae	46	72	2	
Hydropsychidae	8	2	22	27
Hydroptilidae				3
Leptoceridae	2			
Limnephilidae	3	2	6	1
Molannidae		3	4	
Philopotamidae	1	1	78	1
Phryganeidae			4	
Polycentropodidae			2	4
Uenoidae	4	4		
Lepidoptera (moths)				
Pyrilidae	3	1		
Coleoptera (beetles)				
Hydrophilidae (total)			2	
Dryopidae			3	
Elmidae	7	11	10	1
Psephenidae (larvae)	1	5		

Diptera (flies)				
Athericidae				1
Ceratopogonidae			1	
Chironomidae	12	2	27	7
Dixidae			1	
Ephydriidae				1
Simuliidae	3		1	12
Tabanidae	1	1	6	1
Tipulidae			10	1
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)	23	6		1
Hydrobiidae	24	1		5
Lymnaeidae	4			
Physidae	12	1	9	19
Planorbidae	20	2		1
Pleuroceridae	10	32		5
Viviparidae		2		
Pelecypoda (bivalves)				
Dreissenidae				274
Sphaeriidae (clams)	197	52	2	7
Unionidae (mussels)	1			
<b>TOTAL INDIVIDUALS</b>	<b>493</b>	<b>313</b>	<b>256</b>	<b>433</b>

METRIC	AuSable River McKinley Road / F32 8/21/2012 SITE 6		AuSable River US 4350 Cathedral Pines 8/21/2012 SITE 7		Ninemile Creek South River Road 8/20/2012 SITE 8		AuSable River Bamfield Road downstream 8/20/2012 SITE 9	
	Value	Score	Value	Score	Value	Score	Value	Score
	TOTAL NUMBER OF TAXA	39	1	34	1	28	1	33
NUMBER OF MAYFLY TAXA	5	1	6	1	1	1	2	-1
NUMBER OF CADDISFLY TAXA	7	1	6	1	8	1	5	0
NUMBER OF STONEFLY TAXA	1	0	1	0	0	-1	1	0
PERCENT MAYFLY COMP.	7.51	0	23.32	1	1.17	-1	2.08	-1
PERCENT CADDISFLY COMP.	14.60	0	26.84	0	48.05	1	8.31	0
PERCENT DOMINANT TAXON	39.96	-1	23.00	0	30.47	-1	63.28	-1
PERCENT ISOPOD, SNAIL, LEECH	19.27	-1	14.38	-1	3.52	1	9.01	0
PERCENT SURF. AIR BREATHERS	4.26	1	1.92	1	1.17	1	0.23	1
TOTAL SCORE		2		4		3		-1
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 4 cont. Qualitative macroinvertebrate sampling results for the Au Sable River watershed probabilistic sites June-September 2012.

TAXA	West Branch Pine River Hubbard Lake Rd 8/1/2012 SITE 11	East Branch Pine River Procurier Rd 9/13/2012 SITE 12	McGillis Creek Buhl Road 8/1/2012 SITE 14
<b>PLATYHELMINTHES (flatworms)</b>			
Turbellaria		9	
<b>ANNELIDA (segmented worms)</b>			
Hirudinea (leeches)	1		
Oligochaeta (worms)	1	7	44
<b>ARTHROPODA</b>			
<b>Crustacea</b>			
Amphipoda (scuds)	5	2	15
Decapoda (crayfish)	1		2
Isopoda (sowbugs)		2	
<b>Arachnoidea</b>			
Hydracarina	1	1	1
<b>Insecta</b>			
<b>Ephemeroptera (mayflies)</b>			
Baetiscidae		8	
Baetidae	24	16	10
Ephemerellidae	1	24	
Ephemeridae	1		3
Heptageniidae	17	12	17
Isonychiidae	3		4
Leptophlebiidae		3	
Tricorythidae	4	8	10
<b>Odonata</b>			
<b>Anisoptera (dragonflies)</b>			
Aeshnidae	1	1	1
Cordulegastridae	2		
Gomphidae	1	1	4
<b>Zygoptera (damselflies)</b>			
Calopterygidae	13	21	11
<b>Plecoptera (stoneflies)</b>			
Perlidae	12	1	4
<b>Hemiptera (true bugs)</b>			
Belostomatidae		1	
Corixidae		2	1
Gerridae		1	1
Mesoveliidae		5	3
Notonectidae		1	
Veliidae	1		
<b>Megaloptera</b>			
Corydalidae (dobson flies)	1	1	4
Sialidae (alder flies)	1	1	2
<b>Trichoptera (caddisflies)</b>			
Brachycentridae	1		
Glossosomatidae	1	1	3
Helicopsychidae	3	35	6
Hydropsychidae	73	11	8
Leptoceridae	1	22	6
Limnephilidae		10	1
Molannidae	1	1	1
Philopotamidae	1		
Phryganeidae		4	
Polycentropodidae	1		10
Uenoidae	1	5	1
<b>Coleoptera (beetles)</b>			
Gyrinidae (adults)		1	1
Hydrophilidae (total)		1	
Dryopidae	1		1
Elmidae	22	59	18
Psephenidae (larvae)		1	

Diptera (flies)			
Athericidae	13	7	10
Ceratopogonidae	1	2	2
Chironomidae	50	10	58
Culicidae		1	
Simuliidae	2	4	
Tabanidae	1	4	5
Tipulidae	1	1	2
MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)	2	2	
Hydrobiidae			5
Physidae	3	18	22
Planorbidae		1	
Pelecypoda (bivalves)			
Sphaeriidae (clams)	4	12	50
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TOTAL INDIVIDUALS	274	341	347

