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MICHIGAN DEPARTMENT OF NATURAL RESOURCES
SURFACE WATER QUALITY DIVISION
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STAFF REPORT

A BIOLOGICAL SURVEY OF THE HERSEY RIVER, OSCEOLA COUNTY
AUGUST 5-6, 1991

As part of the point source surveillance activity of Surface Water Quality Division, staff of the Great Lakes and Environmental Assessment Section (GLEAS) conducted a qualitative biological survey of the Hersey River, Osceola County, in the vicinity of Reed City. 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 river was exhibiting signs of adverse effects from discharges from: the local Wastewater Treatment Plant (WWTP); a 307 site at the WWTP grounds; and a recently discontinued industrial discharge that had discharged upstream of the WWTP.

The segment of the Hersey River evaluated in this survey is a third order, coldwater stream in the Southern Michigan Northern Indiana Till Plain Ecoregion. The Hersey River flows into the Muskegon River.

SUMMARY

1. The locations of the three 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. Overall, the biological community and physical condition of the Hersey River was rated as good to excellent at the time of the survey for the parameters evaluated.
3. The fish community (Tables 1A, 1B) was rated as good (slightly impaired) at the 5 stations surveyed.
4. The macroinvertebrate community (Tables 2A, 2B) was rated as good (slightly impaired) at Stations 1, 2, 4, and 5 while Station 3, the station just downstream of the WWTP, was rated excellent (non-impaired). The presence of 2 rocky riffle areas in the survey reach were probably the reason for the higher rating relative to the other stations.

- TABLE 3
5. Habitat conditions (Table 3) were rated as excellent at Stations 1-4 and good at Station 5. The Station 5 habitat scored lower than the other stations because of the presence of large sandy areas that were being colonized by the plant, Potamogeton. The plant growths appear to be trapping some of the sand as it moves downstream. The source(s) of the sand deposits seen at Station 5 is not clear.
6. The metals and organic chemical data (Table 4) do not show obvious effects in the river water at the time of the survey from direct or indirect discharge sources. However, when disturbed, some sediments at Station 3 appeared to release oily substances which caused a sheen on the water. Additionally, oily spots were intermittently observed coming downstream at Station 3. Instream ammonia concentrations increased immediately below the WWTP but decreased to background by Station 5 while nitrite+nitrate concentrations increased from Station 3 to Station 5. These nitrogen data may reflect nitrification of the ammonia.

