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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER RESOURCES DIVISION
MAY 2012

STAFF REPORT

BIOLOGICAL SURVEYS OF SELECTED STATIONS ON KIDS CREEK AND NEARBY STREAMS IN THE BOARDMAN RIVER WATERSHED GRAND TRAVERSE COUNTY, MICHIGAN AUGUST 2010 AND SEPTEMBER 2011

Introduction

Biological and physical habitat conditions of Kids Creek and nearby streams in the Boardman River watershed in Grand Traverse County were assessed by staff of the Surface Water Assessment Section (SWAS) in August 2010 and September 2011. Relevant data collected from prior years are also included in this report. The primary objectives of the assessments were to:

1. Assess the current status and condition of individual water bodies and determine if Michigan Water Quality Standards (WQS) are being met.
2. Support Total Maximum Daily Load (TMDL) development needs for Kids Creek.

The macroinvertebrate community, fish community, and physical habitat were qualitatively assessed (unless otherwise noted) at each of 6 stations (Tables 1-4, Figure 1) using the SWAS Procedure 51 (MDEQ, 1990; Creal et al., 1996) for wadeable streams. If a station is sampled at a road crossing, it is generally sampled upstream unless otherwise noted. The macroinvertebrate and fish communities were assessed and scored with metrics that rate waterbodies from excellent (+5 to +9 [macroinvertebrates], +5 to +10 [fish]) to poor (-5 to -9 [macroinvertebrates], -5 to -10 [fish]). Scores from +4 to -4 are rated acceptable. Negative scores in the acceptable range are considered tending towards a poor rating, while positive scores in the acceptable range are tending towards an excellent rating. For designated coldwater streams, the fish metrics do not apply. The presence of salmonids at 1 percent or greater in the fish community is interpreted as meeting the coldwater designated use. Coldwater stream designation is determined by the Michigan Department of Natural Resources (MDNR) 1997 Designated Trout Streams for the State of Michigan (MDNR, 1997), per Michigan's Part 4, Water Quality Standards, promulgated under Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

Habitat evaluations are based on 10 metrics, with a maximum total score of 200. A station habitat score of >154 is characterized as excellent habitat, 105-154 is good, 56-104 is marginal, and <56 is poor.

Six stations within the Boardman River watershed were selected for targeted monitoring (Figure 1) to support decisions regarding the development of a TMDL for Kids Creek.