METRIC	West Branch Pine River Hubbard Lake Rd 8/1/2012 SITE 11		East Branch Pine River Proconier Rd 9/13/2012 SITE 12		McGillis Creek Buhl Road 8/1/2012 SITE 14	
	Value	Score	Value	Score	Value	Score
	TOTAL NUMBER OF TAXA	39	1	45	1	37
NUMBER OF MAYFLY TAXA	6	1	6	1	5	1
NUMBER OF CADDISFLY TAXA	9	1	8	1	8	1
NUMBER OF STONEFLY TAXA	1	0	1	0	1	0
PERCENT MAYFLY COMP.	18.25	0	20.82	0	12.68	0
PERCENT CADDISFLY COMP.	30.29	1	26.10	0	10.37	0
PERCENT DOMINANT TAXON	26.64	0	17.30	0	16.71	1
PERCENT ISOPOD, SNAIL, LEECH	2.19	1	6.74	0	7.78	0
PERCENT SURF. AIR BREATHERS	0.36	1	3.81	1	1.73	1
TOTAL SCORE		6		4		5
MACROINV. COMMUNITY RATING		EXCELLENT		ACCEPT.		EXCELLENT

Table 5. Habitat evaluation for the Au Sable River watershed trend and targeted sites, June-September 2012.

	East Branch AuSable	AuSable River	North Branch AuSable	Wright Creek
	Downstream from County Road 612	Wiseman Trail West of McMaster Bridge Road	2 Track off McMasters Bridge Road	Bear Lake Road
	RIFFLE/RUN SITE 1T	RIFFLE/RUN SITE 2T	RIFFLE/RUN SITE 3T	GLIDE/POOL SITE 4T
<b>HABITAT METRIC</b>				
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	16	18	17	14
Embeddedness (20)*	10	16	16	
Velocity/Depth Regime (20)*	10	15	15	
Pool Substrate Characterization (20)**				11
Pool Variability (20)**				12
<b>Channel Morphology</b>				
Sediment Deposition (20)	15	16	17	15
Flow Status - Maint. Flow Volume (10)	10	10	10	10
Flow Status - Flashiness (10)	10	10	10	10
Channel Alteration (20)	20	20	20	18
Frequency of Riffles/Bends (20)*	10	17	16	
Channel Sinuosity (20)**				16
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	10	10	10	10
Bank Stability (R) (10)	10	10	10	10
Vegetative Protection (L) (10)	10	10	10	9
Vegetative Protection (R) (10)	10	10	10	9
Riparian Veg. Zone Width (L) (10)	10	8	8	10
Riparian Veg. Zone Width (R) (10)	10	8	10	10
<b>TOTAL SCORE (200):</b>	<b>161</b>	<b>178</b>	<b>179</b>	<b>164</b>
<b>HABITAT RATING:</b>	<b>EXCELLENT (NON-IMPAIRED)</b>	<b>EXCELLENT (NON-IMPAIRED)</b>	<b>EXCELLENT (NON-IMPAIRED)</b>	<b>EXCELLENT (NON-IMPAIRED)</b>

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

Date:	7/31/2012	7/31/2012	6/8/2012	6/7/2012
Weather:	Cloudy	Cloudy	Partly Cloudy	Sunny
Air Temperature:	68 Deg. F.	75 Deg. F.	73 Deg. F.	75 Deg. F.
Water Temperature:	70 Deg. F.	62 Deg. F.	62 Deg. F.	78 Deg. F.
Ave. Stream Width:	45 Feet	90 Feet	95 Feet	5 Feet
Ave. Stream Depth:	1 Feet	2.5 Feet	1.5 Feet	0.75 Feet
Surface Velocity:	0.5 Ft./Sec.	1.8 Ft./Sec.	1.75 Ft./Sec.	1 Ft./Sec.
Estimated Flow:	22.5 CFS	405 CFS	249.375 CFS	3.75 CFS
Stream Modifications:	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N
Report Number:				
<b>STORET No.:</b>	<b>200165</b>	<b>200160</b>	<b>200161</b>	<b>680066</b>
<b>Stream Name:</b>	<b>East Branch AuSable</b>	<b>AuSable River</b>	<b>North Branch AuSable</b>	<b>Wright Creek</b>
<b>Road Crossing/Location:</b>	<b>Downstream from County Road 612</b>	<b>Wiseman Trail West of McMaster Bridge Road</b>	<b>2 Track off McMasters Bridge Road</b>	<b>Bear Lake Road</b>
<b>County Code:</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>68</b>
<b>TRS:</b>	<b>28N02W30</b>	<b>26N01W11</b>	<b>26N01W02</b>	<b>27N01W03</b>
<b>Latitude (dd):</b>	<b>44.78794</b>	<b>44.66635</b>	<b>44.67569</b>	<b>44.76252</b>
<b>Longitude (dd):</b>	<b>-84.59722</b>	<b>-84.40427</b>	<b>-84.39149</b>	<b>-84.30752</b>
<b>Ecoregion:</b>	<b>NLAF</b>	<b>NLAF</b>	<b>NLAF</b>	<b>NLAF</b>
<b>Stream Type:</b>	<b>Coldwater</b>	<b>Coldwater</b>	<b>Coldwater</b>	<b>Warmwater</b>
<b>USGS Basin Code:</b>	<b>4070007</b>	<b>4070007</b>	<b>4070007</b>	<b>4070007</b>

\* Applies only to Riffle/Run stream Surveys

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



Table 5 cont. Habitat evaluation for the Au Sable River watershed trend and targeted sites, June-September 2012.