REFERENCES

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

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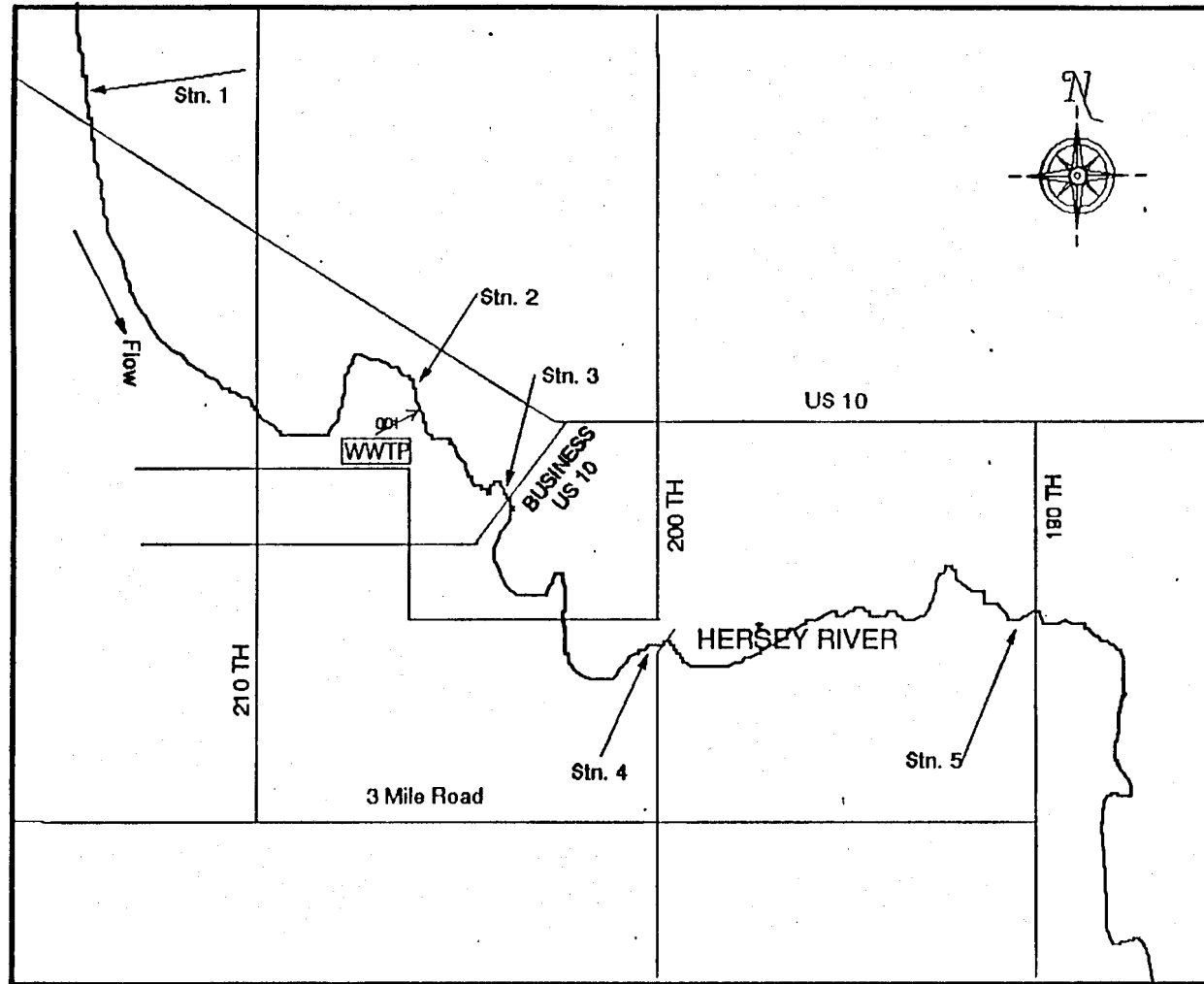


Figure 1. Sampling stations on the Hersey River, Osceola County, on August 5-6, 1991.

Table 1A. Qualitative fish sampling results for the Hersey River, Osceola County, on August 5-6, 1991.

TAXA	STATION 1	STATION 2	STATION 3	STATION 4	STATION 5
Petromyzontidae (Lampreys)					
Ammocetes	1	10	5	4	1
Salmonidae (Trouts)					
Salmo trutta (Brown trout)	23	7	6	20	12
Cyprinidae (Minnows and Carps)					
Campostoma anomalum (Cent. ston.)					1
Cyprinus carpio (Carp)		1			
Nocomis biguttatus (Horneyhead)				1	
Semotilus atromaculatus (Creek)	3	25	16	6	16
Notemigonus crysoleucas (Golden)	1			1	
Notropis volucellus (mimic shin.)	1				
Pimephales promelas (Fathead mi.)				2	
Phoxinus eos (N. redbelly dace)		1	4	2	
Rhinichthys atratulus (Blacknose)	2	30	38	73	46
R. cataractae (Longnose dace)	54		2	36	6
Cottidae (Sculpins)					
Cottus bairdi (Mottled sculpin)	22	20	24	6	
Catostomidae (Suckers)					
Catostomus commersoni (W. sucker)	53	41	22	33	65
Centrarchidae (Sunfish)					
Lepomis cyanellus (Green sunfish)		2	3	3	3
Percidae (Perches)					
E. nigrum (Johnny darter)	4	16	4	5	6
Percina maculata (Blackside dar.)	2	7	4	5	10
TOTAL INDIVIDUALS	166	160	128	197	166
NUMBER OF ANOMALIES	0	1	0	0	0
SQUARE FOOT SAMPLED	11025	7000	9450	7830	6450
DENSITY OF INDIVIDUALS (#/SF)	0.015	0.023	0.014	0.025	0.026

Table 1B. Fish metric evaluation of the Hersey River, Osceola County, on August 5-6, 1991:

