

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
SURFACE WATER QUALITY DIVISION
MAY, 1992

STAFF REPORT

A BIOLOGICAL SURVEY OF WHETSTONE CREEK
OSCEOLA COUNTY
JULY 2, 1991

As part of the nonpoint source surveillance activity of Surface Water Quality Division, staff of the Great Lakes and Environmental Assessment Section (GLEAS) conducted a qualitative biological survey of Whetstone Creek, Osceola County. The survey was conducted as a follow-up to a previous investigation (Sayles, 1989) of an April, 1988 fish kill in the creek. The biological survey was conducted according to GLEAS Procedure #51 (available upon request). Water samples were collected, preserved and transported to the MDNR Environmental Laboratory for analyses (MDNR, 1981). The survey objective was to evaluate if the stream had recovered from a manure lagoon spill which apparently had caused the 1988 fish kill. Grindstone Creek was sampled as a background water chemistry station.

The segment of upper Whetstone Creek evaluated in this survey is a second order, coldwater stream in the Southern Michigan Northern Indiana Till Plain ecoregion. The majority of the flow in the lower half of Whetstone Creek is from Grindstone Creek. The first 150 yards of Whetstone Creek upstream of the confluence with Grindstone Creek are more indicative of Grindstone Creek conditions because of the substantial underground flows from Grindstone Creek. Whetstone Creek flows into the Muskegon River.

SUMMARY

1. The locations of the three Whetstone and one Grindstone Creek sampling stations are shown on Figure 1. The fish and macroinvertebrate community, physical habitat, and chemical data generated at these stations are summarized in Tables 1-4, respectively.

2. A direct comparison of these data to the 1988 data is difficult because: 1) Procedure #51 was not available in 1988 and; 2) season and creek flow varied widely between the two study periods. Flow at Station 1 was nearly absent and very low at Station 2 during this survey.
3. The 1991 macroinvertebrate data show severe (poor conditions), moderate (fair conditions) and slightly (good conditions) impaired ratings for Stations 1, 2 and, 3, respectively. Habitat was rated as poor to fair at all three stations. The fish community showed a slight impairment (good) at all three stations. No trout were found. More fish and macroinvertebrate taxa were found at all three stations in 1991 than in 1988.
4. The biological and habitat impairments observed were probably due largely to the low flow observed. Station 1 was essentially a series of nearly discontinuous pools. The degree of impairment in the macroinvertebrate community decreased as flows increased downstream.
5. The Sphaerotilus bacterial slime growths noted in the 1988 investigation were not observed in this survey. However, a dense growth of Cladophora, which filled about 90% of a section of the channel, was observed at Station 2 in this survey. Excessive amounts of this filamentous algae have adverse effects on stream quality and indicate enriched conditions.
6. As in 1988, the total organic carbon, nitrogen and phosphorus concentrations were highest at Station 2 (Station 4 in 1988) when comparing the three stations common to both studies. Additionally, the 1991 Station 2 total phosphorus concentration was nearly identical to the 1988 sample.
7. The higher number of taxa and the absence of Sphaerotilus at Station 2 suggest that the creek has recovered from the gross effects of the 1988 manure spill. However, the Cladophora growth and the nutrient data indicate a continuing stream enrichment problem exists between 60th Avenue and 14 Mile Road.
8. Cows had collapsed the creek bank and were observed in the creek immediately downstream of 60th Avenue. It appeared that cows also have direct access to the creek upstream of 14 Mile Road. This access will result in additional damage to the creek habitat through erosion and sedimentation.
9. The coldwater fishery in upper Whetstone Creek will reflect seasonal flow restrictions at times. However, continued excessive nutrient and sediment loadings will eventually eliminate this coldwater fishery.

Table 1A. Qualitative fish sampling results for Whetstone Creek, Osceola County, on July 2, 1991

TAXA	STATION 1	STATION 2	STATION 3
Umbridae (Mudminnows)			
<i>Umbra limi</i> (Central mudminnow)	30	27	
Cyprinidae (Minnows and Carps)			
<i>Semotilus atromaculatus</i> (Creek)	56	64	23
<i>Pimephales promelas</i> (Fathead mi.)	2		4
<i>P. notatus</i> (Bluntnose minnow)	1		
<i>Phoxinus eos</i> (N. redbelly dace)	21	3	6
<i>Rhinichthys atratulus</i> (Blacknose)	11	2	21
<i>S. margarita</i> (Pearl dace)			3
Cottidae (Sculpins)			
<i>Cottus bairdi</i> (Mottled sculpin)			12
Catostomidae (Suckers)			
<i>Catostomus commersoni</i> (W. sucker)	15	2	
Gasterosteidae (Sticklebacks)			
<i>Culaea inconstans</i> (Brook)	46	35	
Percidae (Perches)			
<i>Percina maculata</i> (Blackside dar.)			1
TOTAL INDIVIDUALS	182	133	70
NUMBER OF ANOMALIES	0	0	1
SQUARE FOOT SAMPLED	400	1980	1400
DENSITY OF INDIVIDUALS (#/SF)	0.455	0.067	0.050

Table 1B. Fish metric evaluation of Whetstone Creek on July 2, 1992.

