

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER RESOURCES DIVISION
AUGUST 2015

STAFF REPORT

A BIOLOGICAL SURVEY OF THE ROGUE RIVER WATERSHED
KENT COUNTY, MICHIGAN
AUGUST 2013

INTRODUCTION

Objective

Qualitative biological surveys of the Rogue River watershed (Hydrologic Unit Code 04050006) were conducted by staff of the Michigan Department of Environmental Quality (MDEQ), Water Resources Division (WRD), Surface Water Assessment Section (SWAS), during August 2013. The surveys were performed according to the SWAS Procedure 51 (MDEQ, 1990; Creal et al., 1996) at five stations (Figure 1), to evaluate biological communities and physical conditions of selected locations. Additional targeted monitoring was completed throughout the watershed to address specific concerns in Cedar Creek in Cedar Springs and the Rogue River and Rum Creek in Rockford.

Background and Historical Sampling

The Rogue River watershed is within the Southern Michigan Northern Indiana Till Plain (SMNITP) ecoregion (Omernik and Gallant, 1988). The SMNITP is characterized by lacustrine clay and silt soils, and historically white oak-white pine forest. The Rogue River is a natural river with a primarily agricultural watershed.

Biological, chemical, and physical habitat conditions of the Rogue River watershed were monitored at 23 sites by the MDEQ, WRD, in 2003 (Rockafellow, 2004) and at 21 sites in 2008 (Walterhouse, 2009). In 2003, all macroinvertebrate ratings were acceptable or excellent and habitat ratings were good or excellent except for one marginal site on Nash Creek at Phelps Avenue. Rum Creek, assessed at 10-Mile Road for its coldwater fishery, was dominated by brown trout and mottled sculpin and also included brook trout and bluegill. Trout represented 50 percent of the fish; therefore, this stream is meeting its coldwater designation. In 2008, all macroinvertebrate ratings were acceptable or excellent and habitat ratings were marginal or better. Four creeks (Stegman, Cedar, Duke, and Spring) were assessed for their coldwater fishery, and were meeting the coldwater designated use with brook trout and brown trout present.

The Wolverine World Wide tannery was located along the Rogue River in Rockford, Michigan, and was torn down between August 2010 and the fall of 2011. Local groups requested the assessment of water, sediment, macroinvertebrate, and fish for contamination and effects from the former Wolverine World Wide tannery. Trout Unlimited also requested a Procedure 51 macroinvertebrate/habitat assessment at Rum Creek to review the current status from the former Wolverine World Wide tannery impacts. Trout Unlimited requested targeted monitoring at Cedar Creek for continuous temperature monitoring due to concerns for the coldwater fishery.

METHODS

Procedure 51 describes the methodology for macroinvertebrate, fish, and habitat surveys of wadeable streams, and was used to evaluate the stations. Procedure 51 rates macroinvertebrate communities as Poor (-9 to -5), Acceptable (-4 to +4), and Excellent (+5 to +9), based on the proportions of each taxa found, and the sensitivity of the community assemblage to water quality. Habitat was rated on a scale of Poor (<56), Marginal (56-104), Good (105-154), or Excellent (>154) based on in-stream and riparian characteristics and impairments. The coldwater fish community is evaluated for the presence of at least 50 fish, relative abundance of anomalies (less than 2 percent of the catch), and relative abundance of salmonids collected (at least 1 percent of the catch).

Two site-selection methods were used to assess the Rogue River watershed in 2013: *stratified random* to address statewide, regional, and watershed questions about water quality and *targeted* to address specific areas of interest. There were four randomly selected status sites and one randomly selected trend site that is now fixed to be sampled every five years (Figure 1, Table 1a). Procedure 51 was used to assess the macroinvertebrates and habitat at each random site. A target of 300 individual macroinvertebrates was counted at each site.

Targeted monitoring included water, sediment, and fish contamination analysis at four sites along the Rogue River and Rum Creek (Figure 2, Table 1b.). Two of these sites were also assessed using Procedure 51 for macroinvertebrates and habitat. Fish contaminant data will be reported in a separate MDEQ Fish Contaminant Monitoring Program report. Additional targeted sites included three locations on Cedar Creek (Maple Road, Algoma Avenue, Friske Drive) where temperature was monitored using continuous temperature data loggers by Trout Unlimited and monthly grab samples were taken by the MDEQ (Figure 3, Table 1c.). The Maple Road site was assessed for the coldwater fishery and all sites were assessed for habitat using Procedure 51.