	Big Creek Brown Cabin Road	Perry Creek Kneeland Road	Perry Creek F32 Road	Smith Creek 2 Track off from Aldrich
	RIFFLE/RUN SITE 5T	RIFFLE/RUN SITE 6T & A	RIFFLE/RUN SITE B	GLIDE/POOL SITE 7T
<b>HABITAT METRIC</b>				
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	17	9	17	8
Embeddedness (20)*	8	5	18	
Velocity/Depth Regime (20)*	15	11	15	
Pool Substrate Characterization (20)**				9
Pool Variability (20)**				16
<b>Channel Morphology</b>				
Sediment Deposition (20)	15	6	14	15
Flow Status - Maint. Flow Volume (10)	10	8	10	10
Flow Status - Flashiness (10)	10	6	9	10
Channel Alteration (20)	19	18	20	20
Frequency of Rifles/Bends (20)*	15	9	20	
Channel Sinuosity (20)**				15
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	10	5	8	10
Bank Stability (R) (10)	10	5	7	10
Vegetative Protection (L) (10)	10	9	9	9
Vegetative Protection (R) (10)	10	9	9	9
Riparian Veg. Zone Width (L) (10)	10	10	10	10
Riparian Veg. Zone Width (R) (10)	8	10	10	10
<b>TOTAL SCORE (200):</b>	<b>167</b>	<b>120</b>	<b>176</b>	<b>161</b>

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

Date:	6/8/2012	8/21/2012	8/21/2012	6/7/2012
Weather:	Partly Cloudy	Sunny	Sunny	Sunny
Air Temperature:	60 Deg. F.	55 Deg. F.	65 Deg. F.	70 Deg. F.
Water Temperature:	53 Deg. F.	63 Deg. F.	60 Deg. F.	60 Deg. F.
Ave. Stream Width:	40 Feet	7 Feet	12 Feet	9 Feet
Ave. Stream Depth:	1.75 Feet	0.75 Feet	0.6 Feet	1.75 Feet
Surface Velocity:	1.25 Ft./Sec.	0.25 Ft./Sec.	1 Ft./Sec.	0.25 Ft./Sec.
Estimated Flow:	87.5 CFS	1.3125 CFS	7.2 CFS	3.9375 CFS
Stream Modifications:	None	None	None	None
Nuisance Plants (Y/N):	N	N	N	N
Report Number:				
STORET No.:	680008	680063	680056	10108
Stream Name:	Big Creek Brown Cabin Road	Perry Creek Kneeland Road	Perry Creek F32 Road	Smith Creek 2 Track off from Aldrich
Road Crossing/Location:				
County Code:	68	68	68	01
TRS:	26N01E12	27N03E21	26N03E09	25N05E22
Latitude (dd):	44.6522	44.7105	44.6583	44.5476
Longitude (dd):	-84.2586	-84.0874	-84.0828	-83.8221
Ecoregion:	NLAF	NLAF	NLAF	NLAF
Stream Type:	Coldwater	Coldwater		Coldwater
USGS Basin Code:	4070007	4070007	4070007	4070007

\* Applies only to Riffle/Run stream Surveys

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

Table 5 cont. Habitat evaluation for the Au Sable River watershed trend and targeted sites, June-September 2012.

	South Branch Pine River Buhl Road	Pine River F-41 (Somers Road)	Duvall Creek downstream F41 (Somers Road)
	GLIDE/POOL SITE 8T	GLIDE/POOL SITE 9T	RIFFLE/RUN SITE 10T
<b>HABITAT METRIC</b>			
<b>Substrate and Instream Cover</b>			
Epifaunal Substrate/ Avail Cover (20)	9	8	8
Embeddedness (20)*			6
Velocity/Depth Regime (20)*			9
Pool Substrate Characterization (20)**	11	8	
Pool Variability (20)**	11	5	
<b>Channel Morphology</b>			
Sediment Deposition (20)	10	8	6
Flow Status - Maint. Flow Volume (10)	10	9	9
Flow Status - Flashiness (10)	9	4	3
Channel Alteration (20)	20	18	18
Frequency of Riffles/Bends (20)*			6
Channel Sinuosity (20)**	14	10	
<b>Riparian and Bank Structure</b>			
Bank Stability (L) (10)	8	3	3
Bank Stability (R) (10)	9	3	3
Vegetative Protection (L) (10)	8	4	5
Vegetative Protection (R) (10)	8	7	5
Riparian Veg. Zone Width (L) (10)	10	7	9
Riparian Veg. Zone Width (R) (10)	10	8	9
<b>TOTAL SCORE (200):</b>	<b>147</b>	<b>102</b>	<b>99</b>
<b>HABITAT RATING:</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>

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

Date:	6/6/2012	6/7/2012	9/13/2012
Weather:	Partly Cloudy	Sunny	Partly Cloudy
Air Temperature:	75 Deg. F.	60 Deg. F.	68 Deg. F.
Water Temperature:	66 Deg. F.	62 Deg. F.	61 Deg. F.
Ave. Stream Width:	20 Feet	42 Feet	8 Feet
Ave. Stream Depth:	2 Feet	2 Feet	0.5 Feet
Surface Velocity:	0.9 Ft./Sec.	1 Ft./Sec.	0.6 Ft./Sec.
Estimated Flow:	36 CFS	84 CFS	2.4 CFS
Stream Modifications:	None	None	None
Nuisance Plants (Y/N):	N	N	N
Report Number:			
<b>STORET No.:</b>	<b>10115</b>	<b>10109</b>	<b>10110</b>
<b>Stream Name:</b>	<b>South Branch Pine River</b>	<b>Pine River</b>	<b>Duvall Creek</b>
<b>Road Crossing/Location:</b>	<b>Buhl Road</b>	<b>F-41 (Somers Road)</b>	<b>downstream F41 (Somers Road)</b>
<b>County Code:</b>	<b>01</b>	<b>01</b>	<b>01</b>
<b>TRS:</b>	<b>25N08E08</b>	<b>25N08E23</b>	<b>28N08E23</b>
<b>Latitude (dd):</b>	<b>44.57713</b>	<b>44.5507</b>	<b>44.5468</b>
<b>Longitude (dd):</b>	<b>-83.50319</b>	<b>-83.4221</b>	<b>-83.4219</b>
<b>Ecoregion:</b>	<b>NLAF</b>	<b>NLAF</b>	<b>NLAF</b>
<b>Stream Type:</b>	<b>Coldwater</b>	<b>Warmwater</b>	<b>Warmwater</b>
<b>USGS Basin Code:</b>	<b>4070007</b>	<b>4070007</b>	<b>4070007</b>

\* Applies only to Riffle/Run stream Surveys

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

Table 6. Qualitative macroinvertebrate sampling results for the Au Sable River watershed trend and targeted sites June-September 2012.

