

0355e (0037e) Raccoon Creek - 1986 Biological & WQ Evaluation February 25, 1987

Biological and Water Quality Study of
Raccoon Creek

Sandusky County, Ohio.

February 25, 1987

prepared by

Ohio Environmental Protection Agency
Division of Water Quality Monitoring and Assessment
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The Raccoon Creek study area was surveyed in 1983 for the purpose of evaluating the need for advanced treatment (AT) at the Clyde WWTP. The results and analysis of this effort are contained in the 1984 Water Quality Technical Support Document for Raccoon Creek (Ohio EPA 1984a). The follow-up work in 1986 was prompted by the need for information to support the development of water quality-based effluent limits, including any applicable toxicity considerations, for the Whirlpool Corp.- Clyde discharge. In addition, changes in the OOI process wastewater discharge were made since the 1983 survey. Thus an additional objective was to evaluate the result of these changes. Other pollution sources in the study area include the Clyde WWTP, combined sewer overflows from Clyde, septic inputs, and nonpoint sources.

Study Area

Biological and grab chemical samples were collected from seven stream locations between River Mile (RM) 13.2 and 3.1 upstream and downstream from the Village of Clyde in 1986. In addition grab chemical samples were collected from Whirlpool-Clyde OOI and Clyde WWTP OOI outfalls. Sediment samples were collected from three locations (RM 13.2, 10.2, and 3.1). Stream sampling locations were positioned to provide a longitudinal profile of the biological and chemical results so that the magnitude (distance downstream) and severity (degree of degradation) of any observed impacts could be evaluated. A detailed description of the Raccoon Creek study area is contained in Ohio EPA (1984a). Further details about sampling locations, methods, and results are contained in the attached tables and figures.

Results and Discussion

Detailed results of the grab chemical, sediment, effluent, macroinvertebrate, and fish components of the survey are contained in the attachments. A severe biological and chemical impact was observed immediately downstream from the Whirlpool facility. These results indicate little overall change from that observed in 1983 (Ohio EPA 1984a). Highlights of the findings are:

Chemical, Sediment, and Effluent Sampling

- High levels of nitrogenous compounds were observed downstream from Whirlpool and the Clyde WWTP. Nitrite-N was very high in the Whirlpool effluent and remained above 0.5 mg/l in Raccoon Creek downstream to RM 6.5. The Clyde WWTP was the principal source of ammonia-N.
- Dissolved oxygen levels were very low (minimums less than 2-3 mg/l) from immediately downstream from Whirlpool to RM 10.2 (first site downstream Clyde WWTP). Steady recovery was observed from this point to RM 3.2 where all values exceeded 4 mg/l.
- Metals results showed elevated levels of nickel and copper downstream from the Whirlpool discharge. The elevated copper level (130 ug/l) at RM 13.2 (upstream from Whirlpool and the Clyde WWTP) on July 23 is unexplained.
- Lead and zinc were found in highly elevated concentrations in sediments at RM 10.2 the closest of two sites downstream from the point sources. All other parameters were in non-elevated concentrations at this and two other sites.

Physical Stream Habitat

- Raccoon Creek offers a small stream habitat with good pool-riffle development between RM 13.2 and RM 3.7. Few areas of recent channel modification were evident. However, a portion of the stream channel is completely covered by the Whirlpool facility in Clyde and the RM 11.7 location is extensively rip-rapped.
- The lower 3-4 miles of Raccoon Creek are affected by the level of Sandusky Bay and Lake Erie which results in a flooded river mouth habitat.
- QHEI (Qualitative Habitat Evaluation Index) scores ranged from 52 at RM 8.6 to 72 at RM 13.2 which indicates fair to good habitat conditions for aquatic life.