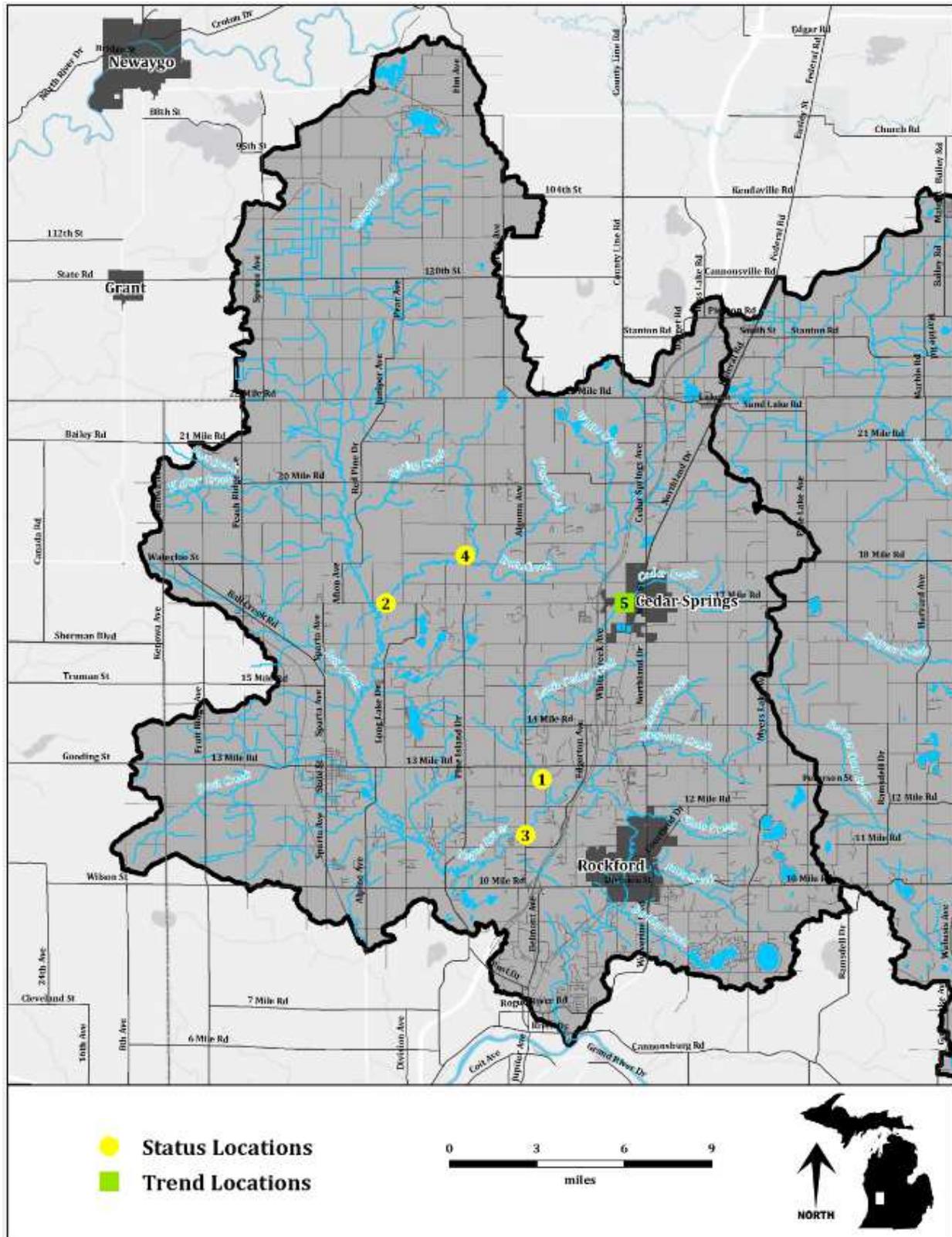


Figure 1. Status and Trend Locations in the Rogue River Watershed.

Table 1a. Status and Trend Locations in the Rogue River Watershed.

Site ID	Water Body	Location	STORET	County	Latitude	Longitude	Habitat Evaluation		Macroinvertebrate Community	
1	Cedar Creek	Friske Road	410615	Kent	43.15614	-85.60295	Excellent	156	Excellent	8
2	Duke Creek	17 Mile Road	410692	Kent	43.21981	-85.68018	Good	108	Acceptable	4
3	Rogue River	Algoma Avenue	410778	Kent	43.13594	-85.61089	Good	134	Acceptable	3
4	Duke Creek	Hanna Avenue	410691	Kent	43.23715	-85.64082	Excellent	166	Excellent	7
5	Cedar Creek	17 Mile Road	410750	Kent	43.22000	-85.56200	Good	117	Acceptable	-3

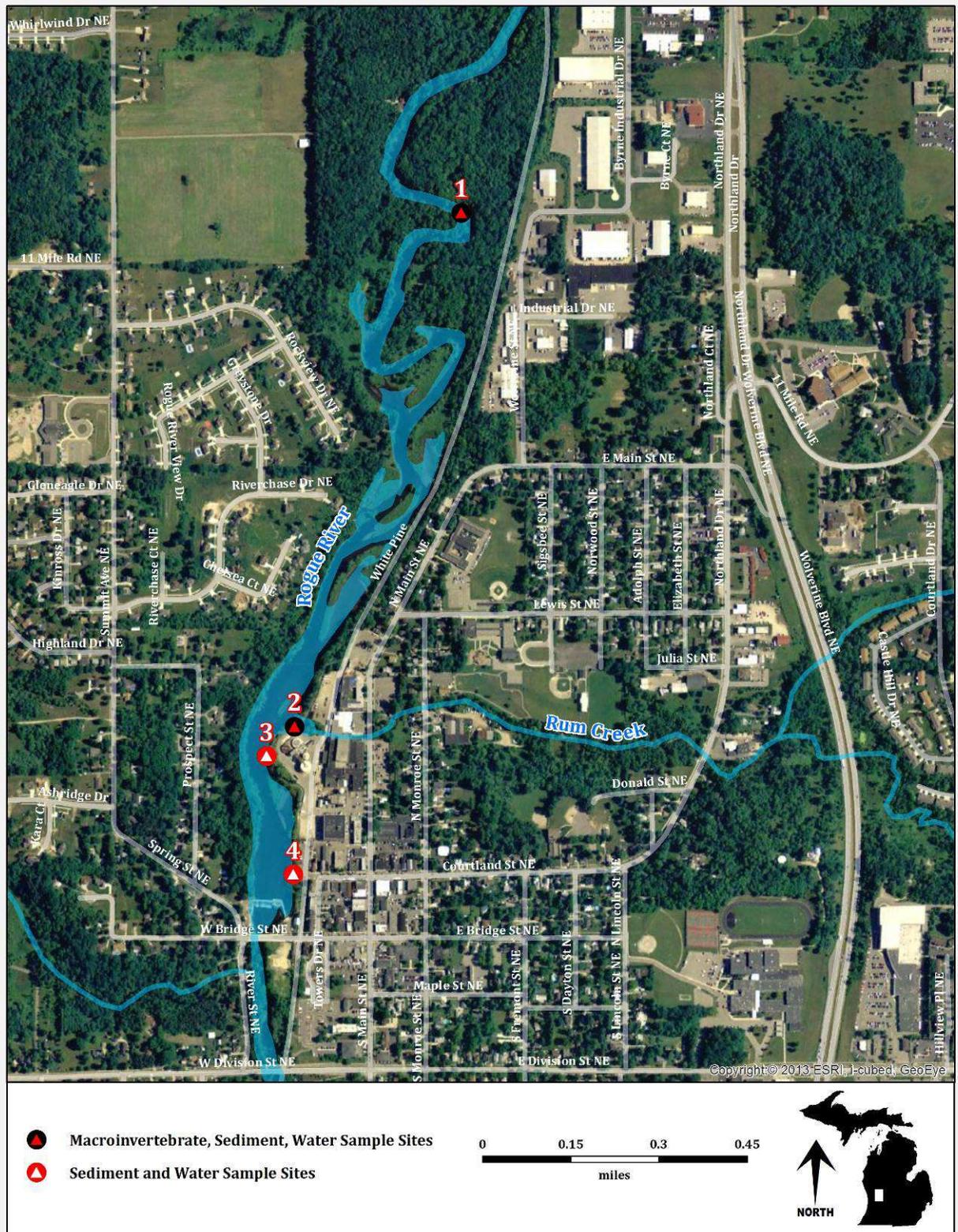


Figure 2. Targeted Monitoring Locations on the Rogue River and Rum Creek.

Table 1b. Targeted Monitoring Locations on the Rogue River and Rum Creek.