METRIC	STATION 1		STATION 2		STATION 3	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	8	3	6	3	7	3
NUMBER OF DARTER SPECIES	0	1	0	1	1	3
NUMBER OF SUNFISH SPECIES	0	1	0	1	0	1
NUMBER OF SUCKER SPECIES	1	3	1	3	0	1
PERCENT CARP, G.SUNFISH, W.SUCKER	8.2	5	1.5	5	0.0	5
PERCENT OMNIVORES	9.9	5	1.5	5	5.7	5
PERCENT INSECTIVO. CYPRINIDS	0.0	1	0.0	1	4.3	1
PERCENT PISCIVORES	0.0	1	0.0	1	0.0	1
DENSITY OF INDIVIDUALS	0.455	5	0.067	5	0.050	5
PERCENT ANOMALIES	0.0	5	0.0	5	1.4	3
TOTAL SCORE		30		30		28
FISH COMMUNITY CATEGORY		GOOD (SLIGHTLY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)

Table 2A. Qualitative macroinvertebrate sampling results for Whetstone Creek, Osceola County, on July 2, 1991.

TAXA	STATION 1	STATION 2	STATION 3
BRYOZOA (moss worms)			3
ANNELIDA (segmented worms)			
Hirudinea (leeches)	8	40	
ARTHROPODA			
Amphipoda (scuds)		25	35
Decapoda (crayfish)			11
Insecta			
Ephemeroptera (mayflies)			
Baetidae		2	14
Heptageniidae			11
Ephemerellidae			2
Odonata			
Zygoptera (damselflies)			
Calopterygidae			1
Anisoptera (dragonflies)			
Aeshnidae	1		3
Hemiptera (true bugs)			
Corixidae	6	1	
Notonectidae		1	
Gerridae	15	20	6
Trichoptera (caddisflies)			
Hydropsychidae		5	30
Cheumatopsyche		1	1
Glossosomatidae			9
Brachycentridae			2
Limnephilidae		1	21
Lepidostomatidae			1
Coleoptera (beetles)			
Haliplidae (adults)		1	
Dytiscidae (total)		1	
Dryopidae			4
Elmidae			4
Diptera (flies)			
Tipulidae			1
Simuliidae		3	
Chironomidae	60	5	13
Rheotanytarsus			1
Tabanidae			1
MOLLUSCA			
Gastropoda (snails)			
Lymnaea	1	2	
Physa	8	1	2
Pelecypoda (clams)			
Sphaerium	2	3	
TOTAL INDIVIDUALS	101	112	176

Table 2B. Macroinvertebrate metric evaluation of Whetstone Creek on July 2, 1991.

METRIC	STATION 1		STATION 2		STATION 3	
	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	8	0	16	4	22	6
NUMBER OF MAYFLY TAXA	0	0	1	2	3	6
NUMBER OF CADDISFLY TAXA	0	0	3	2	6	4
NUMBER OF STONEFLY TAXA	0	0	0	0	0	0
PERCENT MAYFLY COMP.	0.0	0	1.8	0	15.3	0
PERCENT CADDISFLY COMP.	0.0	0	6.3	0	36.4	6
PERCENT CONTR. DOM. TAXON	59.4	0	35.7	2	19.9	6
PERCENT ISOPOD, SNAIL, LEECH	16.8	0	38.4	0	1.1	4
PERCENT SURFACE AIR BREATHERS	20.8	2	21.4	2	3.4	6
TOTAL SCORE		2		12		38
MACROINVERTEBRATE COMMUNITY CATEGORY	POOR (SEVERELY IMPAIRED)		FAIR (MODERATELY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)	

Table 3. Habitat evaluation for Whetstone Creek, Osceola County, on July 2, 1991.