Macroinvertebrates

- Results showed essentially no change downstream from the Whirlpool facility between 1983 and 1986. Severe degradation was observed during both years.
- Between 1983 and 1986 some marginal improvement was noted downstream from RM 10.1. This was attributed to better water quality conditions in Buck Creek (RM 10.1) in 1986, not to improved conditions at the two point sources. Indications of less significant water quality problems in Buck Creek still remain compared to 1983.
- The effect of intermittent flow conditions were evident in the results at RM 13.2, but water quality appeared adequate for sustaining invertebrates along the water line margin.
- Recovery was not complete at the farthest downstream location.

Fish

- A larger difference between the conventional composite index and modified composite index¹ values was observed at the two upstream sites in 1986 as compared to 1983. This was attributed to the lower relative numbers of tolerant fish species captured in 1986. The lower flow conditions in 1986 compared to 1983 were apparently responsible for these results.
- A severe toxic impact was indicated by the 1986 results, much the same as in 1983, immediately downstream from the Whirlpool facility. Both modified and conventional composite index values increased steadily downstream to RM 3.7.
- Minor influences from intermittent stream flow and combined sewer overflow inputs were noted at RM 13.2 and 11.6.

¹ The modified composite index removes any of 13 highly tolerant fish species from the numbers and biomass components of the composite index.

Biological and Water Quality Survey of
Raccoon Creek (Sandusky County)

Ohio EPA, Division of Water Quality Monitoring & Assessment
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Introduction

Environmental monitoring is an important step in the management and protection of natural resources. Ideally, monitoring is the activity that directs the progression of events from problem identification and assessment, through management decisions on pollution abatement programs, to the enforcement of environmental regulations. This Biological and Water Quality Report represents some of the initial steps in this progression, and as such is one of the technical bases for management decisions within the study area. At the Ohio EPA, the application of monitoring data is primarily related to the management of the pollution abatement programs funded under the Clean Water Act. However, the data contained herein should be applicable to numerous other surface water and natural resource issues. This is made possible by collecting data according to standardized quality assurance procedures and by recording all pertinent information in this document.

General objectives of all biological and water quality evaluations are:

- 1) to determine and measure if adverse impacts on biological condition and water quality occur due to point source discharges or nonpoint sources of pollution;
- 2) to gather data for the evaluation of water quality standard stream use designations (predominantly aquatic life uses), and;
- 3) to define the extent of any impairment of aquatic life or other uses of the surface waters monitored in the study area.

The Raccoon Creek study area extended from upstream from Clyde (RM 13.2) downstream to where the influence of the level of Lake Erie is first evident (RM 3.1).

Specific objectives of this evaluation were to:

- 1) evaluate the impact from the Whirlpool Corp.- Clyde facility following changes made to the process wastewater discharge;
- 2) evaluate the instream effect of any toxicity observed in effluent bioassay tests conducted on the Whirlpool effluent; and,
- 3) compare the results to those observed in 1983.

The findings of this evaluation may factor into regulatory actions taken by Ohio EPA (e.g. NPDES permits) and eventually be incorporated into the State water quality management plans and biennial 305(b) report.

- Recovery from the point source dominated impacts was not complete at RM 3.7.
- Habitat did not play a major role in the observed fish community response downstream from the point sources. This contention is supported by the lack of a positive correlation between the fish results and the Qualitative Habitat Evaluation Index (QHEI).

Other

- Both the fish and macroinvertebrate communities were typical of small, headwater streams in the upper part of the study area (RM 13.2 and 11.6) and were influenced more by intermittent stream flows and limited habitat than water quality. The potential for a more diverse biota increased downstream with increasing stream size.

The Warmwater Habitat use is impaired for a minimum distance of eight miles between RM 11.2 and 3.2. The predominant negative influence in the study area is the Whirlpool Corp.- Clyde facility discharge. No negative effect from the Clyde WWTP was apparent in the biological results. This is due to the pervasiveness of the toxic impact from Whirlpool, not the lack of potential for negative impact from the Clyde WWTP. The key to full attainment of the WWH use is reducing inputs from Whirlpool and attainment of AT limits at the Clyde WWTP.