Site ID	Water Body	County	Latitude	Longitude	Habitat Evaluation		Macroinvertebrate Community	
1	Rogue River	Kent	43.13277	-85.55710	Excellent	161	Acceptable	2
2	Rum Creek	Kent	43.12360	-85.56139	Good	109	Poor	-6
3	Rogue River	Kent	43.12307	-85.56208				
4	Rogue River	Kent	43.12094	-85.56142				

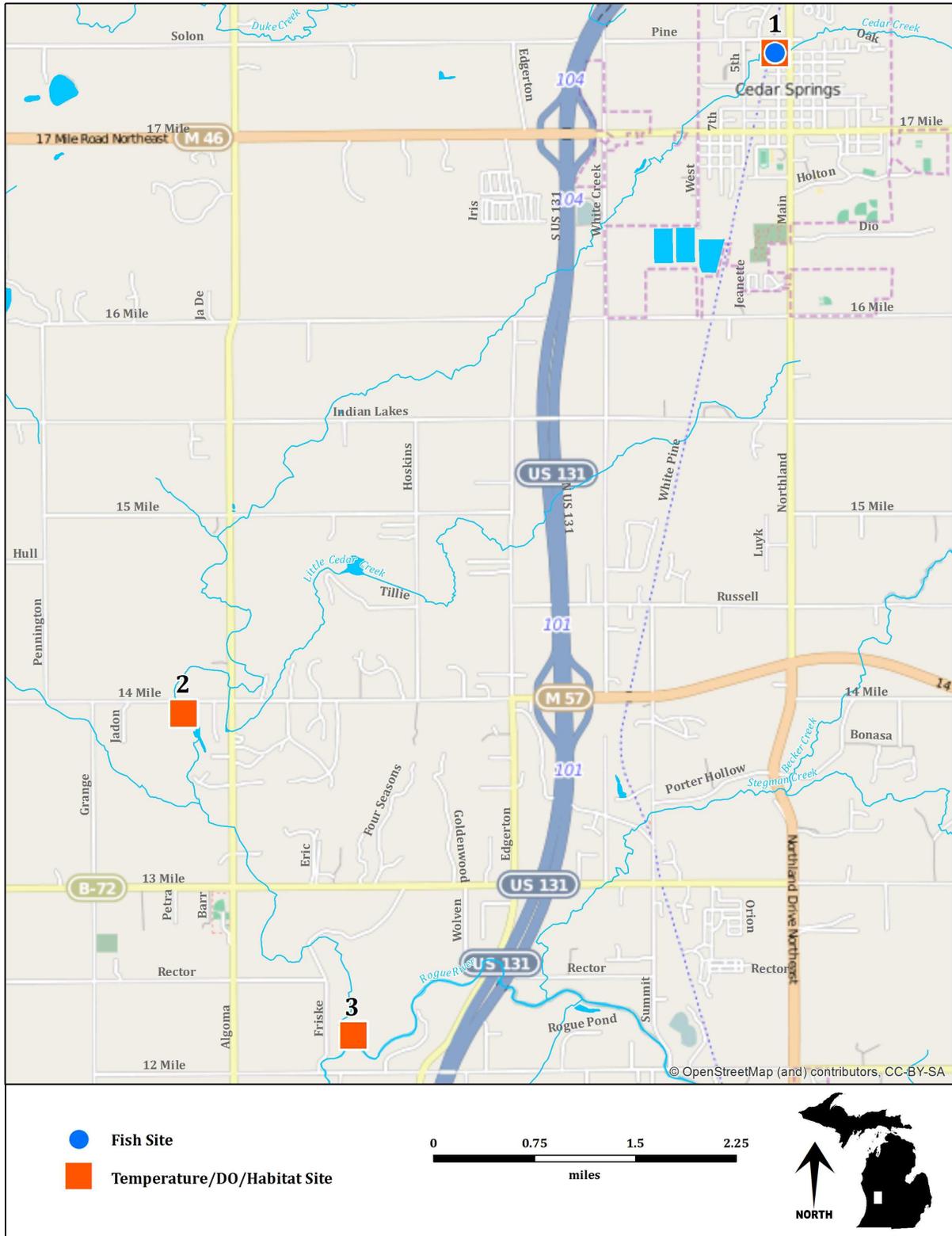


Figure 3. Targeted Monitoring Locations on Cedar Creek.

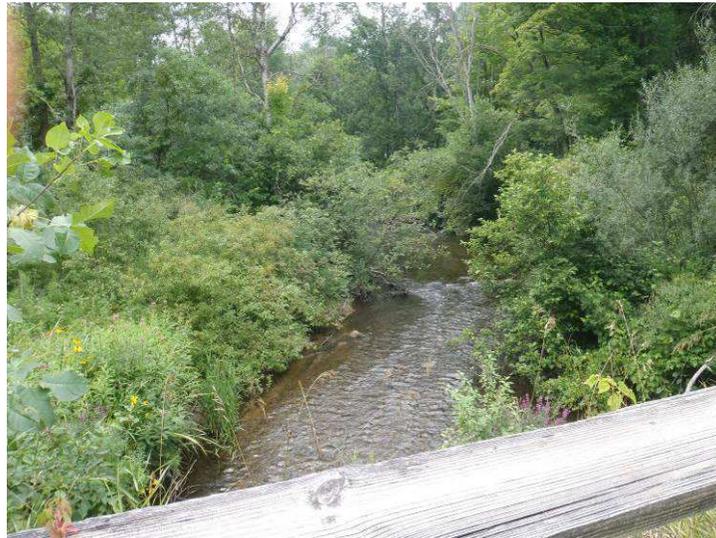
Table 1c. Targeted Monitoring Locations on Cedar Creek.

Site ID	Water Body	Location	County	Latitude	Longitude	Habitat Evaluation		Fish Community	
1	Cedar Creek	Maple Road	Kent	43.22618	-85.55283	Good	151	Coldwater Stream – No Scores Provided	
2	Cedar Creek	Algoma Avenue	Kent	43.17443	-85.61639	Excellent	162		
3	Cedar Creek	Friske Drive	Kent	43.14917	-85.59813	Excellent	159		

RESULTS

Status and Trend Surveys

Macroinvertebrate communities in wadeable streams were sampled and scored using Procedure 51 (Tables 2 and 3). Two sites had Excellent macroinvertebrate community ratings, while the other three sites were rated Acceptable. The habitat was sampled and scored using Procedure 51 (Table 4). Two sites had Excellent habitat scores, while the rest had Good habitat scores (Figure 1, Table 1a).