TAXA	East Branch AuSable Downstream from County Road 612  7/31/2012 SITE 1T	AuSable River Wiseman Trail West of McMaster Bridge Road  7/31/2012 SITE 2T	North Branch AuSable 2 Track off McMasters Bridge Road  6/8/2012 SITE 3T	Wright Creek Bear Lake Road  6/7/2012 SITE 4T
PORIFERA (sponges)		1		
PLATYHELMINTHES (flatworms)				
Turbellaria	3	1		
BRYOZOA (moss animals)				1
ANNELIDA (segmented worms)				
Oligochaeta (worms)	7	13	52	3
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	3	34		
Decapoda (crayfish)	1	1	1	3
Isopoda (sowbugs)		30	1	
Arachnoidea				
Hydracarina	1			
Insecta				
Ephemeroptera (mayflies)				
Baetiscidae		2		
Baetidae	19	11	8	19
Caenidae	6			
Ephemerellidae	2	7	155	
Ephemeridae		5		
Heptageniidae	8	1	15	1
Isynchiidae		1	3	
Leptophlebiidae	3			
Siphonuridae		1		
Tricorythidae		1		
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	1	1	1	5
Cordulegastridae				2
Gomphidae	5	1	1	16
Libellulidae				3
Zygoptera (damselflies)				
Calopterygidae	25	7	13	8
Coenagrionidae	2			
Plecoptera (stoneflies)				
Perlidae			1	
Perlodidae			1	
Pteronarcyidae		1		
Hemiptera (true bugs)				
Corixidae		1		1
Gerridae	1	1	1	2
Mesoveliidae	1			
Pleidae		1		
Veliidae	1			
Megaloptera				
Corydalidae (dobson flies)	1	3	1	
Trichoptera (caddisflies)				
Brachycentridae		12	19	
Helicopsychidae	3	21	8	
Hydropsychidae	55	57	12	1
Hydroptilidae	37		1	
Leptoceridae	11	5	2	
Limnephilidae	4	1	8	7
Molannidae	1			2
Philopotamidae	3	18	1	
Polycentropodidae		3	9	
Lepidoptera (moths)				
Pyrilidae	2			
Coleoptera (beetles)				
Halplidae (adults)	1			
Hydrophilidae (total)	1			
Elmidae	13	3	8	1

Diptera (flies)				
Athericidae		9	9	
Ceratopogonidae	1			50
Chironomidae	80	35	17	54
Simuliidae	1	12	3	1
Tabanidae			1	4
Tipulidae		1	1	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)		1		
Hydrobiidae	2		2	
Lymnaeidae		5	3	
Physidae		21	5	1
Planorbidae		1	1	2
Pleuroceridae	35		1	
Pelecypoda (bivalves)				
Sphaeriidae (clams)	16	7	4	55
Unionidae (mussels)	2			
<hr/>				
TOTAL INDIVIDUALS	358	337	369	242

METRIC	East Branch AuSable Downstream from County 7/31/2012 SITE 1T		AuSable River Wiseman Trail West of 7/31/2012 SITE 2T		North Branch AuSable 2 Track off McMasters 6/8/2012 SITE 3T		Wright Creek Bear Lake Road 6/7/2012 SITE 4T		
	Value	Score	Value	Score	Value	Score	Value	Score	
	TOTAL NUMBER OF TAXA	36	1	39	1	34	1	23	1
	NUMBER OF MAYFLY TAXA	5	1	8	1	4	0	2	0
NUMBER OF CADDISFLY TAXA	7	1	7	1	8	1	3	0	
NUMBER OF STONEFLY TAXA	0	-1	1	0	2	1	0	-1	
PERCENT MAYFLY COMP.	10.61	0	8.61	0	49.05	1	8.26	0	
PERCENT CADDISFLY COMP.	31.84	1	34.72	1	16.26	0	4.13	0	
PERCENT DOMINANT TAXON	22.35	0	16.91	1	42.01	-1	22.73	0	
PERCENT ISOPOD, SNAIL, LEECH	10.34	0	17.21	-1	3.52	1	1.24	1	
PERCENT SURF. AIR BREATHERS	1.40	1	0.89	1	0.27	1	1.24	1	
TOTAL SCORE		4		5		5		2	
MACROINV. COMMUNITY RATING		ACCEPT.		EXCELLENT		EXCELLENT		ACCEPT.	

Table 6 cont. Qualitative macroinvertebrate sampling results for the Au Sable River watershed trend and targeted sites June-September 2012.