Although the instream biological and bioassay results both show the effects of significant toxicity the current and future effect of low D.O. should also be considered. Thus any efforts to reduce toxicity should also be accompanied by an effort to reduce loadings of oxygen demanding wastes. This should be accomplished if the wasteload allocation recommendations of the unpublished 1984 CWQR are followed.

Recommendations

The Whirlpool-Clyde facility must reduce inputs of toxic materials into Raccoon Creek. This includes limiting nitrogenous compounds (particularly nitrite-N) and metals (nickel and copper). This may involve developing an effluent limit for nitrite-N which will prompt the need to calculate a water quality criterion value for this parameter. Toxic units limits may also be necessary. Consideration should also be given to the limits recommended for BOD₅ (and other related parameters) in the unpublished 1984 CWQR.

The Clyde WWTP is currently upgrading to advanced treatment levels thus no further requirements are necessary at this time. Impacts from other sources were either minor or not detected, thus requiring no further recommendations.

RECOMMENDATIONS FOR FUTURE MONITORING

As a result of this survey the following recommendations are made for future water quality and biological monitoring in the Raccoon Creek study area.

1. Follow-up biological field work will be necessary after major improvements are made at the Whirlpool and/or Clyde WWTP in order to assess progress toward attainment of the WWH use. This is important given the complexity and magnitude of the problem. Because of these complexities some "trial and error" may have to be accepted in solving the toxicity problem.

REFERENCES

- Kelly, M.H. and R.L. Hite. 1984. Evaluation of Illinois stream sediment data: 1974-1980. Illinois Environmental Protection Agency, Div. of Water Pollution Control. Springfield, Il. 105p.
- Ohio Environmental Protection Agency. 1984a. Raccoon Creek Comprehensive Water Quality Report - Raccoon Creek Subbasin Sandusky County, Ohio. State of Ohio Environmental Protection Agency, Columbus, Ohio.
- Ohio Environmental Protection Agency. 1984b. Ohio EPA manual of surveillance methods and quality assurance practices, updated edition. Division of Water Quality Monitoring and Assessment, Evaluation and Standards Section, Columbus, Ohio.

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Ohio EPA Fish Evaluation Group Site Description Sheets.