Cedar Creek at Friske Road

Site 1. This riffle/run station had an Excellent (8) macroinvertebrate score and an Excellent (156) habitat score. This station includes a forested buffer on the south side of the creek, but an open canopy over the creek. The substrate is composed of mostly gravel and cobble with sand interspersed throughout the reach. The macroinvertebrate community had a high level of diversity (30 taxa) including mayflies, stoneflies, and caddisflies.



Duke Creek at 17 Mile Road

Site 2. This glide/pool site had an Acceptable (4) macroinvertebrate score and a Good (108) habitat score. The site was dominated by sand substrate, had forested wetlands surrounding the reach, and consisted of moderate undercut banks and overhanging vegetation. The macroinvertebrate community consisted of mayflies, stoneflies, and caddisflies but also had high levels of tolerant taxa including dipterans and amphipods, resulting in a lower score.



Rogue River at Algoma Avenue

Site 3. This riffle/run site had an Acceptable (3) macroinvertebrate community and a Good (134) habitat score. The substrate was dominated by sand with some gravel and cobble. The stretch was surrounded by forested wetlands and had a moderate level of aquatic macrophytes throughout the stretch. This site had little habitat with sparse amounts of large woody debris, undercut banks, and overhanging vegetation. Amphipods, a tolerant taxa, was dominant at this site; however, two taxa of stoneflies (Perlidae and Pteronarcyidae) were present.



Duke Creek at Hanna Avenue

Site 4. This riffle/run site had an Excellent (7) macroinvertebrate score and an Excellent (166) habitat score. This stretch had a mix of cobble, gravel, and sand for substrate and had trees and shrubs along the banks for vegetative cover. The macroinvertebrate community had a good mix of mayflies, stoneflies, and caddisflies. Thirty-two taxa were found in this stretch of stream.



Cedar Creek at 17 Mile Road

Site 5. This glide/pool station had an Acceptable (-3) macroinvertebrate community and a Good (117) habitat score. This stretch of the creek was mostly sand substrate with silty edges and large amounts of garbage most likely from surrounding parking lots and businesses. Minimal structure was available for macroinvertebrate colonization resulting in a majority of tolerant taxa such as amphipods and physids.

Targeted Monitoring Surveys

Rogue River and Rum Creek Targeted Sites



Rogue River u/s Wolverine

Site 6. This glide/pool site scored Acceptable (2) for macroinvertebrate community and Excellent (161) for habitat (Tables 5 and 6). This stretch of the river had cobble substrate with small amounts of sand, silt, and gravel. The community had high numbers of Heptageniidae (44 percent mayflies) along with a few perlids. Sediment and water samples were collected to review the site for hexavalent chromium and metals (Tables 9 and 10). The sediment sample had no exceedances of consensus-based Probable Effect Concentrations (PEC) (MacDonald et al., 2000). The water sample had no exceedances of Michigan's Water Quality Standards (WQS).



Rum Creek u/s Rogue River

Site 7. This site is a glide/pool with Poor (-6) macroinvertebrate community and Good (109) habitat score (Tables 5 and 6). The site was dominated by corixids, with high numbers of chironomids and amphipods. This is a highly disturbed site with 75 percent silt bottom and very little stable habitat for macroinvertebrates. Sediment and water samples were collected to

review the site for hexavalent chromium and metals (Tables 9 and 10). The sediment sample had no exceedances of consensus-based PECs (MacDonald et al., 2000). The water sample had no exceedances of WQS.



Rogue River d/s Rum Creek

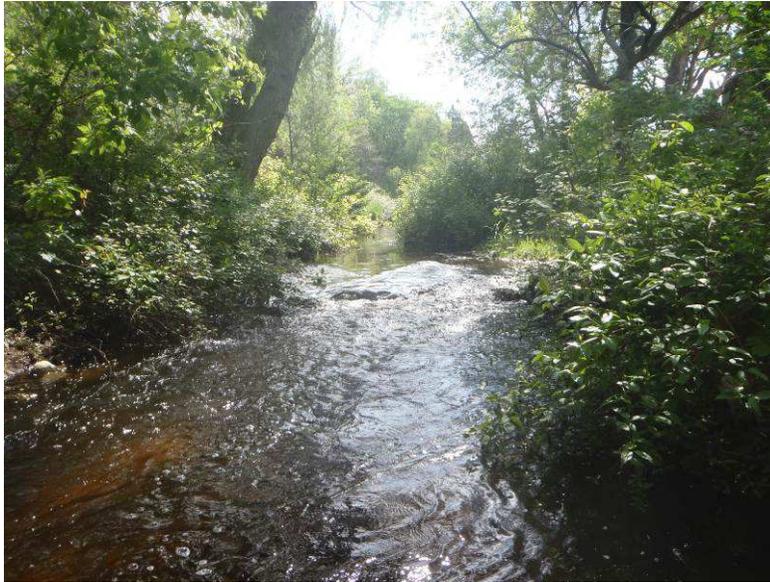
Site 8. Sediment and water samples were collected to review the site for hexavalent chromium and metals (Tables 9 and 10). The sediment sample had no exceedances of consensus-based PECs (MacDonald et al., 2000). The water sample had no exceedances of WQS.



Rogue River u/s Rockford Dam

Site 9. Sediment and water samples were collected to provide data on hexavalent chromium and metals (Tables 9 and 10). The sediment sample had no exceedances of consensus-based PECs (MacDonald et al., 2000). The water sample had no exceedances of WQS.

Cedar Creek Targeted Sites



Cedar Creek at Maple Road

Site 10. This riffle/run station had a Good (151) habitat score (Table 7). This stretch had a good mix of cobble, gravel, sand, and silt substrates. There were moderate levels of structure available for macroinvertebrate colonization including undercut banks, overhanging vegetation, and large woody debris. Backpack shocking for fish provided 46 fish with a 12 percent catch of salmonids (four brown trout ranging in size of 7 to 13 inches) (Table 8).



Cedar Creek at Algoma Avenue

Site 11. This glide/pool station had an Excellent (162) habitat score (Table 7). The substrate through this stretch consisted of sand and gravel. The stream banks were filled with herbaceous vegetation; however, the tree canopy was lacking throughout this reach.



Cedar Creek at Friske Road

Site 12. This riffle/run station had an Excellent (159) habitat score (Table 7). This stretch consisted primarily of cobble substrate with gravel and some sand. Four brown trout were spotted through this stretch while assessing the habitat. The banks of the stream were well vegetated with a mix of herbaceous and tree canopy cover.

Sediment and Water Chemistry Sampling

Table 9. Sediment Results for the Rogue River and Rum Creek.

