

GLEAS

MICHIGAN DEPARTMENT OF NATURAL RESOURCES  
 SURFACE WATER QUALITY DIVISION  
 OCTOBER 1989

## STAFF REPORT

BIOLOGICAL AND SEDIMENT CONTAMINANT SURVEYS  
 OF RYERSON CREEK,  
 MUSKEGON COUNTY, MICHIGAN  
 17 AUGUST 88 AND 1 AUGUST 89

DATE \_\_\_\_\_  
 INITIALS \_\_\_\_\_  
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## INTRODUCTION

The International Joint Commission designated Muskegon Lake as an Area of Concern in 1985 because of concerns about potential environmental impacts due to historical municipal and industrial discharges. Biological and sediment surveys were conducted on Ryerson Creek, a designated warmwater stream, as recommended in the Muskegon Remedial Action Plan (Wuycheck, 1987). The objective of the survey was to evaluate stream quality upstream of Muskegon Lake.

## SUMMARY

1. Similar macroinvertebrate communities were found at Station 1 and Station 2. However, reduced water quality due to increased turbidity, bacterial slimes and sanitary odors was present at Station 2. No biological assessment was conducted at Station 3 due to stream conditions (inaccessible due to deep, unconsolidated sediment deposits).
2. Sediment concentrations of arsenic, cadmium, chromium, copper and nickel several heavy metals were elevated at Stations 2 and 3. Lead and zinc concentrations were substantially elevated throughout the survey reach with concentrations highest at Station 3. Urban runoff is the most probable anthropogenic source since there are no permitted point source dischargers to Ryerson Creek.
3. Habitat quality was limited at both Stations 1 and 2 due to deep deposits of sand. Deep deposits of unconsolidated, fine particulate organic sediments at Station 3 also limited stream habitat quality.

## METHODS

Stations 1 was evaluated on 1 August 89 as a followup survey to the 17 August 89 assessments of Station 2 and Station 3. Macroinvertebrate and plant communities were evaluated at Stations 1 and

2 (Figure 1). The biological stream assessment involved a qualitative evaluation of species composition and relative abundance. Macroinvertebrate (insects, clams, worms) community composition was determined by collecting and identifying organisms attached to colonizable substrate (logs, rocks and vegetation and fine particulate deposits in both erosional and depositional zones. A long-handled triangular net with 1.0 mm pore size netting was also used for collecting. The duration of macroinvertebrate collections was based on a law of diminishing returns (i.e. collecting ceased when no new taxon was found after an additional ten minutes of searching). Qualitative fish collections were also made with the long-handled triangular net. Macroinvertebrate, fish and plant identifications were made in the field.

Sediment samples were collected from depositional zones at Stations 1, 2 and 3 according to procedures outlined in MDNR, 1981. Each sample represented a composite of at least four grab samples from different deposits at each site.

Stream biological and physical characteristics for each station were recorded on stream survey cards (Appendix A).

#### RESULTS AND DISCUSSION

Station 1 (Getty Street), Station 2 (Wood Street) and Station 3 (Yuba Street) were located within the city limits of Muskegon about 1.0, 0.5 and 0.3 miles upstream from Muskegon Lake, respectively. There are no known point source dischargers to Ryerson Creek upstream of these three stations. The stream flows through an intensely urbanized area.

The sediment sample from each station was analyzed for twenty-five chlorinated organic compounds, including polychlorinated biphenyls and at least eight heavy metals (Table 1). Arsenic, cadmium, chromium, copper, nickel, lead and zinc concentrations at Stations 2 and 3 were about double those found at Station 1. Substantially elevated lead and zinc concentrations were found at all three stations. Runoff from this intensely urbanized area is the most probable source of the elevated heavy metals.

Sediment concentrations of the twenty-five organic compounds were undetected (less than analytical detection levels that ranged from 250 to 3900 ug/kg, dry weight).