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SURVEY NAME: RACCOON CREEK

BIOLOGICAL AND WATER QUALITY SAMPLING LOCATIONS
GENERAL STUDY AREA INFORMATION

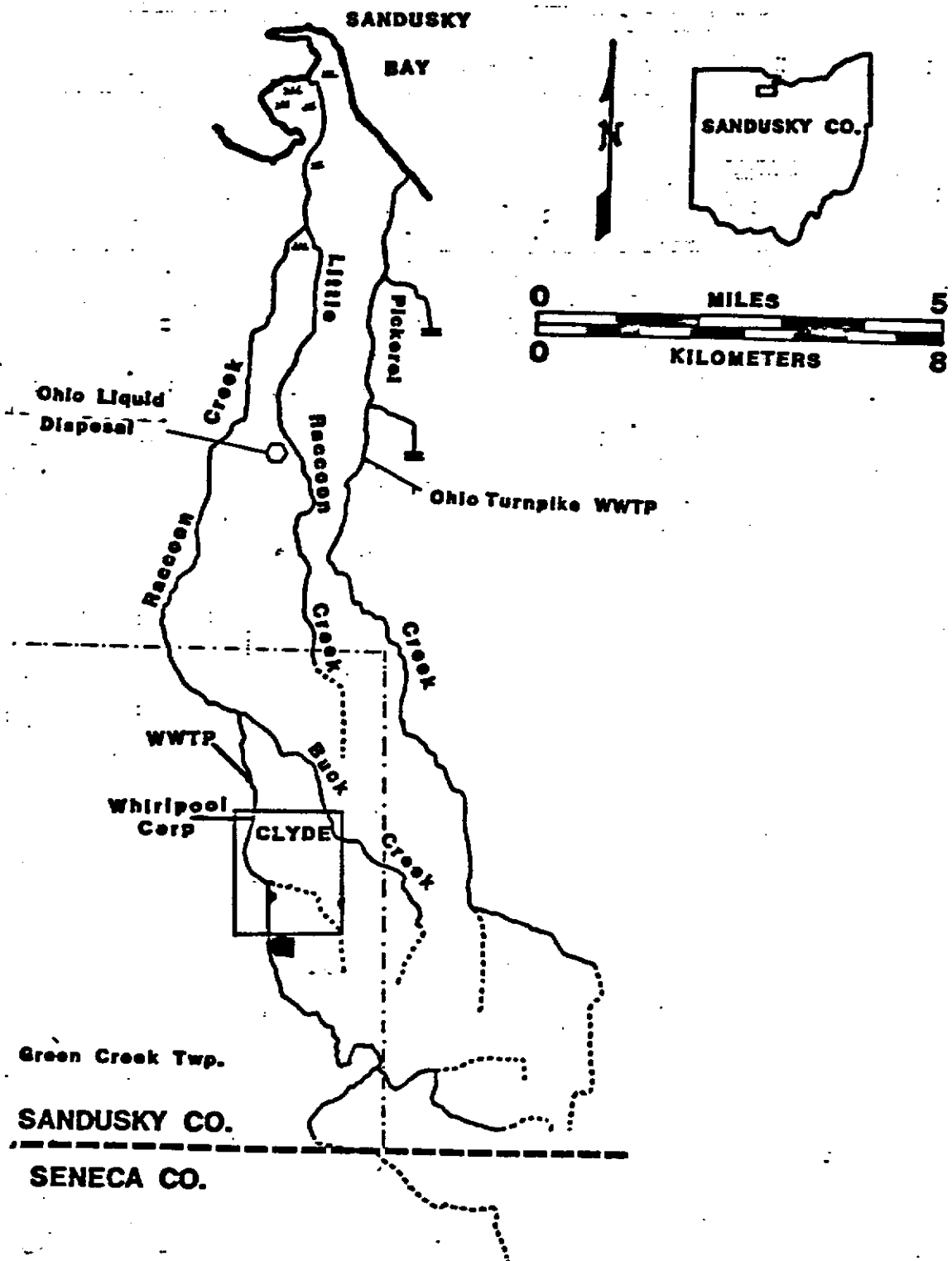


Figure G-1. The Raccoon Creek study area showing principal streams and tributaries, population centers, and pollution sources.

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Table G-1. Sampling locations (effluent sample - E, water chemistry - C sediment chemistry - S, benthos - B, fish - F) in the Raccoon Creek study area, 1986.

Stream River Mile	Type of Sampling	County	Township	Latitude/Longitude	Landmark	USGS 7.5 min. Quad. Map
13.2	C,F,S	Sandusky	Green Cr.	41°27'21"/82°58'54"	Dst. Limerick Rd.	Clyde
13.0	B	Sandusky	Green Cr.	41°17'30"/82°58'53"	Dst. Limerick Rd.	Clyde
11.7	C,B,F	Sandusky	Green Cr.	41°18'27"/82°58'10"	Spring Str.	Clyde
11.6	E	Sandusky	Green Cr.		Whirlpool 001	Clyde
11.3	B	Sandusky	Green Cr.	41°18'46"/82°59'07"	U.S. Rt. 20	Clyde
11.2	F	Sandusky	Green Cr.	41°18'50"/82°59'14"	Dst. Whirlpool	Clyde
11.1	C	Sandusky	Green Cr.		Ust. Clyde WWTP	Clyde
11.0	E	Sandusky	Green Cr.		Clyde WWTP 001	Clyde
10.3	F	Sandusky	Green Cr.	41°19'39"/82°59'14"	Ust. Twp. Rt. 223	Clyde
10.2	C,B,S	Sandusky	Green Cr.	41°19'43"/82°59'16"	At Twp. Rt. 223	Clyde
8.7	C,B	Sandusky	Green Cr.	41°19'30"/83°00'19"	Ust. Twp. Rt. 229	Clyde
8.6	F	Sandusky	Green Cr.	41°20'33"/83°00'19"	Ust. Twp. Rt. 229	Fremont East
6.5	C,B,F	Sandusky	Riley	41°21'56"/83°59'52"	Ust. St. Rt. 412	Clyde
3.7	C,B,F,S	Sandusky	Riley	41°23'59"/83°59'01"	Ust. U.S. Rt. 6	Vichery