	Site 1	Site 2	Site 3	Site 4	Sediment PEC
Latitude/ Longitude	43.13277, -85.55710	43.12360, -85.56139	43.12307, -85.56208	43.12094, -85.56142	NA
Hexavalent Chromium	Not Detected				
Arsenic	0.9 mg/kg	4.5 mg/kg	5.4 mg/kg	5.8 mg/kg	<33 mg/kg
Barium	12 mg/kg	56 mg/kg	59 mg/kg	86 mg/kg	No Standard for PEC
Cadmium	Not Detected	0.4 mg/kg	0.4 mg/kg	0.6 mg/kg	<4.98 mg/kg
Chromium	3.0 mg/kg	32 mg/kg	16 mg/kg	21 mg/kg	<111 mg/kg
Copper	2.1 mg/kg	16 mg/kg	14 mg/kg	18 mg/kg	<149 mg/kg
Lead	2.6 mg/kg	18 mg/kg	14 mg/kg	21 mg/kg	<128 mg/kg
Mercury	Not Detected	0.06 mg/kg	0.06 mg/kg	0.1 mg/kg	<1.06 mg/kg
Selenium	Not Detected	1.3 mg/kg	1.1 mg/kg	1.6 mg/kg	<1.9 mg/kg
Silver	Not Detected				
Zinc	12 mg/kg	59 mg/kg	56 mg/kg	87 mg/kg	<459 mg/kg

Table 10. Water Results for the Rogue River and Rum Creek.

	Site 1	Site 2	Site 3	Site 4	Site 4 Duplicate	WQS
Latitude/ Longitude	43.13277, - 85.55710	43.12360, - 85.56139	43.12307, - 85.56208	43.12094, - 85.56142	43.12094, - 85.56142	NA
Hexavalent Chromium	Not Detected	Not Detected				
Arsenic	1.1 µg/L	1.3 µg/L	Not Detected	Not Detected	Not Detected	<340 µg/L
Barium	35 µg/L	32 µg/L	34 µg/L	34 µg/L	34 µg/L	<1487 µg/L
Cadmium	Not Detected	Not Detected				
Chromium	Not Detected	Not Detected				
Copper	1.3 µg/L	1.8 µg/L	1.4 µg/L	1.1 µg/L	1.3 µg/L	<23.93 µg/L
Lead	Not Detected	Not Detected				
Mercury	Not Detected	Not Detected				
Selenium	Not Detected	Not Detected				
Silver	Not Detected	Not Detected				
Zinc	Not Detected	Not Detected				

DISCUSSION

Status and Trend

The status and trend sites in the Rogue River watershed are in good condition. All sites are meeting the Other Indigenous Aquatic Life and Wildlife designated use. In general, narrow buffers between agricultural fields and streams could be increased and multiple culverts, as seen at Duke Creek Hanna Avenue (2 culverts) and Cedar Creek Friske Road (3 culverts), should be replaced with one appropriate-sized culvert or bridge for the road crossing. In addition, Cedar Creek at 17-Mile Road would benefit from stable habitat, reduced runoff from adjacent parking lots, and additional structure for macroinvertebrate colonization.

Targeted

Rogue River and Rum Creek

The Rogue River upstream of the Wolverine World Wide tannery site has acceptable macroinvertebrates and excellent habitat. Rum Creek is a highly impacted site with a silted bottom and poor macroinvertebrate scores. Upstream from the sampling location on Rum Creek is a channelized stream with concrete banks causing high levels of runoff from the Wolverine World Wide tannery site. This site would benefit from restoration by removing the concrete channel and stabilizing the banks to improve the macroinvertebrate community. The two downstream locations on the Rogue River are impounded due to the Rockford Dam. All four sites had water and sediment samples taken to assess public concerns with hexavalent chromium and metals from the Wolverine World Wide tannery site. Tanneries are known to have discharged chromium, hexavalent chromium, and arsenic. The water samples showed signs of arsenic, barium, and copper, but all samples were below Michigan's WQS. The sediment samples showed levels of arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, and zinc; but all samples were below the sediment PECs (MacDonald et al., 2000). Hexavalent chromium was not detected in the sediment or water samples.

Cedar Creek

The targeted sites at Cedar Creek showed good cobble/gravel substrate for fish habitat. The banks along these three sites were well vegetated and did not show problems with runoff into the stream. Cedar Creek at Algoma Avenue would benefit from additional tree cover as the canopy is very open and could result in increased water temperatures. The Maple Road site was sampled for the fish community and showed 12 percent salmonids with 4 brown trout ranging in size from 7 to 13 inches (Table 8). Under the guidelines of Procedure 51, fish sampling should occur no longer than 45 minutes. During this survey, sampling occurred for 45 minutes and produced a total of 46 fish. According to the procedure, if less than 50 fish are obtained and/or less than 1 percent of the catch are salmonids, the stream should be labeled poor. After reviewing this site, it does not support a poor designation. Coldwater streams like Cedar Creek generally have fewer numbers of fish than a warmwater stream. One potential reason for a reduced number of fish at this site would be a beaver dam that was viewed upstream of the sampling location, just upstream from the White Pine Trail. Removal of the dam should improve fish passage and improve fish numbers downstream in the sampled site.

Temperature data loggers were installed within Cedar Creek at three locations to collect hourly readings of the temperature from May 30-September 29. In addition, Nichol DeMol from Trout Unlimited and an MDEQ biologist took temperature grab samples of the water from June-August. The handheld readings by Trout Unlimited and the MDEQ did not show any exceedances of the 68° Fahrenheit temperature WQS for Cedar Creek; however, the

temperature data loggers showed occurrences in June, July, and August where the temperatures are exceeding the 68° Fahrenheit WQS. In some instances the loggers were showing a 5° increase in temperature within one hour, which does not seem likely. In July, a data logger was found along the stream banks outside the water and its data was disregarded. Temperature data logger readings matched grab sample readings taken in the field. Cedar Creek may have some high fluctuations in water levels that could have resulted in data loggers being exposed to air instead of water temperature. An additional study should be conducted in the future at these locations to assess the fish community and temperature, with the data loggers installed in deeper pools to assure that only water temperature data are recorded.