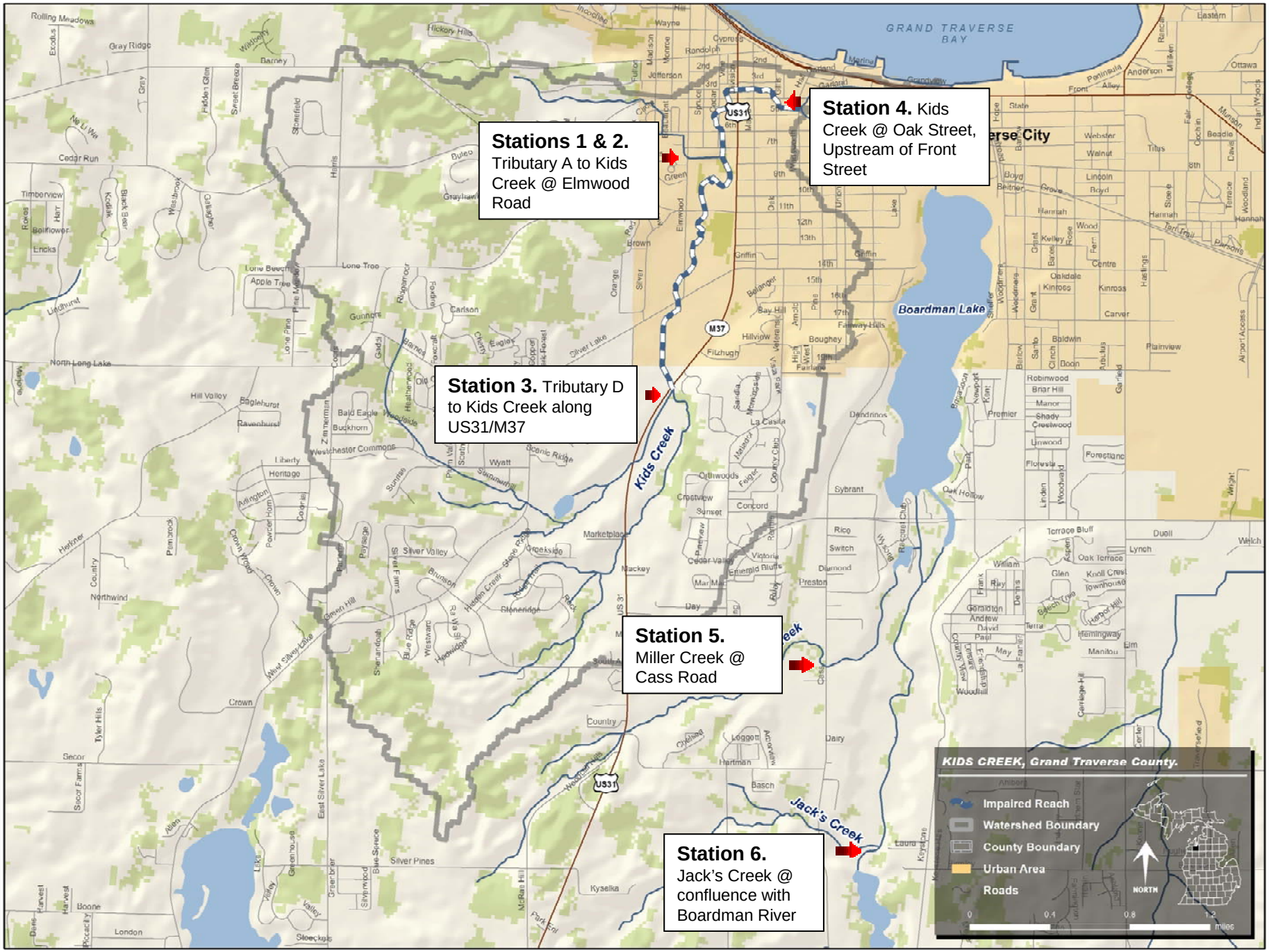

Figure 1. Kids Creek, Miller Creek, and Jack's Creek watershed. Grand Traverse County, Michigan.

Table 1. Summary of the aquatic habitat and macroinvertebrate community evaluations for selected stations in the Boardman River watershed, 2010 and 2011. -- = not sampled, * = fish community was sampled and scored acceptable.

Station #	Stream Name	Road Crossing or landmark	STORET #	TRS	County	Township	Latitude	Longitude	Habitat Evaluation		Macroinvertebrate Community		AUID#
									Rating	Score	Rating	Score	
1	Kids Creek Tributary A	Elmwood (upstream)	280418	27N11W29	Grand Traverse	Traverse City	44.75991	-85.63985	Marginal	95	Acceptable*	2	040601050507-01
2	Kids Creek Tributary A	Elmwood (downstream)	280417	27N11W09	Grand Traverse	Traverse City	44.75971	-85.63941	Marginal	79	Poor*	-5	040601050507-01
3	Kids Creek Tributary D	US-31/M-37	280314	27N11W16	Grand Traverse	Garfield	44.74133	-85.64260	Good	140	Acceptable	2	040601050507-03
4	Kids Creek	Upstream of Front St. @ Oak St.	280321	27N11W03	Grand Traverse	Garfield	44.76410	-85.63050	--	--	--*	--*	040601050507-01
5	Miller Creek	Cass Road	280307	27N11W22	Grand Traverse	Garfield	44.72284	-85.62583	Good	131	Acceptable*	2	040601050507-04
6	Jack's Creek	Upstream of Boardman River confluence	280415	27N11W27	Grand Traverse	Garfield	44.70816	-85.62362	Excellent	163	Acceptable	1	040601050507-06

Habitat Scoring

Poor< 56
Marginal 56-104
Good 105-154
Excellent >154

Macroinvertebrate Scoring

Poor <-4
Acceptable -4 to +4
Excellent > +4

Watershed Information

The Boardman River drains approximately 300 square miles of land in Kalkaska and Grand Traverse Counties and consists of approximately 130 miles of river and stream tributaries (MDNR, 1975). Twelve lakes also drain into the river system (MDNR, 1975).

The Boardman River and its tributaries are located in the Northern Central Hardwood Forests (NCHF) ecoregion (Omernik and Gallant, 1988). The region is a mixture of state and private forest with agricultural and urban land uses. The land use in the watershed is primarily urban (57 percent) followed by forest, open land, and wetlands (39 percent) and agriculture (5 percent) (Dave Fongers, MDEQ, Water Division, personal communication based on 2005 land cover). Agriculture in the area is a mixture of fruit orchards, grain/row crops, and livestock production. Most agricultural practices are small and interspersed with residential and natural land. Tourism is a major industry in the region and property with access to or views of the region's water bodies is highly valued.

Most of the streams in Grand Traverse Bay and Lake Michigan watersheds have historically had good water quality with biological communities that would be characteristic of unimpaired water bodies. The region has well drained soils, which result in ample cold groundwater inputs to the streams and provides for the stable stream flow regimes in this watershed. Almost all streams in the region are coldwater systems and designated trout streams.

Background Sampling Information

Kids Creek is the most downstream tributary to the Boardman River. Its confluence with the Boardman River is less than one mile upstream of where the Boardman River meets the west arm of Grand Traverse Bay (Figure 1). The headwaters of Kids Creek are within Garfield Township and begin from the south near Silver Pines Road and from the west from upstream of Silver Lake Road and upstream of South Airport Road.