Macroinvertebrate and fish habitat quality was reduced due to sand deposit (2 to 3 ft. deep) that characterized Stations 1 and 2. Three to four feet deposits of unconsolidated, fine particulate sediments at Station 3 prevented access for a biological assessment. Only twelve and eleven taxa of macroinvertebrates, generally sparse in abundance, were found at Stations 1 and 2, respectively (Table 2). Stream conditions seem to have improved

slightly based on increased macroinvertebrate taxa and composition reported by Evans (ca. 1973) for a 1972 stream survey of Ryerson Creek. Conditions at that time were influenced by sanitary discharges to the stream. The sanitary discharge sources to Ryerson Creek were to have been eliminated with the construction of the Muskegon County Wastewater Management System No.1 facility.

Reduced water quality, as characterized by increased suspended solids, slight growths of bacterial slimes and increased turbidity were apparent at Station 2, located just downstream from a shallow impoundment. Carp were present in the impoundment and their feeding activity may have contributed to the reduced water quality by resuspending stream sediments.

Water odors at Station 2 indicated possible influence from sanitary wastewater. Sparse growths of bacterial slimes were also evident at Station 2 indicative of increased total organic carbon. There was no apparent source of the sanitary odors.

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Report By: John Wuycheck  
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#### References:

- Evans, E. (ca. 1973). Final Report of Michigan Bureau of Water Management's Investigation of the Sediments and Benthic Communities of Mona, White and Muskegon Lakes, Muskegon County, Michigan 1972. MDNR Report # 02540. Lansing, Michigan.
- MDNR, 1981. Quality Assurance for Water and Sediment Sampling. Environmental Protection Bureau, Lansing, Michigan.
- Wuycheck, J. 1987. Remedial Action Plan for Muskegon Lake Area of Concern. MDNR Report No. MI/DNR/SWQD-87/060. Lansing, Michigan. 274 pp.