Field work by: Marcy Knoll Wilmes, Aquatic Biologist
Tom Alwin, Aquatic Biologist
Jeff Varricchione, Aquatic Biologist
Tamara Lipsey, Aquatic Biologist
Bill Keiper, Aquatic Biologist
Surface Water Assessment Section
Water Resources Division

Report by: Marcy Knoll Wilmes, Aquatic Biologist
Surface Water Assessment Section
Water Resources Division

Literature Cited

- Creal, W., S. Hanshue, S. Kosek, M. Oemke, and M. Walterhouse. 1996. Update of GLEAS Procedure 51 Metric Scoring and Interpretation. MDEQ Staff Report #MI/DEQ/SWQ-96/068. Revised May 1998.
- MacDonald, D.D., C.G. Ingersoll, 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. SWAS Procedure 51 - Qualitative Biological and Habitat Survey Protocols for Wadable Streams and Rivers, April 24, 1990. Revised June 1991, August 1996, January 1997, May 2002, and December 2008.
- Omernik, J.M. and A. Gallant. 1988. Ecoregions of the Upper Midwest States. United States Environmental Protection Agency, Environmental Research Laboratory. EPA/600/3-88/037.
- Rockafellow, D. 2004. A Biological Survey of the Rogue River Watershed, Kent and Newaygo Counties, August 2003. MDEQ Staff Report # MI/DEQ/WD-03/129.
- Walterhouse, M. 2009. A Biological Survey of Sites in the Rogue River Watershed, Kent and Newaygo Counties, Michigan July 2008. MDEQ Staff Report # MI/DEQ/WB-09/057.

Table 2. Qualitative macroinvertebrate sampling results for

TAXA	Cedar Creek Friske Rd 8/6/2013		Duke Creek 17 Mile Road 8/6/2013		Rogue River Algoma Avenue 8/6/2013		Duke Creek Hanna Avenue 8/6/2013	
	Value	Score	Value	Score	Value	Score	Value	Score
ANNELIDA (segmented worms)								
Hirudinea (leeches)	3				2			
Oligochaeta (worms)	6		3		2		26	
ARTHROPODA								
Crustacea								
Amphipoda (scuds)	5		36		70		1	
Decapoda (crayfish)	3		1		8		1	
Isopoda (sowbugs)	1				4			
Arachnoidea								
Hydracarina	1		4				1	
Insecta								
Ephemeroptera (mayflies)								
Baetidae	31		10		7		20	
Ephemeridae	1							
Heptageniidae	22		4		13		20	
Isonychiidae	15		4		1		5	
Leptophlebiidae	5				8			
Tricorythidae							1	
Odonata								
Anisoptera (dragonflies)								
Aeshnidae			5				3	
Gomphidae			1		1		1	
Zygoptera (damselflies)								
Calopterygidae	1		9		6			
Plecoptera (stoneflies)								
Perlidae	13		1		3		11	
Pteronarcyidae					1			
Hemiptera (true bugs)								
Corixidae					10		4	
Geridae	1				1		1	
Notonectidae					1			
Velidae							1	
Megaloptera								
Corydalidae (dobson flies)								
					2			
Sialidae (alder flies)								
							1	
Trichoptera (caddisflies)								
Brachycentridae	1		21				1	
Helicopsychidae	3						6	
Hydropsychidae	95		42		5		77	
Leptoceridae	2		1				2	
Limnephilidae	3		1		35		16	
Molannidae							1	
Philopotamidae	1						2	
Coleoptera (beetles)								
Dytiscidae (total)								
	13		5		1		1	
Hydrophilidae (total)								
			1					
Psephenidae (adults)								
Dryopidae			5		10		3	
Elmidae	15		2		2		17	
Psephenidae (larvae)	2				1			
Diptera (flies)								
Athericidae	2		2				10	
Ceratopogonidae			4					
Chironomidae	27		70		12		40	
Culicidae			1					
Simuliidae	23		36		5		12	
Stratiomyidae			2					
Tipulidae	2						1	
MOLLUSCA								
Gastropoda (snails)								
Hydrobiidae					11			
Lymnaeidae	1				32			
Physidae	1				30		1	
Planorbidae	1							
Viviparidae							1	
Pelecypoda (bivalves)								
Sphaeriidae (clams)			1		4		1	
TOTAL INDIVIDUALS								
	300		272		288		289	
METRIC								
	Cedar Creek Friske Rd 8/6/2013		Duke Creek 17 Mile Road 8/6/2013		Rogue River Algoma Avenue 8/6/2013		Duke Creek Hanna Avenue 8/6/2013	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	30	1	26	1	29	1	32	1
NUMBER OF MAYFLY TAXA	5	1	3	0	4	1	4	1
NUMBER OF CADDISFLY TAXA	6	1	4	0	2	0	7	1
NUMBER OF STONEFLY TAXA	1	1	1	1	2	1	1	1
PERCENT MAYFLY COMP.	24.67	1	6.62	0	10.07	0	15.92	0
PERCENT CADDISFLY COMP.	35.00	1	23.90	0	13.89	0	36.33	1
PERCENT DOMINANT TAXON	31.67	0	25.74	0	24.31	0	26.64	0
PERCENT ISOPOD, SNAIL, LEECH	2.33	1	0.00	1	27.43	-1	0.69	1
PERCENT SURF. AIR BREATHERS	4.67	1	3.31	1	4.51	1	3.46	1
TOTAL SCORE		8		4		3		7
MACROINV. COMMUNITY RATING		EXCELLENT		ACCEPT.		ACCEPT.		EXCELLENT

Table 3. Qualitative macroinvertebrate sampling results for
 Cedar Creek
 17 Mile Road
 8/6/2013

TAXA	
ANNELIDA (segmented worms)	
Hirudinea (leeches)	1
Oligochaeta (worms)	1
ARTHROPODA	
Crustacea	
Amphipoda (scuds)	69
Decapoda (crayfish)	28
Isopoda (sowbugs)	4
Arachnoidea	
Hydracarina	1
Insecta	
Ephemeroptera (mayflies)	
Baetidae	5
Heptageniidae	1
Odonata	
Zygoptera (damselflies)	
Calopterygidae	15
Hemiptera (true bugs)	
Corixidae	1
Gerridae	1
Trichoptera (caddisflies)	
Hydropsychidae	1
Limnephilidae	5
Coleoptera (beetles)	
Elmidae	4
Diptera (flies)	
Chironomidae	21
Simuliidae	1
Syrphidae	2
MOLLUSCA	
Gastropoda (snails)	
Physidae	104
Planorbidae	1
Viviparidae	1
Pelecypoda (bivalves)	
Sphaeriidae (clams)	31
TOTAL INDIVIDUALS	298

Cedar Creek
 17 Mile Road
 8/6/2013

METRIC	Value	Score
TOTAL NUMBER OF TAXA	21	0
NUMBER OF MAYFLY TAXA	2	0
NUMBER OF CADDISFLY TAXA	2	0
NUMBER OF STONEFLY TAXA	0	-1
PERCENT MAYFLY COMP.	2.01	-1
PERCENT CADDISFLY COMP.	2.01	-1
PERCENT DOMINANT TAXON	34.90	0
PERCENT ISOPOD, SNAIL, LEECH	37.25	-1
PERCENT SURF. AIR BREATHERS	1.34	1
TOTAL SCORE		-3
MACROINV. COMMUNITY RATING		ACCEPT.