In 2008, the macroinvertebrate community scored poor when sampled upstream of Front Street at Oak Street (LeSage, 2009). This location was sampled 4 times as part of a quality assurance evaluation method, and each of the four scorings (-6, -5, -7, -6) resulted in a poor designation. The macroinvertebrate community and habitat (Table 2) were sampled at this same station in 2003 and scored poor and marginal, respectively (Holden, 2008).

Also in 2008, the macroinvertebrate community and habitat was sampled in Kids Creek downstream of Silver Lake Road and upstream of US-31. At the Silver Lake Road location, the macroinvertebrate community was rated as acceptable but was within one point of the poor designation. The habitat was rated on the low end of good. At the US-31 location, the community was rated as acceptable and the habitat was also on the low end of good (Holden, 2009).

In 2003, in addition to the Front Street station noted above, the macroinvertebrate community and habitat was sampled upstream of 11th Street and scored poor and marginal, respectively (Holden, 2008). In 1998, the macroinvertebrate community was sampled upstream of 11th Street and was rated as poor (Walker, 2001). All of the stations sampled in the Kids Creek watershed are within a highly urbanized area of Traverse City and appear to be heavily impacted by storm water and possibly sedimentation.

In 2003, sediment samples were collected from Kids Creek at Front Street, 11th Street, Silver Lake Road and US-31, and were tested for volatile parameters. No volatile parameters were detected in any sample. A sediment sample was also collected from Kids Creek at Front Street

and analyzed for metals. Levels did not exceed sediment quality guidance numbers (MacDonald et al., 2000).

In 2003, water samples were collected from Kids Creek at Front Street, 11th Street and at Silver Lake Road, and were analyzed for metals and nutrient parameters. WQS were not exceeded at any station. Two samples were collected at the Front Street station; one the day before a large rain event, and one the morning after the event. Total phosphorus levels were 0.024 mg/L prior to the rain event and rose to 0.31 mg/L after the rain event. Several metal parameters were also elevated after the rain event but did not exceed WQS.

Kids Creek is designated as a coldwater stream. Fish were sampled upstream of 11th in 1998 and the coldwater designation was being attained at that time. Results from additional fish sampling conducted since the 1998 site visit is contained in this report (Table 5).

Miller Creek and Jack's Creek are two watersheds located southeast of the Kids Creek watershed. In 2003, the macroinvertebrate community and habitat was sampled at one station in each of these watersheds. Habitat rated good in both watersheds and the macroinvertebrate community scored acceptable (-2) in Miller Creek at Cass Road and acceptable (-2) in Jack's Creek at Cass Road. These watersheds (especially Miller Creek) have somewhat similar land use, soils and watershed size when compared to Kids Creek, but are meeting the "other indigenous aquatic life and wildlife" designated use. For that reason, these watersheds may be considered reference attainment streams to be used for comparison to Kids Creek. Results from additional sampling within Miller and Jack's Creeks are contained in this report (Tables 2-5).

The portion of Kids Creek from US-31 to the confluence of the Boardman River (Figure 1) is on the 2010 303(d) non-attainment list because it does not meet the "other indigenous aquatic life and wildlife" designated use (AUID 040601050507-01) (LeSage and Smith, 2010). The data contained in this report, along with previous assessments and other relevant data, will be used in the development of a biota TMDL for Kids Creek.

2010 and 2011 Sampling Results

<u>Tributary A to Kids Creek</u>

In 2011, Tributary A to Kids Creek (Tributary A) was sampled at Elmwood Avenue. Separate assessments were conducted upstream (Station 1) and downstream (Station 2) of the Elmwood Avenue road crossing on this designated coldwater stream.

Figure 2. Tributary A to Kids Creek, upstream of Elmwood Avenue (Station 1).

<u>Station 1 on Tributary A</u>

Station 1 (Figure 1 and 2) is the surveyed segment of Tributary A located upstream of the Elmwood Avenue crossing. The glide/pool habitat at station 1 was rated as marginal (95; Table 2A). This site had an average width of 5 feet and consisted of mainly sand substrate. A small amount of gravel and cobble were observed, and boulders were placed in the stream when work on the riparian area was conducted. Riparian vegetation on both banks had been removed and reseeded, but little vegetation was present at the time of assessment. The stream edges contained some large woody debris and, in several places, were lined with coconut fiber "logs". Undercut banks were evident throughout station 1. The macroinvertebrate community scored acceptable (2;

Tables 3A and 4A). Midges composed more than 50 percent of the total individuals collected. A community dominated by one or two taxa can indicate an environmental stress (MDEQ, 1990); however, one stonefly taxa that is sensitive to pollution was also found. Over 97 percent of all fish collected were salmonids (rainbow trout, brown trout, and coho salmon), which meets the coldwater designated use for this location.