Table G-2. Rainfall recorded at the Clyde WWTP on dates of chemical water quality sampling and over the previous five days from the sample date.

Sample Date	Rainfall on Sample Date	Rainfall on Previous Day	Rainfall Over 5 Previous Days
July 21	0	0	0
July 23	0	0	0
July 24	0	0	0
July 25	0.85	0	0
August 12	0	0	0.74
September 3	0	0	0

Table G-2. Stream flow (cfs) and precipitation (inches) recorded in the Raccoon Creek study area during 1986.

Sample Date	Stream Flow Raccoon Creek			Rainfall on Sample Date	Rainfall on Previous Day	Rainfall Over 5 Previous Days
	RM 13.2	11.7	11.1			
July 21	0.46	-	-	0	0	0
July 23	0.18	0.63	1.44	0	0	0
July 25	0.14	-	-	0.85	0	0
August 12	0.03	0.23	0.98	0	0	0.74
September 3	0	0.04	0.83	0	0	0

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SURVEY NAME: RACCOON CREEK

CHEMICAL/PHYSICAL DATA
(IN SUPPORT OF BIOLOGICAL MONITORING)

Chemical/Physical Water Quality Sampling Methods

Chemical water quality samples and measurements were taken three times at seven localities in the Raccoon Creek study area during the period July-September, 1986. Effluent from Whirlpool-Clyde and the Clyde WWTP was also collected. Sediment samples were taken at three sites on November 3, 1986. Conductivity, dissolved oxygen, and temperature were measured in the field with YSI Model 33 and 57 meters. A Corning 620 meter was used to determine instantaneous pH in the field. Grab samples for chemical constituents were preserved and analyzed according to the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio EPA 1984b). Analyses were performed by the Ohio EPA Water Quality Laboratory in Columbus. Parameters monitored are listed in Table 1.

Table C-1. Chemical/physical parameters measured in the Raccoon Creek study area, 1986.

Temperature	Aluminum, Total Recoverable (Al-TR)
Dissolved Oxygen (D.O.)	Barium, Total Recoverable (Ba-TR)
pH	Calcium, Total Recoverable (Ca-TR)
Conductivity	Chromium, Total Recoverable (Cr-TR)
Flow	Copper, Total Recoverable (Cu-TR)
Biochemical Oxygen Demand (BOD ₅)	Iron, Total Recoverable (Fe-TR)
Ammonia-Nitrogen (NH ₃ -N)	Lead, Total Recoverable (Pb-TR)
Nitrate-Nitrogen (NO ₃ -N)	Magnesium, Total Recoverable (Mg-TR)
Nitrite-Nitrogen (NO ₂ -N)	Nickel, Total Recoverable (Ni-TR)
Total Kjeldahl Nitrogen (TKN)	Zinc, Total Recoverable (Zn-TR)
Phosphorus, Total (P-T)	Residue, Total Filterable (TDS)
Hardness, Total (CaCO ₃)	Residue, Total Nonfilterable (TSS)
Fecal Coliform (Fecal coli)	Oil and Grease (O&G)

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Table C-2. Third-quarter (July-September) average flows (million gallons/day, MGD) and pollutant loadings (kilograms/day, KGD) from permitted point source discharges in the Raccoon Creek study area during 1981 through 1986.