Table 4. Habitat evaluation for

	Cedar Creek Friske Rd RIFFLE/RUN	Duke Creek 17 Mile Road GLIDE/POOL	Rogue River Algoma Avenue RIFFLE/RUN	Duke Creek Hanna Avenue RIFFLE/RUN	Cedar Creek 17 Mile Road GLIDE/POOL
HABITAT METRIC					
Substrate and Instream Cover					
Epifaunal Substrate/ Avail Cover (20)	17	5	14	16	10
Embeddedness (20)*	18		12	18	
Velocity/Depth Regime (20)*	18		14	14	
Pool Substrate Characterization (20)**		9			7
Pool Variability (20)**		13			8
Channel Morphology					
Sediment Deposition (20)	15	8	10	19	9
Flow Status - Maint. Flow Volume (10)	10	7	8	9	8
Flow Status - Flashiness (10)	9	7	9	10	6
Channel Alteration (20)	19	16	19	15	18
Frequency of Riffles/Bends (20)*	5		4	15	
Channel Sinuosity (20)**		8			8
Riparian and Bank Structure					
Bank Stability (L) (10)	8	6	9	9	7
Bank Stability (R) (10)	8	6	6	9	7
Vegetative Protection (L) (10)	9	5	9	9	6
Vegetative Protection (R) (10)	9	4	9	9	8
Riparian Veg. Zone Width (L) (10)	4	9	6	8	5
Riparian Veg. Zone Width (R) (10)	7	5	5	6	10
TOTAL SCORE (200):	156	108	134	166	117
HABITAT RATING:	EXCELLENT (NON- IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON- IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)

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

Date:	8/6/2013	8/6/2013	8/6/2013	8/6/2013	8/6/2013
Weather:	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
Air Temperature:	70 Deg. F.	68 Deg. F.	77 Deg. F.	64 Deg. F.	72 Deg. F.
Water Temperature:	58 Deg. F.	54 Deg. F.	57 Deg. F.	55 Deg. F.	64 Deg. F.
Ave. Stream Width:	20 Feet	16 Feet	40 Feet	13 Feet	15 Feet
Ave. Stream Depth:	1.5 Feet	2 Feet	2.5 Feet	2 Feet	1.5 Feet
Surface Velocity:	2 Ft./Sec.	0.5 Ft./Sec.	2 Ft./Sec.	2 Ft./Sec.	0.75 Ft./Sec.
Estimated Flow:	60 CFS	16 CFS	200 CFS	52 CFS	16.875 CFS
Stream Modifications:	None	None	None	None	Canopy Removal
Nuisance Plants (Y/N):	N	N	N	Y	N
Report Number:					
STORET No.:	410615	410692	410778	410691	410750
Stream Name:	Cedar Creek	Duke Creek	Rogue River	Duke Creek	Cedar Creek
Road Crossing/Location:	Friske Rd	17 Mile Road	Algoma Avenue	Hanna Avenue	17 Mile Road
County Code:	41	41	41	41	41
TRS:	09N11W22	10N12W25	09N11W28	10N11W20	10N11W25
Latitude (dd):	43.15614	43.21981	43.13594	43.23715	43.22
Longitude (dd):	-85.60295	-85.68018	-85.61089	-85.64082	-85.562
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4050006	4050006	4050006	4050006	4050006

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 5. Qualitative macroinvertebrate sampling results for

TAXA	Rum Creek at Rogue River (mouth of Rum Creek) 9/16/2013		Rogue River upstream Wolverine Worldwide Tannery Site 9/16/2013	
	Value	Score	Value	Score
ANNELIDA (segmented worms)				
Hirudinea (leeches)	1			
Oligochaeta (worms)	14		7	
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	38		51	
Decapoda (crayfish)	3		15	
Isopoda (sowbugs)	5		3	
Arachnoidea				
Hydracarina	1			
Insecta				
Ephemeroptera (mayflies)				
Ephemeridae			1	
Heptageniidae			113	
Isonychiidae			3	
Polymitarcyidae			4	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	1			
Gomphidae			1	
Zygotera (damselflies)				
Calopterygidae	1		6	
Plecoptera (stoneflies)				
Perlidae			3	
Hemiptera (true bugs)				
Belostomatidae			1	
Corixidae	132		36	
Gerridae	1		1	
Notonectidae			1	
Pleidae	1			
Veliidae			1	
Megaloptera				
Sialidae (alder flies)			3	
Trichoptera (caddisflies)				
Hydropsychidae			4	
Coleoptera (beetles)				
Halipidae (adults)	1			
Elmidae			8	
Psephenidae (larvae)			1	
Diptera (flies)				
Chironomidae	49		8	
Culicidae	2			
Simuliidae			1	
Tabanidae	2		2	
MOLLUSCA				
Gastropoda (snails)				
Physidae			2	
Pelecypoda (bivalves)				
Sphaeriidae (clams)			1	
TOTAL INDIVIDUALS		252		277

METRIC	Rum Creek at Rogue River (mouth of Rum Creek) 9/16/2013		Rogue River upstream Wolverine Worldwide Tannery S 9/16/2013	
	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	15	0	25	1
NUMBER OF MAYFLY TAXA	0	-1	4	1
NUMBER OF CADDISFLY TAXA	0	-1	1	-1
NUMBER OF STONEFLY TAXA	0	-1	1	1
PERCENT MAYFLY COMP.	0.00	-1	43.68	1
PERCENT CADDISFLY COMP.	0.00	-1	1.44	-1
PERCENT DOMINANT TAXON	52.38	-1	40.79	-1
PERCENT ISOPOD, SNAIL, LEECH	2.38	1	1.81	1
PERCENT SURF. AIR BREATHERS	54.37	-1	14.44	0
TOTAL SCORE		-6		2
MACROINV. COMMUNITY RATING		POOR		ACCEPT.