Station 2 on Tributary A

Figure 3. Tributary A to Kids Creek downstream of Elmwood Avenue (Station 2).

Station 2 (Figures 1 and 3) is the surveyed segment located downstream of the Elmwood Avenue crossing. The glide/pool habitat at station 2 was rated as marginal (79; Table 2A). This stream section was nearly double the width of the station upstream, with an average width of 10 feet. In-stream substrate consisted of predominately of shifting sand and silt (> 2 feet deep in places) with a small gravel riffle just downstream of the road crossing. Station 2 had approximately 25 feet of riparian buffer on both stream banks with a mix of trees, grasses, and herbaceous plants. The stream appeared to have flashy flows with several large woody debris jams. The water level was low, and rootwads provided the only habitat for macroinvertebrates community which scored poor (-5, Table 3A and 4A). Amphipods (34 percent) and midges (27 percent) were the dominant taxa at this location. The large discrepancy between macroinvertebrate scores upstream (2; acceptable) and downstream (-5; poor) could be attributed to the inconsistency in average stream width which is used in calculating the macroinvertebrate metric scores. Salmonids comprised over 96 percent of all fish collected at this site (rainbow trout, brown trout, brook trout, and coho salmon), which meets the coldwater stream designated use for this location.

Tributary D to Kids Creek

Figure 4: Tributary D to Kids Creek (Station 3), on right. Kids Creek on left.

In 2010, Tributary D to Kids Creek (Tributary D) was sampled in a section of the creek that parallels US-31/M-37 (Figures 1 and 4). The assessed portion of Tributary D (Station 3) is designated as a coldwater stream and was noted as having significant groundwater input and areas of fairly swift flow. Stream substrate was almost entirely gravel and sand with a few larger cobbles and boulders throughout the site. The habitat for station 3 received a score of good (140; Table 2A). This score was negatively impacted by the lack of riparian zone and vegetative buffer due to visible human influence. Macroinvertebrates at the site received a score of acceptable (2; Tables 3A and 4A). One mayfly and 5 caddisfly families were recorded; no stoneflies were collected at the site. The fish community was not assessed at this location; however, staff from MDNR, Fisheries Division have previously sampled this reach and found brook trout, brown trout, rainbow trout, coho salmon, and chinook salmon at numbers that would be considered meeting the coldwater fisheries designation (Todd Kalish, MDNR, personal communication).

Kids Creek

Kids Creek (Station 4) was assessed upstream of Front Street at the Oak Street crossing (Figures 1 and 5). As noted, Kids Creek is currently not meeting the "other indigenous aquatic life and wildlife"designated use based on the poor macroinvertebrate scores reported throughout the impaired reach (Figure 1). Habitat was assessed at station 4 in 2003 (Holden, 2008) and scored in the range of marginal (70; Table 2B). There is a substantial amount of industrial/urban land use around this station with sedimentation, dredging, canopy removal, and bank stabilization noted as visible stream modifications and impairments. More recent site visits have verified that conditions at station 4 have changed very little since the 2003 habitat assessment. The macroinvertebrate community was surveyed in 2008 and scored as poor (LeSage, 2009). Midges, scuds, and aquatic worms were the dominant taxa collected during the assessment. Three Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) (EPT) families were identified with no stoneflies collected. The fish community was assessed at this designated coldwater stream in August of 2010, and met the coldwater designation, as over 25 percent of the fish collected were salmonids. Brown trout and rainbow trout were the two salmonids species collected (Table 5).

Figure 5: Kids Creek, upstream of Front Street (Station 4).

Miller Creek

Miller Creek (Station 5) was sampled upstream of the Cass Road crossing and was determined to be a riffle/run habitat. Miller Creek is designated as a coldwater stream and was targeted for sampling as a reference reach for comparison to Kids Creek. The surveyed section averaged a width of approximately 4 feet and contained substrate comprised of mainly sand and silt with a small amount of clay. The habitat was sampled in 2010 and was rated as good (131; Table 2B) and was noted as having a riparian zone which was visibly impacted by tree removal and contained some areas of observable erosion. In 2010, the macroinvertebrate community scored acceptable (2; Tables 3B and 4B) with 23 different taxa documented. Amphipods were the dominant taxa, comprising over 41 percent of the individuals collected, which may indicate some environmental stress on this section of creek. The fish community was sampled in 2011. The coldwater designated use for Miller Creek was met with salmonids comprising 98 percent of the fish collected. Brown trout were the only salmonids species collected at this location, with 59 being collected (Table 5).

Miller Creek was surveyed in August of 1990 (Jones, 1991) near the Cass Road crossing. Similar stream substrate description and salmonid numbers were recorded during that assessment.