TAXA	Big Creek Brown Cabin Road 6/8/2012 SITE 5T	Perry Creek Kneeland Road 8/21/2012 SITE 6T & A	Perry Creek F32 Road 8/21/2012 SITE B	Smith Creek 2 Track off from Aldrich 6/7/2012 SITE 7T
<b>ANNELIDA (segmented worms)</b>				
Hirudinea (leeches)	1			
Oligochaeta (worms)	22	3	4	1
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)	10		5	21
Decapoda (crayfish)		1	1	
<b>Arachnoidea</b>				
Hydracarina	2	1		
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetiscidae	2			
Baetidae	38	5	4	13
Caenidae	8			
Ephemerellidae	32	4	27	
Ephemeridae		5	1	
Heptageniidae	23	10	16	1
Isonychiidae			15	
Leptophlebiidae		1		
Polymitarcyidae	4			
Siphonuridae		2		
Tricorythidae			5	5
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae		4	4	
Cordulegastridae	1	3	2	
Gomphidae	1	1	1	
Libellulidae				1
<b>Zygoptera (damselflies)</b>				
Calopterygidae		8	3	
<b>Plecoptera (stoneflies)</b>				
Perlidae		1	7	1
Perlodidae	1			
Pteronarcyidae	1			
<b>Hemiptera (true bugs)</b>				
Corixidae	1			
Gerridae	1	2	1	2
Mesoveliidae			3	
Veliidae		2		
<b>Megaloptera</b>				
Corydalidae (dobson flies)	1		5	1
Sialidae (alder flies)	1	7		1
<b>Trichoptera (caddisflies)</b>				
Brachycentridae	5			8
Glossosomatidae			1	
Helicopsychidae		6	1	
Hydropsychidae	2	3	32	1
Hydroptilidae	2	1		
Leptoceridae	1	3	2	
Limnephilidae	24	1	2	12
Molannidae	1	10	1	1
Philopotamidae			4	
Phryganeidae		1	1	
Polycentropodidae	1	1		
Uenoidae			1	
<b>Coleoptera (beetles)</b>				
Dytiscidae (total)				1
Hydrophilidae (total)	1	1	1	
Elmidae	6	14	24	

Diptera (flies)				
Athericidae	3	3		
Ceratopogonidae	2	3	2	2
Chironomidae	27	96	68	213
Dixidae		3		
Empididae	1			
Simuliidae		4	15	1
Tabanidae	1	2	1	6
Tipulidae		1	1	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)			8	
Hydrobiidae	2			
Lymnaeidae	13	1		
Physidae	9	27	2	1
Planorbidae	22			1
Pelecypoda (bivalves)				
Sphaeriidae (clams)	39	29	1	10
<b>TOTAL INDIVIDUALS</b>	<b>312</b>	<b>270</b>	<b>272</b>	<b>304</b>

METRIC	Big Creek Brown Cabin Road 6/8/2012 SITE 5T		Perry Creek Kneeland Road 8/21/2012 SITE 6T & A		Perry Creek F32 Road 8/21/2012 SITE B		Smith Creek 2 Track off from Aldrich 6/7/2012 SITE 7T	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	37	1	37	1	36	1	22	0
NUMBER OF MAYFLY TAXA	6	1	6	1	6	1	3	0
NUMBER OF CADDISFLY TAXA	7	1	8	1	9	1	4	0
NUMBER OF STONEFLY TAXA	2	1	1	0	1	0	1	0
PERCENT MAYFLY COMP.	34.29	1	10.00	0	25.00	1	6.25	0
PERCENT CADDISFLY COMP.	11.54	0	9.63	0	16.54	0	7.24	0
PERCENT DOMINANT TAXON	12.50	1	35.56	-1	25.00	0	70.07	-1
PERCENT ISOPOD, SNAIL, LEECH	15.06	-1	10.37	0	3.68	1	0.66	1
PERCENT SURF. AIR BREATHERS	0.96	1	1.85	1	1.84	1	0.99	1
TOTAL SCORE		6		3		6		1
MACROINV. COMMUNITY RATING		EXCELLENT		ACCEPT.		EXCELLENT		ACCEPT.

Table 6 cont. Qualitative macroinvertebrate sampling results for the Au Sable River watershed trend and targeted sites June-September 2012.

TAXA	South Branch Pine River	Pine River	Duvall Creek
	Buhl Road	F-41 (Somers Road)	downstream F41 (Somers Road)
	6/6/2012 SITE 8T	6/7/2012 SITE 9T	9/13/2012 SITE 10T
<b>ANNELIDA (segmented worms)</b>			
Oligochaeta (worms)	5	5	
<b>ARTHROPODA</b>			
<b>Crustacea</b>			
Amphipoda (scuds)	12	1	10
Decapoda (crayfish)			3
Isopoda (sowbugs)		1	
<b>Arachnoidea</b>			
Hydracarina	13	13	1
<b>Insecta</b>			
<b>Ephemeroptera (mayflies)</b>			
Baetiscidae	1	1	
Baetidae	16	17	14
Caenidae	6	16	
Ephemerellidae	36	11	
Ephemeridae		1	
Heptageniidae	20	13	40
Isonychiidae		1	
Tricorythidae	1		
<b>Odonata</b>			
<b>Anisoptera (dragonflies)</b>			
Aeshnidae	1	1	5
Cordulegastridae			1
Gomphidae		4	4
<b>Zygoptera (damselflies)</b>			
Calopterygidae	2	3	51
<b>Plecoptera (stoneflies)</b>			
Perlidae	1	3	4
Perlodidae	4	1	
Pteronarcyidae	2	1	
<b>Hemiptera (true bugs)</b>			
Corixidae	5	78	
Gerridae	1		1
Mesoveliidae		1	8
Pleidae		1	
<b>Megaloptera</b>			
Corydalidae (dobson flies)			5
<b>Trichoptera (caddisflies)</b>			
Brachycentridae	40	5	
Helicopsychidae	3		
Hydropsychidae	28	2	7
Hydroptilidae	3	2	
Leptoceridae	20	13	5
Limnephilidae		1	2
Molannidae			1
Philopotamidae	7		
Phryganeidae			3
Polycentropodidae	6	1	3
Uenoidae			1
<b>Coleoptera (beetles)</b>			
Halipidae (adults)		1	
Hydrophilidae (total)	1		1
Dryopidae			3
Elmidae	7	11	21