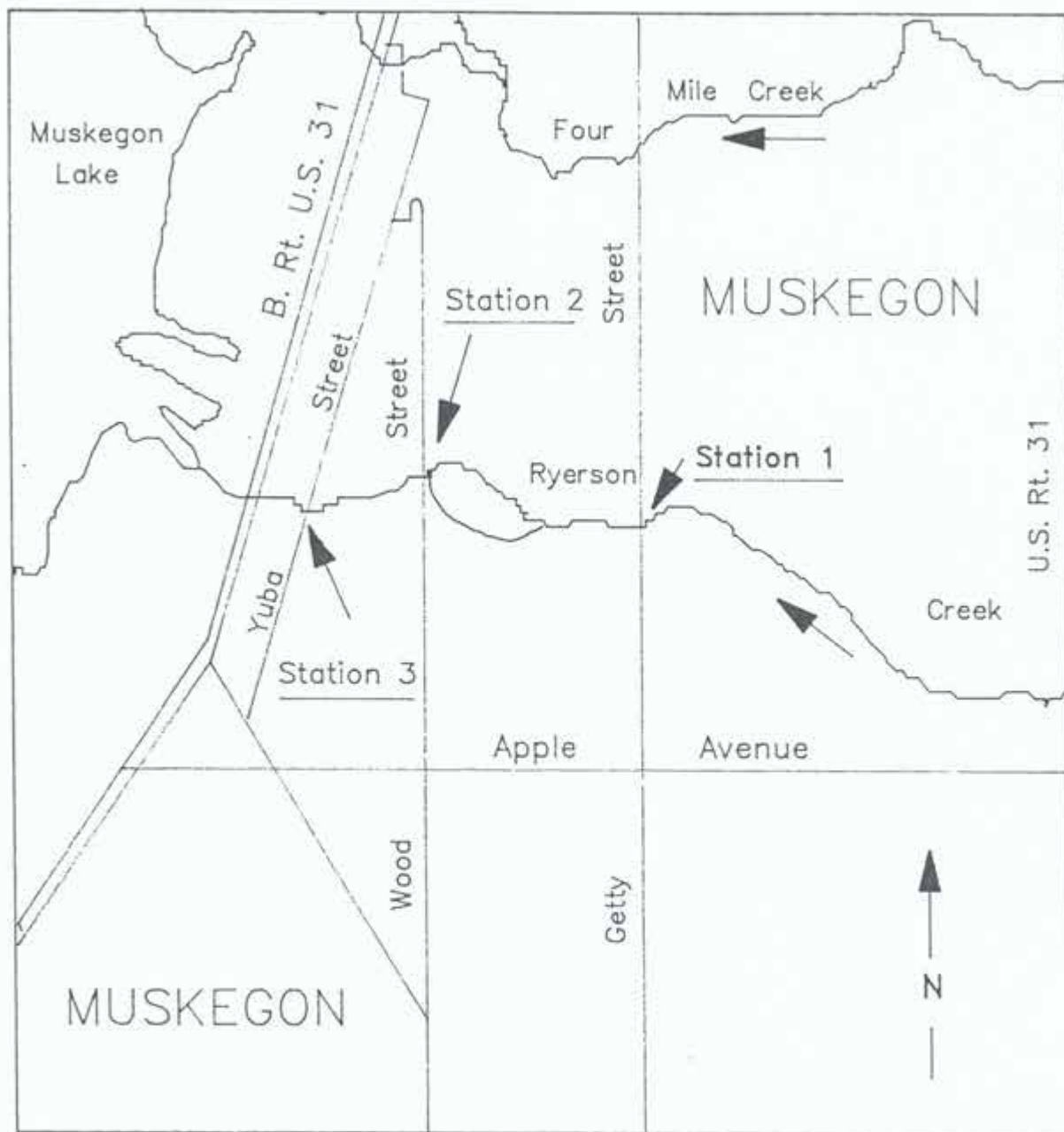


Figure 1. Biological and/or sediment sampling survey stations in Ryerson Creek upstream of Muskegon Lake, 17 August 88 and 1 August 89, Muskegon, Michigan.

Table 1. Analytical results for Ryerson Creek sediment samples collected 17 August 88 and 1 August 89, Muskegon, Michigan.

Parameters	Station 1 Getty St. (1 August 89)	Station 2 Wood St. (17 August 88)	Station 3 Yuba Ave. (17 August 88)
<u>Heavy Metals as mg/kg:</u>			
Aluminum	3173		
Arsenic	5.2	5.3	6.3
Cadmium	K 2	3.1	4
Chromium	31	69.4	58.1
Copper	93	162	188
Mercury	0.17	0.33	0.38
Nickel	13	22	29
Lead	313	582	702
Zinc	300	541	657
<u>Organic Compounds as ug/kg:</u>			
1,3-dichlorobenzene	K 2500	K 3400	K 3900
1,4-dichlorobenzene	K 2500	K 3400	K 3900
1,2-dichlorobenzene	K 2500	K 3400	K 3900
hexachlorbenzene	K 250	K 340	K 390
1,2,4-trichlorobenzene	K 2500	K 3400	K 3900
hexachlorobutadiene	K 250	K 340	K 390
2-chloronaphthalene	K 2500	K 3400	K 3900
hexachlorobenzene	K 250	K 340	K 390
g-BHC (lindane)	K 250	K 340	K 390
pentachloronitrobenzene	K 250	K 340	K 390
heptachlor	K 250	K 340	K 390
g-chlordane	K 250	K 340	K 390
a-chlordane	K 250	K 340	K 390
4,4'-DDE	K 250	K 340	K 390
4,4'-DDD	K 250	K 340	K 390
1,4'-DDT	K 250	K 340	K 390
4,4'-DDT	K 250	K 340	K 390
hexabromobenzene	K 250	K 340	K 390
methoxychlor	K 250	K 340	K 390
mirex	K 250	K 340	K 390
polychlorinated biphenyls			
Aroclor 1242	K 2500	K 3400	K 3900
Aroclor 1254	K 2500	K 3400	K 3900
Aroclor 1260	K 2500	K 3400	K 3900
BP-6 *	K 250	K 340	K 390
toxaphene *	K 2500	K 3400	K 3900
Total Solids (percent)	23	15.2	13.4
Oil/Grease (mg/kg)	350		

K = value is less than the level of detection indicated.  
 \* = seldom encountered, reported semi-quantitatively.