METRIC	STATION 1		STATION 2		STATION 3		STATION 4		STATION 5	
	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	11	5	11	5	11	5	14	5	10	5
NUMBER OF DARTER SPECIES	2	5	2	5	2	5	2	5	2	5
NUMBER OF SUNFISH SPECIES	0	1	1	3	1	3	1	3	1	3
NUMBER OF SUCKER SPECIES	1	3	1	3	1	3	1	3	1	3
PERCENT CARP, G.SUNFISH, W.SUCKER	31.9	1	27.5	1	19.5	3	18.3	3	41.0	1
PERCENT OMNIVORES	33.1	3	32.5	3	21.1	3	20.3	3	39.8	3
PERCENT INSECTIVO. CYPRINIDS	33.1	3	0.0	1	1.6	1	18.8	1	3.6	1
PERCENT PISCIVORES	0.0	1	0.0	1	0.0	1	0.0	1	0.0	1
DENSITY OF INDIVIDUALS	0.015	5	0.023	5	0.014	5	0.025	5	0.026	5
PERCENT ANOMALIES	0.0	5	0.6	5	0.0	5	0.0	5	0.0	5
TOTAL SCORE		32		32		34		34		32
FISH COMMUNITY CATEGORY	GOOD (SLIGHTLY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)	

Table 2A. Qualitative macroinvertebrate sampling results for the Hersey River, Osceola County, on August 5-6, 1991.

TAXA	STATION 1	STATION 2	STATION 3	STATION 4	STATION 5
PORIFERA (sponges)		2	1	1	2
PLATYHELMINTHES (flatworms)	6		2	4	1
BRYOZOA (moss worms)	1	2	1		1
ANNELIDA (segmented worms)					
Oligochaeta (worms)					1
ARTHROPODA					
Amphipoda (scuds)	3	10	3	5	3
Decapoda (crayfish)	2	11	2	2	3
Insecta					
Ephemeroptera (mayflies)					
Baetidae	6	7	12	25	25
Oligoneuriidae	5	1	3	4	3
Heptageniidae	12	7	20	8	25
Tricorythidae			1		
Caenidae					1
Odonata					
Zygoptera (damselflies)					
Calopterygidae			2		2
Anisoptera (dragonflies)					
Aeshnidae	1	1			
Plecoptera (stoneflies)					
Perlidae	2		1	4	
Hemiptera (true bugs)					
Belostomatidae					
Belastoma	1	1	2	1	
Nepidae		5			
Pleidae					1
Corixidae	2	4		3	
Gerridae		2			1
Mesoveliidae				1	
Megaloptera					
Sialidae (alder flies)					
Sialis sp.		1			
Nigronia			1		
Trichoptera (caddisflies)					
Polycentropodidae		3			
Hydropsychidae	20	30	25	35	15
Glossosomatidae	6	4			
Hydroptilidae	11	10	25	12	
Limnephilidae	10	18	8	10	
Leptoceridae	3	2	3	2	2
Coleoptera (beetles)					
Gyrinidae (adults)		3			
Halplidae (adults)				1	
Hydrophilidae (total)			2	2	
Elmidae		2	1		
Diptera (flies)					
Tipulidae				1	1
Simuliidae	15		15	7	15
Ceratopogonidae					1
Chironomidae	2	3	4	4	10
Rheotanytarsus	2		4		
Athericidae		1	1	1	
MOLLUSCA					
Gastropoda (snails)					
Ferrissia (limpet)	2	4	2	5	5
Physa	2	2	2	3	2
TOTAL INDIVIDUALS	114	136	143	141	120

Table 2B. Macroinvertebrate metric evaluation of the Hersey River, Osceola County, on August 5-6, 1991.

METRIC	STATION 1		STATION 2		STATION 3		STATION 4		STATION 5	
	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	21	6	25	6	25	6	23	6	21	6
NUMBER OF MAYFLY TAXA	3	4	3	4	4	6	3	4	4	6
NUMBER OF CADDISFLY TAXA	5	6	6	6	4	6	4	6	2	2
NUMBER OF STONEFLY TAXA	1	4	0	0	1	4	1	4	0	0
PERCENT MAYFLY COMP.	20.2	4	11.0	0	25.2	6	26.2	6	45.0	6
PERCENT CADDISFLY COMP.	43.9	6	49.3	6	42.7	6	41.8	6	14.2	0
PERCENT CONTR. DOM. TAXON	17.5	6	22.1	4	17.5	6	24.8	4	20.8	4
PERCENT ISOPOD, SNAIL, LEECH	3.5	2	4.4	2	2.8	4	5.7	0	5.8	0
PERCENT SURFACE AIR BREATHERS	2.6	6	11.0	4	2.8	6	5.7	4	1.7	6
TOTAL SCORE		44		32		50		40		30
MACROINVERTEBRATE COMMUNITY CATEGORY		GOOD (SLIGHTLY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)		EXCELLENT (NON-IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)		GOOD (SLIGHTLY IMPAIRED)

Table 3. Habitat evaluation for the Hersey River, Osceola County, on August 5-6, 1991.