Jack's Creek

Jack's Creek (Station 6) is a tributary of the Boardman River that enters just downstream of the Sabin pond impoundment. It is designated as a coldwater stream and was sampled just upstream of its confluence with the Boardman River (Figures 1 and 6). Jack's Creek was targeted along with Miller Creek as a reference site because of its similarity to Kids Creek and due to the fact that it meets the "other indigenous aquatic life and wildlife" designated use. The riffle/run habitat was rated as excellent (163; Table 2B) in 2010 and contained in-stream substrate consisting of predominately gravel and sand with a minimal amount of silt. Habitat characteristics such as a full tree canopy, stable stream banks, and prevalent riffle habitat were noted during assessment at this location. The macroinvertebrate community scored acceptable (1; Table 3B and 4B) in 2010 and contained a good diversity (9 different families) of, EPT taxa. These taxa are usually intolerant to pollution. The fish community was not assessed at this location; however, staff from MDNR, Fisheries Division has previously sampled Jack's Creek and found brook trout, brown trout, rainbow trout, and coho salmon, at numbers that would be considered meeting the coldwater fisheries designation (Todd Kalish, MDNR, personal communication).

Figure 6: Jacks Creek, upstream of the confluence with the Boardman River (Station 6).

Summary of Results of Monitoring Objectives

1. Assess the current status and condition of individual waters of the state and determine whether Michigan WQS are being met.

   In summary aquatic macroinvertebrate community and habitat assessments were conducted in 2010 and 2011 at a total of 3 stations in the Kids Creek watershed and at one station each in the Miller Creek and Jack's Creek watersheds (Table 1, Figure 1). Fish community assessments were made at 3 stations (Table 5) in the Kids Creek watershed and one station in the Miller Creek watershed. Additional fish community information was available from the MDNR for Tributary D to Kids Creek and Jack's Creek.

   The coldwater fisheries designated use is being met throughout the Kids Creek, Miller Creek, and Jack's Creek watersheds. The other indigenous aquatic life designated use is being met in the Miller Creek and Jack's Creek watershed, and in Tributary A of Kids Creek upstream of Elmwood Avenue and in Tributary D of Kids Creek. The other indigenous aquatic life designated use was not being met in Tributary A downstream of Elmwood Avenue. This is due to a poor macroinvertebrate score at this location (Tables 3A and 4A).

2. Support TMDL development for Kids Creek.

   Data collected in the surveys presented in this report will be used to support development of the Kids Creek TMDL. Kids Creek from the confluence with the Boardman River upstream to US-31/M-37, including Tributary A from its confluence with Kids Creek upstream to its headwaters, will be included in the development of the TMDL. Individual macroinvertebrate

community scores were acceptable in Tributary A upstream of Elmwood Avenue and in Kids Creek upstream of Silver Lake Road. However, Kids Creek upstream of Silver Lake Road was one point away from scoring poor (-4) and had a macroinvertebrate community that consisted of 77 percent oligochaetes, which are tolerant to environmental stress. Although the macroinvertebrate community scored acceptable in Tributary A upstream of Elmwood Avenue, it scored poor downstream of the road crossing, indicating stressors are present in this tributary as well.

Possible causes listed for the impaired reach include “other anthropogenic substrate alterations”, “other flow regime alterations”, and “sedimentation/siltation.” Possible sources are listed as impervious surface/parking lot runoff, post development erosion and sedimentation, and urban runoff/storm sewers. Additional investigations are ongoing to more specifically identify possible stressors to the impaired reach and identify the needed pollutant target for the TMDL. Currently, the TMDL is scheduled for development in 2013.

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Literature Cited

Creal, W., S. Hanshue, S. Kosek, M. Oemke, and M. Walterhouse. 1996. Update of GLEAS Procedure 51 Metric Scoring and Interpretation. Michigan Department of Environmental Quality, Water Division, Lansing, MI. Report No. MI/DEQ/SWQ-96/068. Revised May 1998.

Holden, S. 2008. A Biological Survey of Selected Grand Traverse Bay and Lake Michigan Tributaries in Antrim, Charlevoix, Grand Traverse, Kalkaska, and Leelanau Counties, Michigan July –August 2003. Michigan Department of Environmental Quality, Water Division, Lansing, MI. Report No. MI/DEQ/WB-08/079

Holden, S. 2009. Biological Surveys of Selected Northwest Lower Peninsula Streams. Antrim, Charlevoix, Emmet, Grand Traverse, and Kalkaska Counties, MI. July to August 2008. Michigan Department of Environmental Quality, Water Resources Division, Lansing, MI. Report No. MI/DEQ/WB-09/028.

Jones, R.J. 1991. A Biological Survey of Miller Creek, Grand Traverse County, MI 1990. Michigan Department of Environmental Quality, Water Division, Lansing, MI. Report No.MI/DNR/SWQ-91/038

LeSage, S.W. 2009. A Quality Assurance Evaluation of the Qualitative Biological and Habitat Survey Protocols for Wadeable Stream and Rivers 2008. Michigan Department of Environmental Quality, Water Division, Lansing, MI. Report No. MI/DEQ/WB-09/029.