Table 2. Relative abundance of macroinvertebrate taxa identified at Ryerson Creek survey stations 17 August 88 (Station 2) and 1 August 89 (Station 1), Muskegon County, Michigan.

Taxon	Station 1 (Getty St.)	Station 2 (Wood St.)
Hirudinea (leeches)		S
Gastropoda (snails)		
<u>Lymnea</u>		S
<u>Physa</u>	S	
Isopoda (sowbugs)	P	
Amphipoda (scuds)	M-A	M
Decapoda (crayfish)	S	M
Ephemeroptera (mayflies)		
Baetidae	S	
Odonata		
Anisoptera (dragonflies)	S	A
Zygoptera (damselflies)		S
Hemiptera (bugs)		
Corixidae	S	
Gerridae	S	S
Trichoptera (caddisflies)		
Hydropsychidae	S	
Coleoptera (beetles)		
Dytiscidae	S	S
Haliplidae		
Hydrophilidae		S
Diptera (flies)		
Chironomidae		S-M
Tanypodinae	A	
Simuliidae	M	
Tipulidae		S
	Total Taxa	11
	12	11

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 S = Sparse, M = Moderate, A = Abundant

STORET NO. \_\_\_\_\_

STATION NUMBER 1 INVESTIGATOR (S) WUYCHECK AND TAFT DATE 1 / AUGUST / 89 TIME 1040

BODY OF WATER RYERSON CREEK LOCATION BETTY STREET PHOTOGRAPHS: X

COUNTY MUSKEGON TOWNSHIP MUSKEGON T 10 N R 16 W S 21 WATER SAMPLES: \_\_\_\_\_

STREAM TYPE: ( ) Coldwater (X) Warmwater REASON FOR SURVEY URBAN RUNOFF SEDIMENT SAMPLE: X

WEATHER: (X) Sunny ( ) Partly Cloudy ( ) Cloudy ( ) Rainy AIR TEMP. 20°C WATER TEMP. 16°C OTHER: \_\_\_\_\_

LOCAL LAND USE: (X) Urban ( ) Suburban ( ) Agricultural ( ) Grassland ( ) Forest ( ) Other UPSTREAM WETLAND - TYPHA

SURVEY REACH LENGTH: 50 ft. % STREAM SHADING: 50 CHANNELIZED: ( ) Yes (X) No DAM u/s: ( ) Yes (X) No \_\_\_\_\_ ft.

STREAMBANK VEG.: ( ) Barren ( ) Grasses ( ) Herbaceous ( ) Brush ( ) Deciduous ( ) Conifer ( ) Other TYPHA  
 Est. % Coverage 10 30 20 10 30  
 Vegetative Height (ft.) \_\_\_\_\_

BANK STABILITY: (X) Stable ( ) Slightly Eroded ( ) Moderately Eroded ( ) Severely Eroded BANK MATERIAL: sandy/loam

DISCHARGE STABILITY: (X) Stable ( ) Moderately Stable ( ) Unstable ( ) Severely Unstable UNDERCUT BANKS: ( ) Yes (X) No

AVE. STREAM WIDTH 10 ft. AVE. STREAM DEPTH 0.5 ft. SURFACE VELOCITY 0.75 ft./sec. ESTIMATED FLOW: 3.75 cfs

BANKFULL HEIGHT 1.5 ft. BANKFULL WIDTH 20 ft. CHANNEL SLOPE \_\_\_\_\_ ft./mile

CHANNEL X - SECTION: (X) Rectangular ( ) V-Shaped ( ) U-Shaped ( ) Other \_\_\_\_\_ % BANK SLOPE 10

TURBIDITY: (X) Clear ( ) Slight (X) Turbid ( ) Opaque SECCHI DISC TRANS: \_\_\_\_\_ ft. WATER COLOR: CLEAR

SURFACE OILS: (X) None ( ) Flecks ( ) Globs ( ) Sheen ( ) Slick ( ) Other \_\_\_\_\_ % Aerial Coverage \_\_\_\_\_