HABITAT METRIC	STATION 1 SCORE	STATION 2 SCORE	STATION 3 SCORE	STATION 4 SCORE	STATION 5 SCORE
Bottom Substrate Available Cover:	17	10	17	16	10
Embeddedness:	18	15	19	18	15
Velocity:Depth:	20	16	18	18	13
Flow Stability:	14	14	11	14	15
Bottom Deposition:	14	11	12	13	8
Pools-Riffles-Runs-Bends:	15	13	14	14	10
Bank Stability:	9	8	8	10	10
Bank Vegetative Stability:	10	10	10	10	10
Streamside Cover:	10	8	8	8	5
TOTAL SCORE	127	105	117	121	96
HABITAT CONDITION CATEGORY	EXCELLENT (NON-IMPAIRED)	EXCELLENT (NON-IMPAIRED)	EXCELLENT (NON-IMPAIRED)	EXCELLENT (NON-IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
Date:	August 5, 1991	August 5, 1991	August 5, 1991	August 6, 1991	August 6, 1991
Stream Type:	Coldwater	Coldwater	Coldwater	Coldwater	Coldwater
Weather:	Sunny	Sunny	Sunny	Sunny	Sunny
Stream Order:	Third	Third	Third	Third	Third
Air Temperature:	72 Deg. F.	66 Deg. F.	67 Deg. F.	63 Deg. F.	63 Deg. F.
Water Temperature:	61 Deg. F.	63.5 Deg. F.	63.5 Deg. F.	59.5 Deg. F.	63 Deg. F.
Ave. Stream Width:	35 Feet	40 Feet	45 Feet	60 Feet	45 Feet
Ave. Stream Depth:	1 Feet	1.5 Feet	1.5 Feet	1 Feet	1.33 Feet
Surface Velocity:	2.3 Ft./Sec.	1.2 Ft./Sec.	1.1 Ft./Sec.	1.2 Ft./Sec.	1.25 Ft./Sec.
Estimated Flow:	80 CFS	72 CFS	74 CFS	72 CFS	75 CFS

COMMENTS:

Table 4. Water chemistry analyses for grab samples collected from the Hersey River, Osceola County, and the Reed City WWTP. Samples were collected on August 5-6, 1991 except for Station 4 which was sampled on August 7th.

<u>Parameter (1,2)</u>	<u>Station 1</u>	<u>Station 2</u>	<u>WWTP</u>	<u>Station 3</u>	<u>Station 4</u>	<u>Station 5</u>
NO ₂ + NO ₃ Nitrogen (mg N/l)	0.130	0.121	5.0	0.188	0.22	0.26
Ammonia Nitrogen (mg N/l)	0.028	0.022	5.1	0.075	0.053	0.019
Kjeldahl Nitrogen (mg N/l)	0.47	0.46	7.9	0.54	0.43	0.47
Total Organic Carbon (mg/l)	4.7	4.5	7.3	4.8	4.2	4.8
Total Phosphorus (mg/l)	0.025	0.028	0.19	0.028	0.032	0.029
Aluminum	56	51	66	<50	-	79
Cadmium	<0.2	<0.2	<0.2	<0.2	<20	<0.2
Chromium	<1.0	<1.0	<1.0	<1.0	<25	<1.0
Copper	1.5	1.4	2.9	1.0	<20	<1.0
Lead	<1.0	<1.0	<1.0	<1.0	<50	<1.0
Nickel	<2.0	<2.0	9.5	<2.0	<50	<2.0
Zinc	<4.0	<4.0	5.3	4.0	<50	<4.0

Purgeable Halocarbons	ND	-	-	ND	-	-
Aromatic Hydrocarbons	ND	-	-	ND	-	ND
Phenols	ND*	-	-	ND*	-	ND*
GC/MS Base Neutrals	ND	-	-	ND	-	ND

ND - No found above respective detection limits.

* - detection limit for 4 phenolic compounds was 200 ug/l (instead of 10 ug/l) due to instrument problems.

1 - units are ug/l unless otherwise noted.

2 - metals values are total metals.