LeSage, S.W. and J. Smith. 2010. Water Quality and Pollution Control in Michigan, 2008, Sections 303(d), 305(b), and 314 Integrated Report. Michigan Department of Environmental Quality, Water Resources Division, Lansing, MI. Report No. MI/DEQ/WRD-10/001.

MacDonald, D.D., Ingersoll, C.G., and T.A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems. Archives of Environmental Contamination and Toxicology. 39:20-31

MDEQ, 1990. GLEAS Procedure 51 - Qualitative Biological and Habitat Survey Protocols for Wadable Streams and Rivers, April 24, 1990. Revised June 1991, August 1996, January 1997, and May 2002.

MDNR, 1975. Natural River Plan - Boardman River. Michigan Department of Natural Resources.

MDNR, 1997. Designated Trout Streams for the State of Michigan. Director's order DFI-101.97. Lansing, Michigan.

Omernik, J. and A. Gallant. 1988. Ecoregions of the Upper Midwest States. USEPA, Environmental Research Laboratory. EPA/600/3-88/037.

Table 2A Habitat evaluation for selected sites in the Kids Creek watershed, Grand Traverse County, MI.

HABITAT METRIC	Kids Creek Tributary A @ Elmwood Ave (upstream) GLIDE/POOL STATION 1	Kids Creek Tributary A @ Elmwood Ave (downstream) GLIDE/POOL STATION 2	Kids Creek Tributary D US31/M37 RIFFLE/RUN STATION 3
Substrate and Instream Cover			
Epifaunal Substrate/ Avaiable Cover (20)	11	7	13
Embeddedness (20)*			15
Velocity/Depth Regime (20)*			14
Pool Substrate Characterization (20)**	10	7	
Pool Variability (20)**	10	11	
Channel Morphology			
Sediment Deposition (20)	13	4	15
Flow Status - Maintained. Flow Volume (10)	10	7	10
Flow Status - Flashiness (10)	7	1	10
Channel Alteration (20)	8	10	15
Frequency of Riffles/Bends (20)*			18
Channel Sinuosity (20)**	2	6	
Riparian and Bank Structure			
Bank Stability (L) (10)	8	4	9
Bank Stability (R) (10)	8	4	9
Vegetative Protection (L) (10)	2	6	5
Vegetative Protection (R) (10)	2	6	5
Riparian Vegetated Zone Width (L) (10)	2	3	1
Riparian Vegetated Zone Width (R) (10)	2	3	1
TOTAL SCORE (200):	95	79	140
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

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

Date:	9/15/2011	9/14/2011	8/5/2010
Weather:	Partly Cloudy	Partly Cloudy	Sunny
Air Temperature:	55 °F	58 °F	80 °F
Water Temperature:	50 °F	54 °F	
Ave. Stream Width:	5 ft.	10 ft.	2.5 ft.
Ave. Stream Depth:	0.67 ft.	0.5 ft.	0.2 ft.
Surface Velocity:	0.83 ft./sec	1 ft./sec	1.4 ft./sec
Estimated Flow:	2.7805 CFS	5 CFS	0.7 CFS
Stream Modifications:	Bank Stabilization	Canopy Removal	Canopy Removal
Nuisance Plants (Y/N):	N	N	N
Report Number:			
STORET No.:	280418	280417	
Stream Name:	Kids Creek Tributary A	Kids Creek Tributary A	280314
Road Crossing/Location:	Elmwood Ave	Elmwood Ave	Kids Creek Tributary D
County Code:	28	28	US31/M37
TRS:	27N11W29	27N11W9	28 27N11W16
Latitude (dd):	44.759914	44.759711	44.742587
Longitude (dd):	-85.639845	-85.639411	-85.6410018
Ecoregion:	NCHF	NCHF	NCHF
Stream Type:	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4060105	4060105	4060105 8/5/2010

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

Table 2B Habitat evaluation for selected sites in the Kids Creek watershed, Grand Traverse County, MI