WATER ODORS: (X) Normal ( ) Sewage (X) Petroleum ( ) Chemical ( ) Other \_\_\_\_\_

SEDIMENT OILS: (X) Absent (X) Slight ( ) Moderate ( ) Profuse DEPOSITS: ( ) None ( ) Sludge (X) Sand ( ) Other \_\_\_\_\_

SEDIMENT ODORS: (X) Normal ( ) Sewage (X) Petroleum ( ) Chemical ( ) Anaerobic ( ) Other \_\_\_\_\_

UNDERSIDES OF IMBEDDED RUBBLE BLACK? ( ) Yes (X) No LENGTH OF REACH AFFECTED \_\_\_\_\_ ft. % Reach Affected \_\_\_\_\_

INORGANIC SUBSTRATE	FLOW VELOCITY	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA	ORGANIC SUBSTRATE	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
BOULDERS*	> 3 fps	> 10 inch dia.	_____	MUCK-MUD	Black, very fine organic.	_____
RUBBLE*	2 fps	2.5 - 10 inch dia.	_____	PULPY PEAT	Indistinguishable plant parts.	_____
GRAVEL*	1 fps	0.1 - 2.5 inch dia.	_____	FIBROUS PEAT	Partially decomposed plant material.	<u>50</u>
SAND	0.7 fps	0.002 - 0.079 inch dia.	<u>40</u>	DETRITUS	Sticks, wood, coarse plant material.	<u>50</u>
SILT	< 0.4 fps		<u>60</u>	LOGS, LIMBS		<u>100</u> %
CLAY		Slick Texture	<u>100</u> %			

\*IMBEDDEDNESS: (1) None (2) 1/3 or less (3) 2/3 or more SITE SUBSTRATE COMPOSITION: % INORGANIC 90 % ORGANIC 10

## BIOTA:

SLIMES N PERIPHYTON S FILAMENTOUS ALGAE \_\_\_\_\_ MACROPHYTES M MACROINVER. M-A FISH M OTHER \_\_\_\_\_

\*\*\*\*\* (S)Sparse (M)Moderate (A)Abundant (P)Profuse (N)Not Observed \*\*\*\*\*

AQUATIC PLANTS: % Aerial Coverage < 5 % FISH: (X)Hand Net ( )Electrofishing Duration: \_\_\_\_\_ min.

MACROPHYTES		ATTACHED ALGAE		Taxa:	GAME	ROUGH	FORAGE MINNOWS
<u>Ceratophyllum</u>		<u>Batrachosperma</u>		_____	_____	_____	_____
<u>Elodea</u>	<u>M</u>	<u>Cladophora</u>	<u>S</u>	_____	_____	_____	_____
<u>Leana</u>	<u>S-M</u>	<u>Hydrodictyon</u>		_____	_____	_____	_____
<u>Myriophyllum</u>		<u>Rhizoclonium</u>		_____	_____	_____	_____
<u>Nasturtium</u>	<u>M</u>	<u>Spirogyra</u>		_____	_____	_____	_____
<u>Potamogeton</u>		<u>Vaucheria</u>		_____	_____	_____	_____
<u>Ranunculus</u>		_____		_____	_____	_____	_____
<u>Typha</u>	<u>M-A</u>	_____		_____	_____	_____	_____
_____		_____		_____	_____	_____	_____
_____		_____		_____	_____	_____	_____

\*\*\*\*\* (S)Sparse (M)Moderate (A)Abundant (P)Profuse (N)Not Observed \*\*\*\*\*