Table 6. Habitat evaluation for

Rum Creek
at Rogue River (mouth of Rum Creek)
GLIDE/POOL

Rogue River
u/s Wolverine Worldwide Tannery Site
GLIDE/POOL

HABITAT METRIC

HABITAT METRIC	Rum Creek at Rogue River (mouth of Rum Creek) GLIDE/POOL	Rogue River u/s Wolverine Worldwide Tannery Site GLIDE/POOL
Substrate and Instream Cover		
Epifaunal Substrate/ Avail Cover (20)	5	16
Embeddedness (20)*		
Velocity/Depth Regime (20)*		
Pool Substrate Characterization (20)**	11	15
Pool Variability (20)**	7	7
Channel Morphology		
Sediment Deposition (20)	8	16
Flow Status - Maint. Flow Volume (10)	9	9
Flow Status - Flashiness (10)	9	9
Channel Alteration (20)	13	19
Frequency of Riffles/Bends (20)*		
Channel Sinuosity (20)**	5	17
Riparian and Bank Structure		
Bank Stability (L) (10)	9	9
Bank Stability (R) (10)	9	9
Vegetative Protection (L) (10)	7	9
Vegetative Protection (R) (10)	7	9
Riparian Veg. Zone Width (L) (10)	3	8
Riparian Veg. Zone Width (R) (10)	7	9
TOTAL SCORE (200):	109	161

HABITAT RATING:

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:	9/16/2013	9/16/2013
Weather:	Cloudy	Partly Cloudy
Air Temperature:	62 Deg. F.	Deg. F.
Water Temperature:	54 Deg. F.	58 Deg. F.
Ave. Stream Width:	22 Feet	50 Feet
Ave. Stream Depth:	1.5 Feet	3 Feet
Surface Velocity:	0.5 Ft./Sec.	0.2 Ft./Sec.
Estimated Flow:	16.5 CFS	30 CFS
Stream Modifications:	Dredged	None
Nuisance Plants (Y/N):	N	N
Report Number:		
STORET No.:	410788	410787
Stream Name:	Rum Creek	Rogue River
Road Crossing/Location:	at Rogue River (mouth of Rum Creek)	upstream Wolverine Worldwide Tannery Site
County Code:	41	41
TRS:	09N11W36	09N11W25
Latitude (dd):	43.1236	43.13285
Longitude (dd):	-85.5612	-85.55729
Ecoregion:	SMNITP	SMNITP
Stream Type:		
USGS Basin Code:	4050006	4050006

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 7. Habitat evaluation for

	Cedar Creek Maple Road (Site 1) RIFFLE/RUN	Cedar Creek Algoma (Site 2 Larry's House) GLIDE/POOL	Cedar Creek Site 3 DNR Park off Friske Drive RIFFLE/RUN
HABITAT METRIC			
Substrate and Instream Cover			
Epifaunal Substrate/ Avail Cover (20)	17	13	18
Embeddedness (20)*	16		18
Velocity/Depth Regime (20)*	15		14
Pool Substrate Characterization (20)**		16	
Pool Variability (20)**		11	
Channel Morphology			
Sediment Deposition (20)	15	19	18
Flow Status - Maint. Flow Volume (10)	9	10	9
Flow Status - Flashiness (10)	9	10	4
Channel Alteration (20)	13	19	18
Frequency of Riffles/Bends (20)*	12		19
Channel Sinuosity (20)**		10	
Riparian and Bank Structure			
Bank Stability (L) (10)	8	10	7
Bank Stability (R) (10)	9	10	7
Vegetative Protection (L) (10)	8	10	9
Vegetative Protection (R) (10)	8	10	7
Riparian Veg. Zone Width (L) (10)	3	7	10
Riparian Veg. Zone Width (R) (10)	9	7	1
TOTAL SCORE (200):	151	162	159
HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON- IMPAIRED)	EXCELLENT (NON- IMPAIRED)

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

	7/8/2013	8/30/2013	7/8/2013
Date:	7/8/2013	8/30/2013	7/8/2013
Weather:	Cloudy	Sunny	Cloudy
Air Temperature:	Deg. F.	80 Deg. F.	Deg. F.
Water Temperature:	63.9 Deg. F.	64 Deg. F.	65.1 Deg. F.
Ave. Stream Width:	10 Feet	27 Feet	15 Feet
Ave. Stream Depth:	0.7 Feet	1.5 Feet	0.5 Feet
Surface Velocity:	4 Ft./Sec.	0.5 Ft./Sec.	0.6 Ft./Sec.
Estimated Flow:	28 CFS	20.25 CFS	4.5 CFS
Stream Modifications:	Bank Stabilization	None	Canopy Removal
Nuisance Plants (Y/N):	N	N	N
Report Number:			
STORET No.:	410789	410790	410791
Stream Name:	Cedar Creek	Cedar Creek	Cedar Creek
Road Crossing/Location:	Maple Road (Site 1)	Algoma (Site 2 Larry's House)	Site 3 DNR Park off Friske Drive
County Code:	41	41	41
TRS:	10N11W25	09N11W16	09N11W22
Latitude (dd):	43.22618	43.17443	43.14917
Longitude (dd):	-85.55283	-85.61639	-85.59813
Ecoregion:	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater
USGS Basin Code:	4050006	4050006	4050006

* Applies only to Riffle/Run stream Surveys

** Applies only to Glide/Pool stream Surveys

Table 8. Qualitative fish sampling results for

Cedar Creek
Maple Road (Site 1)
7/8/2013
STATION 1

TAXA

Salmonidae (trouts)	
<i>Salmo trutta</i> (Brown trout)	4
Umbridae (mudminnows)	
<i>Umbra limi</i> (Central mudminnow)	2
Cyprinidae (minnows and carps)	
<i>Semotilus atromaculatus</i> (Creek chub)	10
<i>Rhinichthys atratulus</i> (Blacknose dace)	2
Cottidae (sculpins)	
<i>Cottus bairdii</i> (Mottled sculpin)	21
Catostomidae (suckers)	
<i>Catostomus commersoni</i> (White sucker)	4
Centrarchidae (sunfish)	
<i>Lepomis cyanellus</i> (Green sunfish)	2
<i>Lepomis macrochirus</i> (Bluegill sf)	1
TOTAL INDIVIDUALS	46
Number of hybrid sunfish	0
Number of anomalies	0
Percent anomalies	0.000
Percent salmonids	8.696
Reach sampled (ft)	200
Area sampled (sq ft)	
Density (# fish/sq ft)	#DIV/0!
Gear	bps

Table 1B. Fish metric evaluation of

Cedar Creek
Maple Road (Site 1)
7/8/2013
STATION 1

METRIC

Value Score

TOTAL NUMBER OF TAXA	8
NO. OF DARTER, SCULPIN, MADTOM TAXA	1
NUMBER OF SUNFISH TAXA	2
NUMBER OF SUCKER TAXA	1
NUMBER OF INTOLERANT TAXA	2
PERCENT TOLERANT	43.48
PERCENT OMNIVOROUS TAXA	39.13
PERCENT INSECTIVOROUS TAXA	52.17
PERCENT PISCIVOROUS TAXA	0.00
% SIMPLE LITHOPHILIC SPAWNER TAXA	13.04