Source (Permit Number) ^a & Outfall No. Parameter	Year					
	1981	1982	1983	1984	1985	1986
Whirlpool Corp. (2IC000008)						
001 Effluent						
Flow	0.202	0.243	0.249	0.274	0.295	0.332
Biochemical Oxygen Demand (5-day)	24.3	58.7	48.7	57.2	45.9	56.2
Total Suspended Solids	13.3	18.2	12.0	19.1	17.5	14.2
Oil and Grease	2.2	4.2	4.5	9.9	5.1	4.3
Iron-Total	0.194	0.275	0.194	0.185	0.292	0.358
Nickel-Total	0.457	0.344	0.597	0.496	0.568	0.508
Zinc-Total	-	0.077	0.197	0.046	0.198	0.051
Chemical Oxygen Demand	-	179.6	248.3	250.8	200.2	273.0
Phosphorus-Total	-	0.949	0.971	0.620	3.248	4.496
Chromium-Total	-	0.016	0.033	0.028	0.109	0.084
002 Noncontact cooling water						
Flow	0.032	0.024	0.023	0.029	0.007	0.021
003 Wash machine test water						
Flow	0.013	0.012	0.023	0.012	0.009	0.042
Clyde WWTP (2PD000004)						
001 Final Effluent						
Flow	1.358	0.907	0.706	0.621	0.765	1.141
Biochemical Oxygen Demand (5-day)	78.1	76.2	54.8	61.0	67.7	70.5
Chemical Oxygen Demand	551.3	450.4	286.2	480.1	594.2	526.2
Total Suspended Solids	34.7	48.7	23.6	19.7	31.6	58.2
Oil and Grease	13.5	7.0	4.7	4.0	2.7	8.1
Ammonia-N	65.4	50.7	35.8	53.3	44.3	37.8
Nitrite-N	1.47	0.89	0.75	0.65	3.66	0.74
Nitrate-N	26.2	15.3	9.2	6.6	6.8	14.9
Phosphorus-T	27.5	20.4	11.7	15.2	19.4	24.7
Cadmium-T	0.019	0.032	0.016	0.009	0.009	0.017
Chromium-T	0.051	0.033	0.074	0.023	0.029	0.042
Copper-T	0.060	0.065	0.030	0.056	0.060	0.134
Lead-T	0.157	0.151	0.076	0.053	0.076	0.092
Nickel-T	0.086	0.033	0.031	0.026	0.029	0.055
Zinc-T	0.168	0.097	0.064	0.069	0.100	0.193
Chlorine-TR	0.563	0.597	0.503	0.630	0.680	0.693
Mercury-T	0.001	0.001	0.001	0.002	0.001	0.001
Carbonaceous BOD ₅	-	-	-	52.2	58.0	58.7

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Table C-2. Continued.

Source (Permit Number) ^a & Outfall No. Parameter	Year					
	1981	1982	1983	1984	1985	1986
Clyde WWTP (2PD000004)						
010 Settled Bypass Flow	-	-	-	-	-	-
011 Raw Bypass Flow	-	-	-	0.058	0.134	0.017
012 Raw Weir Overflow Flow	-	-	-	0.015	-	-
602 Effluent Overflow Flow	-	-	0.047	-	-	-
603 Mechanical Value Effluent Flow	-	-	-	-	-	-

Table C-3. Violations of Ohio EPA Warmwater Habitat water quality standards (OAC 3745-1-07) for chemical/physical parameters measured in the Raccoon Creek study area, 1986.

Stream Name	River Mile	Violation: Parameter (value)*
Limerick Road	13.2	D.O. (2.3); Cu (130*)
Spring Street	11.7	Fe (1330)
Ust. WWTP	11.1	D.O. (2.1, 2.2); NH3-N (1.7, 2.9); Cu (60*); Ni(430)
Twp. Rt. 223	10.2	D.O. (2.7, 3.0, 3.5); NH3-N (3.7, 4.8, 5.9); Ni(270)
Twp. Rt. 229	8.7	D.O. (3.5, 3.6); NH3-N (2.3, 5.1); Cu (20)

* indicates violation of numerical WQS for prevention of acute toxicity.