## MACROBENTHOS - QUALITATIVE SAMPLE - (INDICATE DOMINANT GROUPS \*)

BRYOZOA	_____	STONEFLIES	_____	DRAGONFLIES	<u>S</u>	CADDISFLIES	_____	AQU. CATERPIL.	_____
FLATWORMS	_____	Perlidae	_____	DAMSELFLIES	_____	Brachycentridae	_____	BEETLES	_____
ROUNDWORMS	_____	Pteronarcys	_____	TRUE BUGS	_____	Glossosomatidae	_____	Dytiscidae	<u>S</u>
AQUATIC WORMS	_____	Taeniopterigidae	_____	<u>Belostoma</u>	_____	Helicopsyche	_____	Elmidae	_____
LEECHES	_____	Perlodidae	_____	Corixidae	<u>S</u>	Hydropsychidae	<u>S</u>	Syrinidae	_____
SNAILS	_____	MAYFLIES	_____	Gerridae	<u>S</u>	_____	_____	Hydrophilidae	_____
<u>Ferrissia</u>	_____	Baetidae	<u>S</u>	<u>Lethocerus</u>	_____	Hydroptilidae	_____	Psephenidae	_____
<u>Lyanea</u>	_____	Baetisca	_____	Naucoridae	_____	Leptoceridae	_____	Halipidae (a)	<u>S</u>
<u>Physa</u>	<u>S</u>	Caenidae	_____	Notonectidae	_____	Lepidostomatidae	_____	TRUE FLIES	_____
_____	_____	Ephemerellidae	_____	Pleidae	_____	Limnephilidae	_____	Atherix	_____
CLAMS	_____	Ephemeridae	_____	Veliidae	_____	<u>Pycnopsyche</u>	_____	Ceratopogonidae	_____
Sphaeriidae	_____	Heptageniidae	_____	MEGALOPTERA	_____	<u>Neophylax</u>	_____	Chironomidae	_____
Unionidae	_____	Leptophlebiidae	_____	<u>Corydalis</u>	_____	Molannidae	_____	Tanypodinae	<u>A</u>
SOWBUGS	<u>P</u>	<u>Potomanthus</u>	_____	<u>Nigronia</u>	_____	Odontoceridae	_____	_____	_____
SCUDS	<u>M-A</u>	Siphonuridae	_____	<u>Sialis</u>	_____	Philopotamidae	_____	Epididae	_____
CRAYFISH	<u>S</u>	Tricorythidae	_____	SPONGILLAFLIES	_____	Phryganeidae	_____	Simuliidae	<u>M</u>
WATER MITES	_____	_____	_____	_____	_____	Polycentropidae	_____	Tabanidae	_____
OTHER	_____	_____	_____	_____	_____	Psychomyiidae	_____	Tipulidae	_____
_____	_____	_____	_____	_____	_____	Rhyacophilidae	_____	_____	_____

\*\*\*\*\* (S)Sparse (M)Moderate (A)Abundant (P)Profuse \*\*\*\*\*

MACROINVERTEBRATE HABITAT QUALITY ? (X)Low ( )Medium ( )High FISH HABITAT QUALITY ? (X)Low ( )Medium ( )High

## STATION SKETCH AND NOTES:

Habitat was reduced due to excess sand deposits / visual water quality was acceptable.



STATION NUMBER 2 INVESTIGATOR (S) WUYCHECK AND DEMKE DATE 17 / AUGUST / 88 TIME 1654

BODY OF WATER RYERSON CREEK LOCATION WOOD STREET PHOTOGRAPHS: \_\_\_\_\_

COUNTY MUSKEGON TOWNSHIP MUSKEGON T 10 N R 16 W S 17 WATER SAMPLES: \_\_\_\_\_

STREAM TYPE: ( ) Coldwater (X) Warmwater REASON FOR SURVEY URBAN RUNOFF SEDIMENT SAMPLE: X  
OTHER: \_\_\_\_\_

\*CONDITIONS DURING SURVEY\*

WEATHER: (X) Sunny ( ) Partly Cloudy ( ) Cloudy ( ) Rainy AIR TEMP. 31°C WATER TEMP. 31°C

LOCAL LAND USE: (X) Urban ( ) Suburban ( ) Agricultural ( ) Grassland ( ) Forest ( ) Other UPSTREAM WETLAND

SURVEY REACH LENGTH: 50 ft. % STREAM SHADING: 80 CHANNELIZED: ( ) Yes (X) No DAM u/s: ( ) Yes (X) No \_\_\_\_\_ ft.