Diptera (flies)			
Athericidae	3	1	1
Ceratopogonidae	1	1	4
Chironomidae	33	44	16
Culicidae			1
Dixidae			2
Simuliidae	4	12	6
Tabanidae		3	9
Tipulidae	1	1	
MOLLUSCA			
Gastropoda (snails)			
Ancylidae (limpets)			7
Lymnaeidae		1	1
Physidae	1	1	5
Viviparidae		1	
Pelecypoda (bivalves)			
Sphaeriidae (clams)	13		1
<hr/>			
TOTAL INDIVIDUALS	297	274	247

METRIC	South Branch Pine River		Pine River		Duvall Creek	
	Buhl Road		F-41 (Somers Road)		ownstream F41 (Somers Road)	
	6/6/2012		6/7/2012		9/13/2012	
	SITE 8T		SITE 9T		SITE 10T	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	32	1	37	1	34	1
NUMBER OF MAYFLY TAXA	6	1	7	1	2	0
NUMBER OF CADDISFLY TAXA	7	1	6	1	7	1
NUMBER OF STONEFLY TAXA	3	1	3	1	1	0
PERCENT MAYFLY COMP.	26.94	1	21.90	1	21.86	1
PERCENT CADDISFLY COMP.	36.03	1	8.76	0	8.91	0
PERCENT DOMINANT TAXON	13.47	1	28.47	-1	20.65	0
PERCENT ISOPOD, SNAIL, LEECH	0.34	1	1.46	1	5.26	0
PERCENT SURF. AIR BREATHERS	2.36	1	29.56	-1	4.45	1
TOTAL SCORE		9		4		4
MACROINV. COMMUNITY RATING		EXCELLENT		ACCEPT.		ACCEPT.



Table 7. Water Chemistry Data for Antler Creek 2012 ( $\mu\text{g/L}$  = micrograms/Liter,  $\text{mg/L}$  = milligrams/Liter, ND = Not Detected).

Parameter	Unit	Antler Creek (Downstream) SITE C	Antler Creek (Upstream) SITE D
Arsenic - Total	$\mu\text{g/L}$	1.3	1.1
Barium - Total	$\mu\text{g/L}$	23	21
Cadmium - Total	$\mu\text{g/L}$	ND	ND
Calcium - Total	$\text{mg/L}$	44	46
Chromium - Total	$\mu\text{g/L}$	ND	ND
Conductance	$\text{umhos/cm}$	347	363
Copper - Total	$\mu\text{g/L}$	ND	ND
Hardness - Calculate	$\text{mg/L}$	180	189
Lead - Total	$\mu\text{g/L}$	ND	ND
Magnesium - Total	$\text{mg/L}$	17	18
Mercury - Total	$\mu\text{g/L}$	ND	ND
pH	pH	7.90	8.00
Selenium - Total	$\mu\text{g/L}$	ND	ND
Silver -Total	$\mu\text{g/L}$	ND	ND
Zinc - Total	$\mu\text{g/L}$	ND	ND

Table 8. Fish Community Results for Gimlet Creek 2012 (SITE E).

TAXA	Gimlet Creek Buhl Road 8/1/2012 SITE E
<i>Semotilus atromaculatus</i> (Creek chub)	64
<i>Luxilus cornutus</i> (Common shiner)	1
<i>Notropis heterolepis</i> (Blacknose shiner)	5
<i>Notropis stramineus</i> (Sand shiner)	1
<i>Phoxinus eos</i> (Northern redbelly dace)	14
<i>Rhinichthys atratulus</i> (Blacknose dace)	10
<i>Cottus bairdii</i> (Mottled sculpin)	5
<i>Catostomus commersoni</i> (White sucker)	2
<i>Lepomis cyanellus</i> (Green sunfish)	4
<i>Lepomis macrochirus</i> (Bluegill sunfish)	1
<i>Etheostoma caeruleum</i> (Rainbow darter)	1
<i>Etheostoma nigrum</i> (Johnny darter)	2
<i>Perca flavescens</i> (Yellow perch)	1
TOTAL INDIVIDUALS	111

Table 9. Habitat evaluation for the Black River watershed probabilistic sites, June-September 2012.

	McLary Creek M-32 GLIDE/POOL SITE 1	Black River Poor Farm Road GLIDE/POOL SITE 2	Black River Ritchie Road RIFFLE/RUN SITE 3	Devils River State Street GLIDE/POOL SITE 4
<b>HABITAT METRIC</b>				
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	9	8	8	7
Embeddedness (20)*			6	
Velocity/Depth Regime (20)*			10	
Pool Substrate Characterization (20)**	10	9		6
Pool Variability (20)**	8	5		5
<b>Channel Morphology</b>				
Sediment Deposition (20)	7	10	6	13
Flow Status - Maint. Flow Volume (10)	10	9	9	8
Flow Status - Flashiness (10)	4	5	7	3
Channel Alteration (20)	7	16	16	16
Frequency of Riffles/Bends (20)*			7	
Channel Sinuosity (20)**	6	15		13
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	4	7	7	3
Bank Stability (R) (10)	4	7	7	3
Vegetative Protection (L) (10)	4	8	6	5
Vegetative Protection (R) (10)	3	8	7	5
Riparian Veg. Zone Width (L) (10)	4	9	8	7
Riparian Veg. Zone Width (R) (10)	3	4	6	7
<b>TOTAL SCORE (200):</b>	<b>83</b>	<b>120</b>	<b>110</b>	<b>101</b>
<b>HABITAT RATING:</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>

