

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

STAFF REPORT

A BIOLOGICAL SURVEY OF AN UNNAMED CREEK IN OSCEOLA COUNTY
JULY 2, 1991

As part of the nonpoint surveillance activity of Surface Water Quality Division, staff of the Great Lakes and Environmental Assessment Section (GLEAS) conducted a qualitative biological survey of an unnamed creek in Osceola County. 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 document current conditions to provide baseline data prior to implementation of a watershed nonpoint source control program.

The unnamed creek evaluated in this survey varies from a first to third order, coldwater stream in the Southern Michigan Northern Indiana Till Plain Ecoregion. The creek flows into the Muskegon River in Section 24 of Osceola Township.

SUMMARY

1. The locations of the four 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. The fish data show slightly impaired (good) conditions at Stations 1 and 3, and nonimpaired (excellent) conditions at Station 4. The macroinvertebrate data show moderately impaired (fair) conditions at Station 1 and slightly impaired (good) conditions at Stations 3 and 4. The habitat data show poor, fair, and excellent conditions at Stations 1, 3, and 4, respectively. Station 2 was rated as severely impaired (poor conditions) for fish, macroinvertebrate, and habitat.
3. Based on the macroinvertebrates, Station 1 has an overall rating of moderately impaired (fair condition) which probably reflects the poor habitat and low flow. The fish rating of good is biased by a higher density score because the reduced flows concentrated most fish into the plunge pool created by the raised culvert. The culvert may restrict fish movements. A fish rating of moderately impaired (fair) is a more realistic assessment at this station. Stream habitat is

severely altered in this area. Downstream of 70th Avenue, cows had direct access to the stream and had collapsed part of the stream bank. Downstream of 10 Mile Road, a small pond created by a cobble dam may limit fish migration and probably traps some sediments. Below the dam, the creek is a straight ditch for about 3/4 of a mile. Cattle pasturing above 10 Mile Road has a high potential to cause stream degradation over time through nutrient and sediment loadings to the system.

4. The severe impairment of the Station 2 biota was due partly to the minimal flow available. No fish were found in the segment surveyed although one stickleback and two sculpins were found above and below, respectively, the segment surveyed. Upstream fish passage is probably restricted by the raised culvert at 80th Avenue. The chemical data also show impairment at Station 2 in that total phosphorus, ammonia, and organic carbon were considerably elevated in comparison to the other stations. The enriched conditions had resulted in an algal bloom which colored the plunge pool below 80th Avenue a dark green color. Nutrient enrichment can lead to losses of sensitive aquatic life by promoting excessive plant growth which can obscure habitat and alter water quality.
5. Overall, Station 3 was rated as slightly impaired (good condition). Stream habitat was rated moderately impaired (fair condition) because of physical degradation related to excessive sand deposition. Stream productivity may be limited by physical habitat in this segment. This survey found the same number of brook trout but only a quarter the number of brown trout that were found in a July, 1968 survey at this site (MDNR, unpublished). The high nutrient levels found upstream at Station 2 were not seen at this station. The influx of high quality waters to the stream apparently diluted the upstream nutrient concentrations.
6. Overall, Station 4 was rated as slightly impaired (good condition) on the basis of the macroinvertebrates. This site had the best habitat rating (excellent). A fair sized pool created by a cobble dam upstream of the segment surveyed may be aiding downstream habitat by acting as a sediment trap. However, a large, raw bank in the survey segment is probably eroding and causing sedimentation below River Road. Additionally, cows have direct access to the stream and may be accelerating the erosion from this bank. At the time of the survey, the majority of the flow at Station 4 was from the western branch of the creek system.
7. Overall, the unnamed creek has better quality in the lower reaches. Dairy operations and cattle pasturing in the headwaters of this creek have the potential to cause basin wide degradation through excessive nutrient and sediment loadings. Cattle pasturing practices in the lower creek

reaches may also be causing unnecessary nutrient and sediment loadings to the creek and Muskegon River.

REFERENCES

MDNR. 1981. Quality Assurance for Water and Sediment Sampling. Environmental Protection Bureau, Lansing, Michigan. Pub. Number 3730-0028.