STREAMBANK VEG.: ( ) Barren (X) Grasses (X) Herbaceous (X) Brush (X) Deciduous ( ) Conifer ( ) Other \_\_\_\_\_  
Est. % Coverage 10 20 40 30 \_\_\_\_\_  
Vegetative Height (ft.) \_\_\_\_\_

BANK STABILITY: (X) Stable ( ) Slightly Eroded ( ) Moderately Eroded ( ) Severely Eroded BANK MATERIAL: \_\_\_\_\_

DISCHARGE STABILITY: ( ) Stable (X) Moderately Stable ( ) Unstable ( ) Severely Unstable UNDERCUT BANKS: ( ) Yes (X) No

AVE. STREAM WIDTH 20 ft. AVE. STREAM DEPTH 0.5 ft. SURFACE VELOCITY 0.5 ft./sec. ESTIMATED FLOW: 5 cfs

BANKFULL HEIGHT 2.5 ft. BANKFULL WIDTH 25 ft. CHANNEL SLOPE \_\_\_\_\_ ft./mile

CHANNEL X - SECTION: (X) Rectangular ( ) V-Shaped ( ) U-Shaped ( ) Other \_\_\_\_\_ % BANK SLOPE \_\_\_\_\_

TURBIDITY: ( ) Clear ( ) Slight (X) Turbid ( ) Opaque SECCHI DISC TRANS: \_\_\_\_\_ ft. WATER COLOR: BROWN

SURFACE FILMS: (X) None ( ) Flecks ( ) Globes ( ) Sheen ( ) Slick ( ) Other \_\_\_\_\_ % Aerial Coverage \_\_\_\_\_

WATER ODORS: ( ) Normal ( ) Sewage (X) Petroleum ( ) Chemical ( ) Other \_\_\_\_\_

SEDIMENT FILMS: ( ) Absent (X) Slight ( ) Moderate ( ) Profuse DEPOSITS: ( ) None ( ) Sludge (X) Sand ( ) Other \_\_\_\_\_

SEDIMENT ODORS: ( ) Normal ( ) Sewage (X) Petroleum ( ) Chemical ( ) Anaerobic ( ) Other \_\_\_\_\_

UNDERSIDES OF IMBEDDED RUBBLE BLACK? (X) Yes ( ) No LENGTH OF REACH AFFECTED \_\_\_\_\_ ft. % Reach Affected \_\_\_\_\_

INORGANIC SUBSTRATE	FLOW VELOCITY	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA	ORGANIC SUBSTRATE	CHARACTERISTICS OR SIZE	PERCENT IN SAMPLING AREA
INORGANIC:				ORGANIC:		
BOULDERS*	> 3 fps	> 10 inch dia.	_____	MUCK-MUD	Black, very fine organic.	_____
RUBBLE*	2 fps	2.5 - 10 inch dia.	_____	PULPY PEAT	Indistinguishable plant parts.	_____
GRAVEL*	1 fps	0.1 - 2.5 inch dia.	<u>20</u>	FIBROUS PEAT	Partially decomposed plant material.	<u>90</u>
SAND	0.7 fps	0.002 - 0.079 inch dia.	<u>60</u>	DETRITUS	Sticks, wood, coarse plant material.	_____
SILT	< 0.4 fps		<u>20</u>	LOGS, LIMBS		<u>10</u>
CLAY		Slick Texture	_____			<u>100 %</u>
			<u>100 %</u>			

\*IMBEDDEDNESS: (1) None (2) 1/3 or less (3) 2/3 or more SITE SUBSTRATE COMPOSITION: % INORGANIC 90 % ORGANIC 10

## BIOTA:

SLIMES S PERIPHYTON N FILAMENTOUS ALGAE S MACROPHYTES S MACROINVER. S FISH S OTHER \_\_\_\_\_

\*\*\*\*\* (S)Sparse (M)Moderate (A)Abundant (P)Profuse (N)Not Observed \*\*\*\*\*

AQUATIC PLANTS: % Aerial Coverage \_\_\_\_\_ FISH: ( )Hand Net ( )Electrofishing Duration: \_\_\_\_\_ min.