HABITAT METRIC	Kids Creek Upstream of Front Street @ Oak Street RIFFLE/RUN STATION 4	Miller Creek @ Cass Road RIFFLE/RUN STATION 5	Jack's Creek Upstream of Boardman River confluence RIFFLE/RUN STATION 6
Substrate and Instream Cover			
Epifaunal Substrate/ Available Cover (20)	8	9	11
Embeddedness (20)*	7	9	12
Velocity/Depth Regime (20)*	14	13	14
Pool Substrate Characterization (20)**			
Pool Variability (20)**			
Channel Morphology			
Sediment Deposition (20)	7	9	8
Flow Status - Maintained. Flow Volume (10)	4	9	9
Flow Status - Flashiness (10)	2	9	10
Channel Alteration (20)	5	15	20
Frequency of Riffles/Bends (20)*	7	20	19
Channel Sinuosity (20)**			
Riparian and Bank Structure			
Bank Stability (L) (10)	3	7	10
Bank Stability (R) (10)	3	8	10
Vegetative Protection (L) (10)	3	7	10
Vegetative Protection (R) (10)	3	9	10
Riparian Vegetated Zone Width (L) (10)	1	2	10
Riparian Vegetated Zone Width (R) (10)	3	5	10
TOTAL SCORE (200):	70	131	163
HABITAT RATING:	MARGINAL (MODERATELY IMPAIRED)	GOOD (SLIGHTLY 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:	8/20/2003	8/4/2010	8/4/2010
Weather:	Sunny	Sunny	Sunny
Air Temperature:	85	86 °F	85 °F
Water Temperature:	61	63 °F	60 °F
Ave. Stream Width:	10	4.3 ft.	7.3 ft.
Ave. Stream Depth:	1.5	0.25 ft.	0.34 ft.
Surface Velocity:	0.8	0.8 ft./sec	0.9 ft./sec
Estimated Flow:	12	0.86 CFS	2.2338 CFS
Stream Modifications:	Dredged, Canopy Removal, Bank Stabilization	Bank Stabilization	Bank Stabilization
Nuisance Plants (Y/N):	N	N	N
Report Number:			
		280307	
STORET No.:	280321	Miller Creek	280415
Stream Name:	Kid's Creek	Cass Road	Jack's Creek
Road Crossing/Location:	u/s Front St @ Oak St	28	Upstream Boardman River confluence
County Code:	28	27N11W22	28
TRS:	27N11W03		27N11W27
Latitude (dd):	44.7641	44.72284	44.708168
Longitude (dd):	-85.6305	-85.6258285	-85.623627
Ecoregion:	NCHF	NCHF	NCHF
Stream Type:	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4060105		4060105

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

Table 3A. Qualitative macroinvertebrate sampling results for selected sites in the Kids Creek watershed, Grand Traverse County, MI

TAXA	Kids Creek Tributary A upstream Elmwood Avenue 9/15/2011 STATION 1	Kids Creek Tributary A downstream Elmwood Avenue 9/14/2011 STATION 2	Kids Creek Tributary D 31 8/5/2010 STATION 3
PLATYHELMINTHES (flatworms)			
Turbellaria			2
ANNELIDA (segmented worms)			
Hirudinea (leeches)		9	
Oligochaeta (worms)	25	57	32
ARTHROPODA			
Crustacea			
Amphipoda (scuds)	28	108	60
Isopoda (sowbugs)		1	12
Arachnoidea			
Hydracarina	23	3	11
Insecta			
Ephemeroptera (mayflies)			
Baetidae	53	39	71
Leptophlebiidae	2		
Odonata			
Zygoptera (damselflies)			
Calopterygidae	1		
Plecoptera (stoneflies)			
Nemouridae	2		
Hemiptera (true bugs)			
Corixidae	1		
Gerridae			1
Mesoveliidae	1	1	
Megaloptera			
Sialidae (alder flies)	4	1	
Trichoptera (caddisflies)			
Brachycentridae	2		13
Hydropsychidae	1	1	1
Hydroptilidae			5
Limnephilidae			4
Molannidae			1
Phryganeidae		1	
Coleoptera (beetles)			
Dytiscidae (total)		1	
Elmidae			18
Diptera (flies)			
Ceratopogonidae	3	1	
Chironomidae	154	86	58
Simuliidae	2		58
Tabanidae		2	
Tipulidae	1		2
MOLLUSCA			
Gastropoda (snails)			
Bithyniidae	1		
Physidae	1		
Planorbidae			1
Pelecypoda (bivalves)			
Sphaeriidae (clams)			1
TOTAL INDIVIDUALS	305	311	351

Table 3B. Qualitative macroinvertebrate sampling results for selected sites in the Miller Creek and Jack's Creek watershed, Grand Traverse County, MI

TAXA	Miller Creek Cass Road 8/4/2010 STATION 5	Jack's Creek upstream Boardman River confluence 8/4/2010 STATION 6
ANNELIDA (segmented worms)		
Oligochaeta (worms)	5	12
ARTHROPODA		
Crustacea		
Amphipoda (scuds)	120	116
Isopoda (sowbugs)	4	4
Arachnoidea		
Hydracarina	1	3
Insecta		
Ephemeroptera (mayflies)		
Baetidae	35	22
Leptophlebiidae	1	
Odonata		
Anisoptera (dragonflies)		
Aeshnidae	5	
Cordulegastridae	1	
Plecoptera (stoneflies)		
Nemouridae	15	26
Perlidae	2	2
Hemiptera (true bugs)		
Gerridae	1	2
Mesoveliidae	2	
Megaloptera		
Corydalidae (dobson flies)	1	
Sialidae (alder flies)	1	1
Trichoptera (caddisflies)		
Brachycentridae	9	3
Glossosomatidae		3
Hydropsychidae	3	13
Hydroptilidae	1	
Lepidostomatidae		1
Limnephilidae		14
Polycentropodidae		1
Coleoptera (beetles)		
Dytiscidae (total)		1
Elmidae	3	
Diptera (flies)		
Ceratopogonidae	1	1
Chironomidae	40	59
Dixidae		1
Simuliidae	33	19
Tipulidae	1	3
MOLLUSCA		
Gastropoda (snails)		
Physidae	2	2
TOTAL INDIVIDUALS	287	309