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Table C-4. Results of chemical/physical data collected from the Raccoon Creek study area, 1986. The R column denotes samples stored with remark codes. The K remark denotes values which are below laboratory detection limits. The T remark denotes the total summary of values stored with and without remark codes.

STORET STATION NUMBER U05W19										
LATITUDE/LONGITUDE 41 24 27/82 58 55										
RACCOON CREEK NW OF VICKERY - S.R. 6										
RIVER MILE 3.08										
PARAMETER			R	NO	MEAN	STAN DEV	MAXIMUM	MINIMUM	BEG	END
WATER	TEMP	CENT		3	18.03300	2.484700	20.9	16.5	86/07	86/09
CNDUCTVY	AT 25C	MICROMHO		3	1540.000	291.0300	1870	1320	86/07	86/09
DO	PROBE	MG/L		3	6.000000	.7550600	6.8	5.3	86/07	86/09
COD	LOWLEVEL	MG/L		2	32.00000	5.656900	36.0	28.0	86/08	86/09
PH		SU		3	7.100000	.4001700	7.50	6.70	86/07	86/09
RESIDUE	TOT NFLT	MG/L		3	13.66700	8.082900	23	9	86/07	86/09
OIL-GRSE	FREON-GR	MG/L		1	2.790000		2.79	2.79	86/07	86/07
NH3+NH4-	N TOTAL	MG/L		3	.1166700	.0305510	.150	.090	86/07	86/09
NO2-N	TOTAL	MG/L		3	.1233300	.0873690	.220	.050	86/07	86/09
TOT KJEL	N	MG/L		3	.9666700	.3055100	1.300	.700	86/07	86/09
NO2&NO3	N-TOTAL	MG/L		3	1.676700	.3962800	2.09	1.30	86/07	86/09
PHOS-TOT		MG/L P		3	.9966700	.5666000	1.650	.640	86/07	86/09
TOT HARD	CACO3	MG/L		3	763.0000	168.8800	958	664	86/07	86/09
CALCIUM	CA-TOT	MG/L		3	242.3300	54.50100	305.0	206.0	86/07	86/09
MGNSIUM	MG,TOT	MG/L		3	38.30000	8.576800	47.7	30.9	86/07	86/09
BARIUM	BA,TOT	UG/L	K	3	200.0000	.0000000	200	200	86/07	86/09
CHROMIUM	CR,TOT	UG/L	K	3	30.00000	.0000000	30	30	86/07	86/09
COPPER	CU,TOT	UG/L		2	22.50000	10.60700	30	15	86/07	86/09
			K	1	10.00000		10	10	86/08	86/08
			T	3	18.33300	10.40800	30	10	86/07	86/09
IRON	FE,TOT	UG/L		3	713.3300	291.6100	1050	540	86/07	86/09
LEAD	PB,TOT	UG/L	K	3	2.000000	.0000000	2	2	86/07	86/09
NICKEL	NI,TOTAL	UG/L	K	3	40.00000	.0000000	40	40	86/07	86/09
ZINC	ZN,TOT	UG/L		2	17.50000	3.535500	20	15	86/07	86/09
			K	1	10.00000		10	10	86/08	86/08
			T	3	15.00000	5.000000	20	10	86/07	86/09
ALUMINUM	AL,TOT	UG/L		3	620.0000	140.0000	780	520	86/07	86/09
RESIDUE	DISS-180 C	MG/L		3	1240.000	240.2100	1510	1050	86/07	86/09

Table C-4 (Continued).