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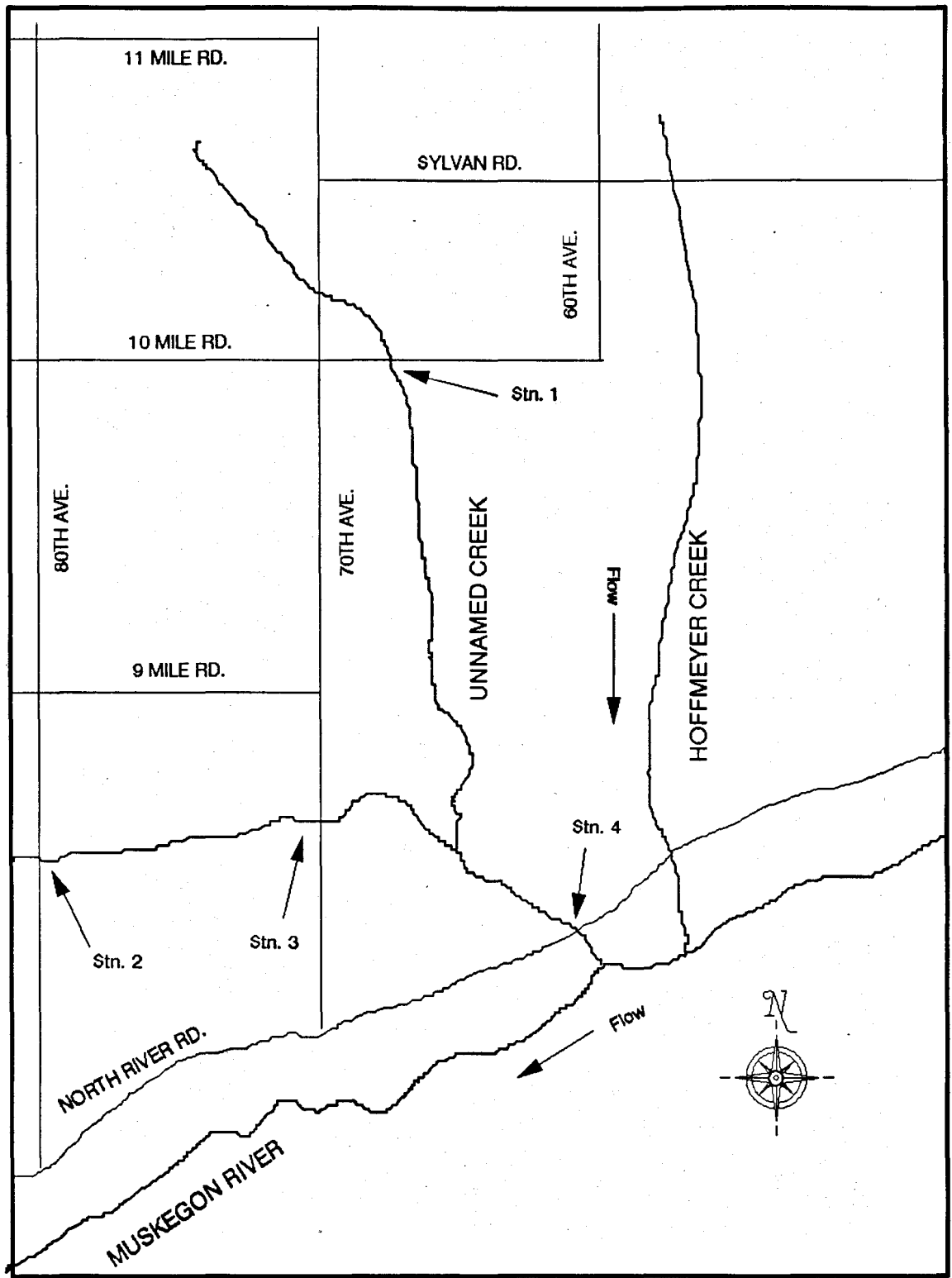


Figure 1. Sampling Stations On Unnamed Creek In Osceola County
On July 1 and 2, 1991.

Table 1A. Qualitative fish sampling results at an unnamed creek in Osceola County on July 1 and 2, 1991.