MACROPHYTES	ATTACHED ALGAE	Taxa:	SAME	ROUGH	FORAGE
				CARP (U/S)	
<u>Ceratophyllum</u> _____	<u>Batrachosperma</u> _____	_____	_____	_____	_____
<u>Elodea</u> _____	<u>Cladophora</u> <u>S</u>	_____	_____	_____	_____
<u>Leana</u> _____	<u>Hydrodictyon</u> _____	_____	_____	_____	_____
<u>Myriophyllum</u> _____	<u>Rhizoclonium</u> _____	_____	_____	_____	_____
<u>Nasturtium</u> _____	<u>Spirogyra</u> <u>S</u>	_____	_____	_____	_____
<u>Potamogeton</u> <u>S</u>	<u>Vaucheria</u> _____	_____	_____	_____	_____
<u>Ranunculus</u> _____	_____	_____	_____	_____	_____
<u>Vallisneria</u> _____	_____	_____	_____	_____	_____
_____	_____	% Fish Type _____	_____	_____	_____

\*\*\*\*\* (S)Sparse (M)Moderate (A)Abundant (P)Profuse (N)Not Observed \*\*\*\*\*

MACROBENTHOS - QUALITATIVE SAMPLE - (INDICATE DOMINANT GROUPS \*)

BRYOZOA _____	STONEFLIES _____	DRAGONFLIES <u>A</u>	CADDISFLIES _____	AQU. CATERPIL. _____
FLATWORMS _____	Perlidae _____	DAMSELFLIES <u>S</u>	Brachycentridae _____	BEETLES _____
ROUNDWORMS _____	Pteronarcys _____	TRUE BUGS _____	Glossosomatidae _____	Dytiscidae <u>S</u>
AQUATIC WORMS _____	Taeniopterigidae _____	<u>Belostoma</u> _____	Helicopsyche _____	Elmidae _____
LEECHES <u>S</u>	Perlodidae _____	Corixidae _____	Hydropsychidae _____	Syrinidae _____
SNAILS _____	MAYFLIES _____	Gerridae <u>S</u>	_____	Hydrophilidae <u>S</u>
<u>Ferrissia</u> _____	Baetidae _____	<u>Lethocerus</u> _____	Hydroptilidae _____	Psephenidae _____
<u>Lyanea</u> <u>S</u>	<u>Baetisca</u> _____	Naucoridae _____	Leptoceridae _____	_____
<u>Physa</u> _____	Caenidae _____	Notonectidae _____	Lepidostomatidae _____	TRUE FLIES _____
_____	Ephemereididae _____	Pleiididae _____	Limnephilidae _____	Atherix _____
CLAMS _____	Ephemeridae _____	Veliidae _____	<u>Pycnopsyche</u> _____	Ceratopogonidae _____
Sphaeriidae <u>S</u>	Heptageniidae _____	MEGALOPTERA _____	<u>Neophylax</u> _____	Chironomidae <u>S-M</u>
Unionidae _____	Leptophlebiidae _____	<u>Corydalus</u> _____	Molannidae _____	_____
SOWBUGS _____	<u>Potomanthus</u> _____	<u>Nigronia</u> _____	Dontoceridae _____	_____
SCUDS <u>M</u>	Siphonuridae _____	<u>Sialis</u> _____	Philopotamidae _____	Epididae _____
CRAYFISH _____	Tricorythidae _____	SPONGILLAFLIES _____	Phryganeidae _____	Simuliidae _____
WATER MITES _____	_____	_____	Polycentropidae _____	Tabanidae _____
_____	_____	_____	Psychomyiidae _____	Tipulidae <u>S</u>
OTHER _____	_____	_____	Rhyacophilidae _____	_____

\*\*\*\*\* (S)Sparse (M)Moderate (A)Abundant (P)Profuse \*\*\*\*\*

MACROINVERTEBRATE HABITAT QUALITY ? ( )Low (X)Medium ( )High FISH HABITAT QUALITY ? (X)Low ( )Medium ( )High

STATION SKETCH AND NOTES:

Habitat was reduced due to excess sand deposits and overall water quality.