HABITAT METRIC	STATION 1 SCORE	STATION 2 SCORE	STATION 3 SCORE
Bottom Substrate Available Cover:	15	15	12
Embeddedness:	5	12	9
Velocity:Depth:	7	7	8
Flow Stability:	3	5	8
Bottom Deposition:	12	10	8
Pools-Riffles-Runs-Bends:	6	8	8
Bank Stability:	5	7	8
Bank Vegetative Stability:	8	8	10
Streamside Cover:	5	5	8
TOTAL SCORE	66	77	79
HABITAT CONDITION CATEGORY	POOR (SEVERELY IMPAIRED)	FAIR (MODERATELY IMPAIRED)	FAIR (MODERATELY IMPAIRED)
Date:	7/2/91	7/2/91	7/2/91
Stream Type:	coldwater	coldwater	coldwater
Weather:	sunny	partly cloudy	sunny
Stream Order:	second	second	second
Air Temperature:	81 Deg. F.	75 Deg. F.	74 Deg. F.
Water Temperature:	69 Deg. F.	67 Deg. F.	66 Deg. F.
Ave. Stream Width:	7 Feet	10 Feet	14 Feet
Ave. Stream Depth:	0.8 Feet	0.7 Feet	0.7 Feet
Surface Velocity:	0 Ft./Sec.	0.1 Ft./Sec.	0.2 Ft./Sec.
Estimated Flow:	~0 CFS	0.7 CFS	1.96 CFS

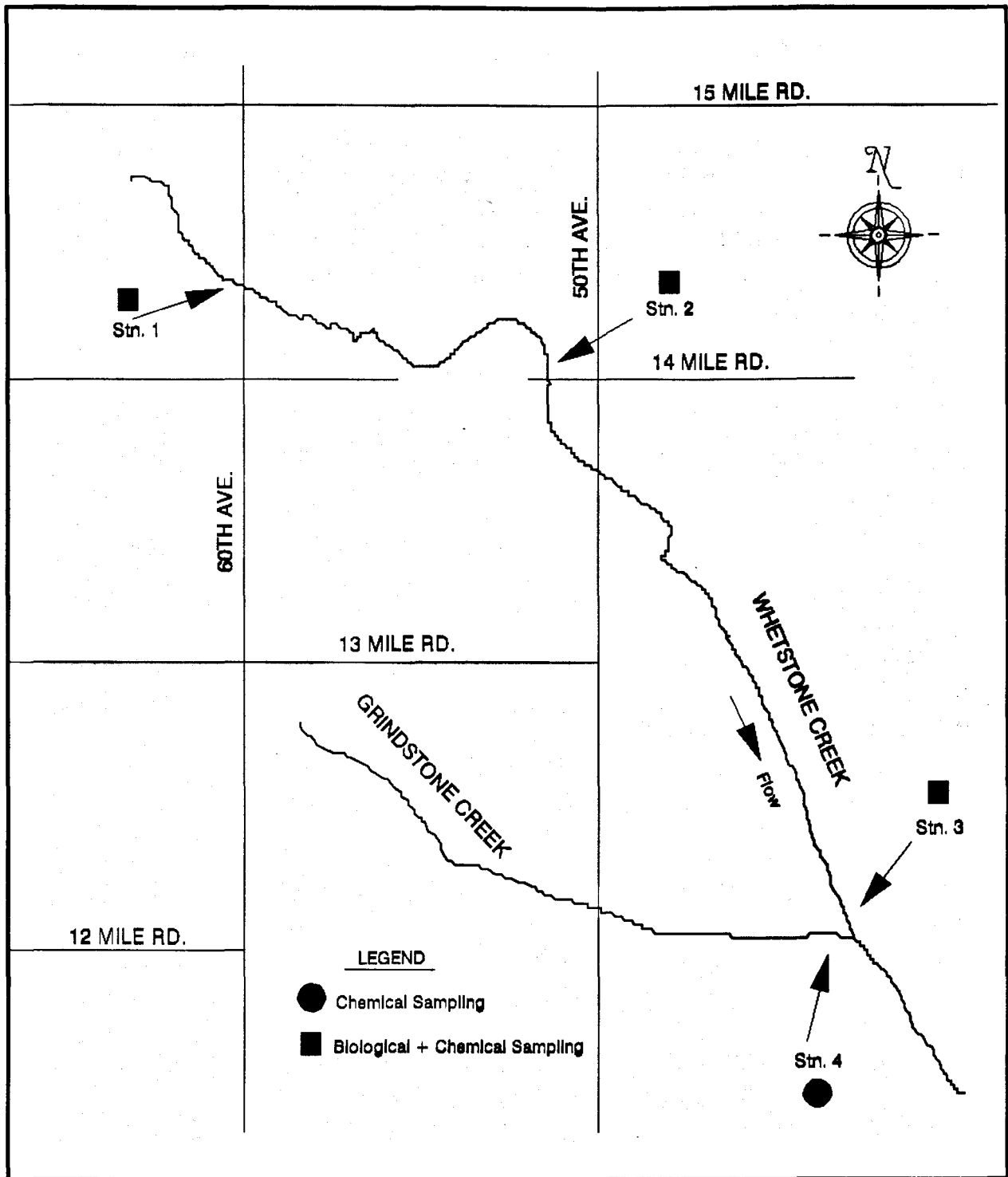


Figure 1. Biological/Chemical Sampling Stations On Whetstone And Grindstone Creeks, Osceola Co., July 2, 1991.