TAXA	STATION 1	STATION 2	STATION 3	STATION 4
Petromyzontidae (Lampreys)				
Other omniv. lamprey			6	6
Salmonidae (Trouts)				
Salmo trutta (Brown trout)			4	2
Salvelinus fontinalis (Brook tr.)			20	8
Umbridae (Mudminnows)				
Umbrina limi (Central mudminnow)				10
Esocidae (Pikes)				
E. masquinongy (Muskellunge)				1
Cyprinidae (Minnows and Carps)				
Hybognathus hankinsoni (Brassy)	2			
Nocomis biguttatus (Horneyhead)				10
Semotilus atromaculatus (Creek)				1
N. micropogon (River chub)				1
Phoxinus eos (N. redbelly dace)	2			
Rhinichthys atratulus (Blacknose)	26		1	
Cottidae (Sculpins)				
Cottus bairdi (Mottled sculpin)			23	4
Catostomidae (Suckers)				
Catostomus commersoni (W. sucker)				1
Hypentelium nigricans (N. hogsu.)				1
Ictaluridae (Bullhead, Catfish)				
Ictalurus melas (Black bullhead)				1
Gasterosteidae (Sticklebacks)				
Culaea inconstans (Brook)	1		1	
Gadidae (Cod)				
Lota lota (burbot)			1	8
Centrarchidae (Sunfish)				
Lepomis cyanellus (Green sunfish)	3		6	3
Percidae (Perches)				
E. nigrum (Johnny darter)				4
Percina maculata (Blackside dar.)				3
TOTAL INDIVIDUALS	34	0	62	64
NUMBER OF ANOMALIES	0	0	0	0
SQUARE FOOT SAMPLED	260	180	2900	3120
DENSITY OF INDIVIDUALS (#/SF)	0.131	0.000	0.021	0.021

Table 1B. Fish metric evaluation of an unnamed stream in Osceola County on July 1 and 2, 1991.

METRIC	STATION 1		STATION 2		STATION 3		STATION 4	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	5	3	-	0	8	3	16	5
NUMBER OF DARTER SPECIES	0	1	-	-	0	1	2	5
NUMBER OF SUNFISH SPECIES	1	3	-	-	1	3	1	3
NUMBER OF SUCKER SPECIES	0	1	-	-	0	1	2	5
PERCENT CARP, G.SUNFISH, W.SUCKER	14.7	3	-	-	9.7	5	6.3	5
PERCENT OMNIVORES	5.9	5	-	-	9.7	5	10.9	5
PERCENT INSECTIVO. CYPRINIDS	0.0	1	-	-	0.0	1	17.2	1
PERCENT PISCIVORES	0.0	1	-	-	1.6	3	14.1	5
DENSITY OF INDIVIDUALS	0.131	5	-	-	0.021	3	0.021	5
PERCENT ANOMALIES	0.0	5	-	-	0.0	5	0.0	5
TOTAL SCORE		28		-		30		44
FISH COMMUNITY CATEGORY		GOOD 0 (SLIGHTLY IMPAIRED)		POOR (SEVERELY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)		EXCELLENT (NON- IMPAIRED)

Table 2A. Qualitative macroinvertebrate sampling results at an unnamed creek in Osceola County on July 1 and 2, 1991.

TAXA	STATION 1	STATION 2	STATION 3	STATION 4
ANNELIDA (segmented worms)				
Oligochaeta (worms)			3	
Hirudinea (leeches)	1	10	1	
ARTHROPODA				
Amphipoda (scuds)	15	1	10	12
Decapoda (crayfish)	2			15
Insecta				
Ephemeroptera (mayflies)				
Baetidae	1	2	25	5
Heptageniidae			4	4
Tricorythidae				2
Caenidae	1			
Ephemeridae			15	
Odonata				
Zygoptera (damselflies)				
Calopterygidae			1	1
Anisoptera (dragonflies)				
Aeshnidae	1			1
Cordulegastridae	1		1	
Corduliidae				6
Libellulidae			1	
Hemiptera (true bugs)				
Gerridae		25	15	1
Megaloptera				
Sialidae (alder flies)				
Sialis sp.			4	1
Corydalidae (Dobson flies)				
Nigronia			1	1
Trichoptera (caddisflies)				
Philopotamidae	4			5
Hydropsychidae				
Cheumatopysche	30		1	16
Glossosomatidae				10
Hydroptilidae				7
Brachycentridae			25	
Limnephilidae	2	2	2	13
Lepidostomatidae			5	
Helicopsychidae				11
Coleoptera (beetles)				
Dryopidae	1			
Elmidae	1			4
Diptera (flies)				
Tipulidae				1
Simuliidae				7
Chironomidae	30	50	5	5
Tabanidae	1		2	1
Athericidae		2		
MOLLUSCA				
Gastropoda (snails)				
Ferrissia (limpet)				15
Pseudosuccinea			1	
Physa		5		5
Pelecypoda (clams)				
Sphaerium			5	
TOTAL INDIVIDUALS	91	97	127	149