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

	8/2/2012	8/2/2012	7/31/2012	8/2/2012
Date:	8/2/2012	8/2/2012	7/31/2012	8/2/2012
Weather:	Cloudy	Cloudy	Cloudy	Cloudy
Air Temperature:	69 Deg. F.	78 Deg. F.	78 Deg. F.	75 Deg. F.
Water Temperature:	63 Deg. F.	65 Deg. F.	66 Deg. F.	69 Deg. F.
Ave. Stream Width:	4 Feet	7 Feet	5 Feet	27 Feet
Ave. Stream Depth:	0.5 Feet	0.75 Feet	0.3 Feet	1 Feet
Surface Velocity:	0.25 Ft./Sec.	0.4 Ft./Sec.	0.5 Ft./Sec.	0.1 Ft./Sec.
Estimated Flow:	0.5 CFS	2.1 CFS	0.75 CFS	2.7 CFS
Stream Modifications:	Relocated	None	None	None
Nuisance Plants (Y/N):	N	N	N	N
Report Number:				
STORET No.:	40191	10134	10135	40134
Stream Name:	McLary Creek	Black River	Black River	Devils River
Road Crossing/Location:	M-32	Poor Farm Road	Ritchie Road	State Street
County Code:	04	01	01	04
TRS:	31N08E19	27N09E27	27N09E33	29N08E12
Latitude (dd):	45.06164	44.7073	44.699807	44.919772
Longitude (dd):	-83.50359	-83.34106	-83.347563	-83.422297
Ecoregion:	NLAF	NLAF	NLAF	NLAF
Stream Type:	Warmwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4090003	4070003	4070003	4070003

\* Applies only to Riffle/Run stream Surveys

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

Table 10. Qualitative macroinvertebrate sampling results for the Black River watershed probabilistic sites June-September 2012.

TAXA	McLary Creek M-32 8/2/2012 SITE 1	Black River Poor Farm Road 8/2/2012 SITE 2	Black River Ritchie Road 7/31/2012 SITE 3	Devils River State Street 8/2/2012 SITE 4
<b>PLATYHELMINTHES (flatworms)</b>				
Turbellaria	1			
<b>ANNELIDA (segmented worms)</b>				
Hirudinea (leeches)		1		
Oligochaeta (worms)		2	1	14
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)	71	35	64	1
Decapoda (crayfish)	1	3	1	1
Isopoda (sowbugs)		1		1
<b>Arachnoidea</b>				
Hydracarina		1	1	1
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetidae		4	7	3
Caenidae				56
Ephemeridae	1	3	8	
Heptageniidae		9	6	10
Leptophlebiidae		3		
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae	1	3	4	4
Cordulegastridae	1	1		
Gomphidae			1	5
Libellulidae	1		1	
<b>Zygoptera (damselflies)</b>				
Calopterygidae	10	7	25	29
Coenagrionidae				5
<b>Plecoptera (stoneflies)</b>				
Perlidae				1
<b>Hemiptera (true bugs)</b>				
Corixidae	1			1
Gerridae	1	1	9	1
Mesoveliidae			1	
Nepidae				1
<b>Megaloptera</b>				
Corydalidae (dobson flies)	1	8	7	2
Sialidae (alder flies)		2	1	1
<b>Trichoptera (caddisflies)</b>				
Brachycentridae	1			
Glossosomatidae			1	1
Helicopsychidae				2
Hydropsychidae	1		4	1
Hydroptilidae				2
Leptoceridae				1
Limnephilidae	2	7	17	1
Molannidae		10	2	
Odontoceridae		1		
Phryganeidae	8	1	2	
Polycentropodidae		7	9	
Uenoidae		2	4	4
<b>Coleoptera (beetles)</b>				
Dytiscidae (total)	1			
Gyrinidae (adults)				1
Hydrophilidae (total)	2		1	
Dryopidae			1	
Elmidae	1	1	5	32

Diptera (flies)				
Athericidae			1	1
Ceratopogonidae			1	
Chironomidae	121	54	47	76
Dixidae			1	
Tabanidae	2	6	7	1
Tipulidae	2			
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)		9	8	3
Lymnaeidae			2	
Physidae	8	25	15	
Planorbidae		1		
Viviparidae				1
Pelecypoda (bivalves)				
Sphaeriidae (clams)	42	72	36	
<b>TOTAL INDIVIDUALS</b>	<b>281</b>	<b>280</b>	<b>301</b>	<b>264</b>

METRIC	McLary Creek		Black River		Black River		Devils River	
	M-32		Poor Farm Road		Ritchie Road		State Street	
	8/2/2012		8/2/2012		7/31/2012		8/2/2012	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	23	1	29	1	34	1	32	1
NUMBER OF MAYFLY TAXA	1	0	4	1	3	1	3	0
NUMBER OF CADDISFLY TAXA	4	0	6	1	7	1	7	1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	1	0
PERCENT MAYFLY COMP.	0.36	-1	6.79	0	6.98	0	26.14	1
PERCENT CADDISFLY COMP.	4.27	0	10.00	0	12.96	0	4.55	0
PERCENT DOMINANT TAXON	43.06	-1	25.71	0	21.26	0	28.79	-1
PERCENT ISOPOD, SNAIL, LEECH	2.85	1	13.21	0	8.31	0	1.89	1
PERCENT SURF. AIR BREATHERS	1.78	1	0.36	1	3.65	1	1.52	1
TOTAL SCORE		0		3		3		4
MACROINV. COMMUNITY RATING		ACCEPT.		ACCEPT.		ACCEPT.		ACCEPT.

Table 11. Habitat evaluation for the Black River watershed trend sites, June-September 2012.