Table 4A. Macroinvertebrate metric evaluation of selected sites in the Kids Creek watershed, Grand Traverse County, MI

	Kids Creek Tributary A @ Elmwood Ave (Upstream) 9/15/2011 STATION 1		Kids Creek Tributary A @ Elmwood Ave (Downstream) 9/14/2011 STATION 2		Kids Creek Tributary D US31/M37 8/5/2010 STATION 3	
METRIC	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	18	1	14	-1	18	1
NUMBER OF MAYFLY TAXA	2	1	1	-1	1	1
NUMBER OF CADDISFLY TAXA	2	0	2	-1	5	1
NUMBER OF STONEFLY TAXA	1	0	0	-1	0	-1
PERCENT MAYFLY COMPOSITION.	18.03	0	12.54	0	20.23	0
PERCENT CADDISFLY COMPOSITION	0.98	-1	0.64	-1	6.84	-1
PERCENT DOMINANT TAXON	50.49	-1	34.73	0	20.23	1
PERCENT ISOPOD, SNAIL, LEECH	0.66	1	3.22	-1	3.70	-1
PERCENT SURF. AIR BREATHERS	0.66	1	0.64	1	0.28	1
TOTAL SCORE		**2**		**-5**		**2**
MACROINVERTEBRATE COMMUNITY RATING	ACCEPTABLE		POOR		ACCEPTABLE	

Table 4B. Macroinvertebrate metric evaluation of selected sites in the Miller Creek and Jack's Creek watershed, Grand Traverse County, MI

	Miller Creek @ Cass Road 8/4/2010 STATION 5		Jack's Creek Upstream of Boardman River confluence 8/4/2010 STATION 6	
METRIC	Value	Value	Value	Score
TOTAL NUMBER OF TAXA	23	1	22	1
NUMBER OF MAYFLY TAXA	2	1	1	0
NUMBER OF CADDISFLY TAXA	3	1	6	1
NUMBER OF STONEFLY TAXA	2	1	2	1
PERCENT MAYFLY COMPOSITION	12.54	0	7.12	-1
PERCENT CADDISFLY COMPOSITION	4.53	-1	11.33	-1
PERCENT DOMINANT TAXON	41.81	-1	37.54	-1
PERCENT ISOPOD, SNAIL, LEECH	2.09	0	1.94	0
PERCENT SURFACE AIR BREATHERS	1.05	0	0.97	1
TOTAL SCORE		**2**		**1**
MACROINVERTEBRATE COMMUNITY RATING	ACCEPTABLE		ACCEPTABLE	

Table 5. Qualitative fish sampling results for selected sites in the Kids Creek and Miller Creek watershed, Grand Traverse County, MI

TAXA	Kids Creek Tributary A @ Elmwood Ave (Upstream) 9/15/2011 STATION 1	Kids Creek Tributary A @ Elmwood Ave (Downstream) 9/14/2011 STATION 2	Kids Creek Upstream of Front Street @ Oak Street 8/5/2010 STATION 4	Miller Creek @ Cass Road 9/15/2011 STATION 6
Salmonidae (trouts)				
Oncorhynchus mykiss (Rainbow trout)	13	24	12	
Salmo trutta (Brown trout)	52	47	6	59
Salvelinus fontinalis (Brook trout)		8		
Oncorhynchus kisutch (Coho salmon)	2	2		
Cottidae (sculpins)				
Cottus bairdii (Mottled sculpin)			53	
Cottus cognatus (Slimy sculpin)	2	3		
Percidae (perch)				
Etheostoma nigrum (Johnny darter)				1
TOTAL INDIVIDUALS	69	84	71	60
Number of hybrid sunfish	0	0	0	0
Number of anomalies	0	0	0	0
Percent anomalies	0.000	0.000	0.000	0.000
Percent salmonids	97.101	96.429	25.352	98.333
Reach sampled (ft)	450	150	185	550
Area sampled (sq ft)	2,250	1,500	1,943	2,200
Density (# fish/sq ft)	0.031	0.056	0.037	0.027
Gear	Backpack Shocker	Backpack Shocker	Backpack Shocker	Backpack Shocker