Table 2B. Macroinvertebrate metric evaluation of an unnamed creek in Osceola Co. on July 1 and 2, 1991

METRIC	STATION 1		STATION 2		STATION 3		STATION 4	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	14	2	8	0	20	6	24	6
NUMBER OF MAYFLY TAXA	2	2	1	0	3	6	3	4
NUMBER OF CADDISFLY TAXA	3	2	1	0	4	2	6	6
NUMBER OF STONEFLY TAXA	0	0	0	0	0	0	0	0
PERCENT MAYFLY COMP.	2.2	0	2.1	0	34.6	6	7.4	0
PERCENT CADDISFLY COMP.	39.6	4	2.1	0	26.0	2	41.6	6
PERCENT CONTR. DOM. TAXON	33.0	2	51.5	0	19.7	6	10.7	6
PERCENT ISOPOD, SNAIL, LEECH	1.1	4	15.5	0	1.6	4	13.4	0
PERCENT SURFACE AIR BREATHERS	0.0	6	25.8	2	11.8	4	0.7	6
TOTAL SCORE		22		2		36		34
MACROINVERTEBRATE COMMUNITY CATEGORY		FAIR (MODERATELY IMPAIRED)		POOR (SEVERELY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)

Table 3. Habitat evaluation for an unnamed creek in Osceola Co. on July 1 and 2, 1991.

HABITAT METRIC	STATION 1 SCORE	STATION 2 SCORE	STATION 3 SCORE	STATION 4 SCORE
Bottom Substrate Available Cover:	7	4	10	15
Embeddedness:	4	6	16	18
Velocity:Depth:	5	6	12	15
Flow Stability:	10	4	14	12
Bottom Deposition:	3	3	4	10
Pools-Riffles-Runs-Bends:	4	4	7	12
Bank Stability:	10	10	10	5
Bank Vegetative Stability:	9	10	10	6
Streamside Cover:	9	5	10	9
TOTAL SCORE	61	52	93	102
HABITAT CONDITION CATEGORY	POOR (SEVERELY IMPAIRED)	POOR (SEVERELY IMPAIRED)	FAIR (MODERATELY IMPAIRED)	EXCELLENT (NON-IMPAIRED)
Date:	7/2/91	7/1/91	7/1/91	7/1/91
Stream Type:	coldwater	coldwater	coldwater	coldwater
Weather:	cloudy	cloudy	cloudy	cloudy
Stream Order:	first	first	second	third
Air Temperature:	72 Deg. F.	69 Deg. F.	71 Deg. F.	65 Deg. F.
Water Temperature:	64 Deg. F.	61 Deg. F.	57 Deg. F.	57 Deg. F.
Ave. Stream Width:	2 Feet	2 Feet	10 Feet	12 Feet
Ave. Stream Depth:	0.3 Feet	0.5 Feet	0.4 Feet	0.8 Feet
Surface Velocity:	0.1 Ft./Sec.	0.02 Ft./Sec.	1.3 Ft./Sec.	0.6 Ft./Sec.
Estimated Flow:	0.06 CFS	0.02 CFS	5.2 CFS	5.76 CFS

Table 4. Water chemistry analyses for grab samples collected from an unnamed creek in Osceola County on July 1 and 2, 1991.

<u>Parameter</u>	<u>Station Description</u>			
	<u>Station 1</u> <u>(10 mile)</u>	<u>Station 2</u> <u>(80th)</u>	<u>Station 3</u> <u>(70th)</u>	<u>Station 4</u> <u>(N. River Rd)</u>
Nitrate + Nitrite Nitrogen (mg N/l)	0.38	0.044	0.28	0.22
Ammonia Nitrogen (mg N/l)	0.036	0.089	0.017	0.028
Kjeldahl Nitrogen (mg N/l)	0.41	0.80	0.26	0.20
Ortho Phosphate (mg P/l)	0.003	--	--	0.007
Total Phosphorus (mg P/l)	0.032	0.145	0.031	0.024
Suspended Solids (mg/l)	<4	--	--	4
Total Dissolved Solids (mg/l)	290	--	--	250
Total Organic Carbon (mg/l)	4.5	11.0	3.3	2.9