	South Branch Devils River Nicholson Hill Rd RIFFLE/RUN SITE 1T	Berlinski Creek (West) Off Cariveau Road RIFFLE/RUN SITE 2T
<b>HABITAT METRIC</b>		
<b>Substrate and Instream Cover</b>		
Epifaunal Substrate/ Avail Cover (20)	18	16
Embeddedness (20)*	19	14
Velocity/Depth Regime (20)*	11	15
Pool Substrate Characterization (20)**		
Pool Variability (20)**		
<b>Channel Morphology</b>		
Sediment Deposition (20)	20	16
Flow Status - Maint. Flow Volume (10)	6	9
Flow Status - Flashiness (10)	6	9
Channel Alteration (20)	18	20
Frequency of Riffles/Bends (20)*	18	18
Channel Sinuosity (20)**		
<b>Riparian and Bank Structure</b>		
Bank Stability (L) (10)	8	9
Bank Stability (R) (10)	8	7
Vegetative Protection (L) (10)	8	8
Vegetative Protection (R) (10)	8	8
Riparian Veg. Zone Width (L) (10)	7	10
Riparian Veg. Zone Width (R) (10)	7	8
<b>TOTAL SCORE (200):</b>	<b>162</b>	<b>167</b>
<b>HABITAT RATING:</b>	<b>EXCELLENT (NON- IMPAIRED)</b>	<b>EXCELLENT (NON- IMPAIRED)</b>

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

Date:	8/1/2012	6/6/2012
Weather:	Sunny	Sunny
Air Temperature:	78 Deg. F.	70 Deg. F.
Water Temperature:	73 Deg. F.	60 Deg. F.
Ave. Stream Width:	18 Feet	9 Feet
Ave. Stream Depth:	0.75 Feet	0.33 Feet
Surface Velocity:	0.3 Ft./Sec.	1.25 Ft./Sec.
Estimated Flow:	4.05 CFS	3.7125 CFS
Stream Modifications:	None	None
Nuisance Plants (Y/N):	N	N
Report Number:		
STORET No.:	40132	40172
Stream Name:	South Branch Devils River	Berlinski Creek (West)
Road Crossing/Location:	Nicholson Hill Rd	Off Cariveau Road
County Code:	04	04
TRS:	29N08E22	29N08E05
Latitude (dd):	44.902069	44.93745
Longitude (dd):	-83.4468344	-83.49062
Ecoregion:	NLAF	NLAF
Stream Type:	Coldwater	Coldwater
USGS Basin Code:	4070003	4070003

\* Applies only to Riffle/Run stream Surveys

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

Table 12. Qualitative macroinvertebrate sampling results for the Black River watershed trend sites June-September 2012.

TAXA	South Branch Devils River	Berlinski Creek (West)
	Nicholson Hill Rd 8/1/2012 SITE 1T	Off Carriveau Road 6/6/2012 SITE 2T
<b>PLATYHELMINTHES (flatworms)</b>		
Turbellaria	1	
<b>ANNELIDA (segmented worms)</b>		
Oligochaeta (worms)	14	4
<b>ARTHROPODA</b>		
<b>Crustacea</b>		
Amphipoda (scuds)	2	53
Decapoda (crayfish)	1	
Isopoda (sowbugs)	1	
<b>Arachnoidea</b>		
Hydracarina	3	
<b>Insecta</b>		
<b>Ephemeroptera (mayflies)</b>		
Baetidae	2	27
Caenidae	5	1
Ephemerellidae	1	
Heptageniidae	50	19
Leptophlebiidae	6	11
Tricorythidae	1	
<b>Odonata</b>		
<b>Anisoptera (dragonflies)</b>		
Cordulegastridae	1	5
Gomphidae	3	
<b>Zygoptera (damselflies)</b>		
Calopterygidae	16	1
Coenagrionidae	1	
<b>Plecoptera (stoneflies)</b>		
Perlidae	7	16
Perlodidae		1
<b>Hemiptera (true bugs)</b>		
Gerridae	1	1
Mesoveliidae	1	1
Veliidae	1	
<b>Megaloptera</b>		
Corydalidae (dobson flies)	5	7
Sialidae (alder flies)	1	
<b>Trichoptera (caddisflies)</b>		
Brachycentridae		3
Glossosomatidae	1	8
Helicopsychidae	9	
Hydropsychidae	11	15
Leptoceridae	1	1
Limnephilidae	1	
Molannidae	1	
Philopotamidae	6	12
Uenoidae	6	1
<b>Coleoptera (beetles)</b>		
Dryopidae		1
Elmidae	66	67

Psephenidae (larvae)	2	
Diptera (flies)		
Athericidae	42	11
Ceratopogonidae	2	1
Chironomidae	32	41
Dixidae	1	
Simuliidae		2
Tabanidae	1	4
Tipulidae	1	2
MOLLUSCA		
Gastropoda (snails)		
Ancylidae (limpets)	2	1
Physidae	4	
Pelecypoda (bivalves)		
Sphaeriidae (clams)	1	12
<hr/>		
TOTAL INDIVIDUALS	314	329

METRIC	South Branch Devils River Nicholson Hill Rd 8/1/2012 SITE 1T		Berlinski Creek (West) Off Carriveau Road 6/6/2012 SITE 2T	
	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	41	1	29	1
NUMBER OF MAYFLY TAXA	6	1	4	1
NUMBER OF CADDISFLY TAXA	8	1	6	1
NUMBER OF STONEFLY TAXA	1	0	2	1
PERCENT MAYFLY COMP.	20.70	0	17.63	0
PERCENT CADDISFLY COMP.	11.46	0	12.16	0
PERCENT DOMINANT TAXON	21.02	0	20.36	0
PERCENT ISOPOD, SNAIL, LEECH	2.23	1	0.30	1
PERCENT SURF. AIR BREATHERS	0.96	1	0.61	1
TOTAL SCORE		5		6
MACROINV. COMMUNITY RATING		EXCELLENT		EXCELLENT