STORET STATION NUMBER U05W16									
LATITUDE/LONGITUDE 41 22 00/82 59 22									
RACCOON CREEK NORTH OF CLYDE - S.R. 412									
RIVER MILE 6.53									
PARAMETER			R	NO	MEAN	STAN DEV	MAXIMUM	MINIMUM	BEG END
WATER TEMP	CENT			3	17.13300	2.138700	19.6	15.8	86/07 86/09
CNDUCTVY AT 25C	MICROMHO			3	1556.700	98.16800	1670	1500	86/07 86/09
DO PROBE	MG/L			3	4.600000	.5291400	5.2	4.2	86/07 86/09
PH	SU			3	6.933300	.2312000	7.20	6.80	86/07 86/09
NH3+NH4- N TOTAL	MG/L			3	.9800000	1.158800	2.300	.130	86/07 86/09
NO2-N TOTAL	MG/L			3	.4533300	.2122100	.690	.280	86/07 86/09
TOT KJEL N	MG/L			3	2.100000	1.253000	3.400	.900	86/07 86/09
NO2&NO3 N-TOTAL	MG/L			3	2.076700	.1266300	2.22	1.98	86/07 86/09
TOT HARD CACO3	MG/L			3	1224.000	718.2900	2050	746	86/07 86/09
CALCIUM CA-TOT	MG/L			3	250.0000	29.13800	282.0	225.0	86/07 86/09
MGNSIUM MG,TOT	MG/L			3	37.20000	4.092700	41.7	33.7	86/07 86/09
COPPER CU,TOT	UG/L			1	20.00000		20	20	86/07 86/07
			K	2	10.00000	.0000000	10	10	86/08 86/09
			T	3	13.33300	5.773500	20	10	86/07 86/09
NICKEL NI,TOTAL	UG/L		K	3	40.00000	.0000000	40	40	86/07 86/09
ZINC ZN,TOT	UG/L			2	15.00000	.0000000	15	15	86/07 86/09
			K	1	10.00000		10	10	86/08 86/08
			T	3	13.33300	2.886800	15	10	86/07 86/09

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Table C-4 (Continued).

STORET STATION NUMBER U05W13										
LATITUDE/LONGITUDE 41 20 33/83 00 18										
RACCOON CREEK E OF FREMONT - CO. RD. 229										
RIVER MILE 8.66										
PARAMETER			R	NO	MEAN	STAN DEV	MAXIMUM	MINIMUM	BEG	END
WATER TEMP	CENT			3	19.46700	1.975700	21.6	17.7	86/07	86/09
CNDUCTVY	AT 25C	MICROMHO		3	1046.300	179.8400	1160	839	86/07	86/09
DO	PROBE	MG/L		3	3.766700	.3785800	4.2	3.5	86/07	86/09
BOD	5 DAY	MG/L		1	12.00000		12.0	12.0	86/07	86/07
BOD	20 DAY	MG/L		1	53.00000		53.0	53.0	86/07	86/07
COD	LOWLEVEL	MG/L		3	53.33300	11.24000	63.0	41.0	86/07	86/09
PH		SU		3	7.200000	.4583100	7.70	6.80	86/07	86/09
RESIDUE	TOT NFLT	MG/L		2	7.500000	3.535500	10	5	86/07	86/09
			K	1	5.000000		5	5	86/08	86/08
			T	3	6.666700	2.886800	10	5	86/07	86/09
OIL-GRSE	FREON-GR	MG/L		1	1.710000		1.71	1.71	86/07	86/07
NH3+NH4-	N TOTAL	MG/L		3	3.703300	1.410600	5.090	2.270	86/07	86/09
NO2-N	TOTAL	MG/L		3	.9533300	.2967100	1.230	.640	86/07	86/09
TOT KJEL	N	MG/L		3	5.800000	1.997500	7.500	3.600	86/07	86/09
NO2&NO3	N-TOTAL	MG/L		3	2.360000	.6269800	2.87	1.66	86/07	86/09
PHOS-TOT		MG/L P		3	2.416700	1.895000	4.600	1.200	86/07	86/09
TOT HARD	CACD3	MG/L		3	307.0000	61.61200	377	261	86/07	86/09
CALCIUM	CA-TOT	MG/L		3	86.36700	20.46800	110.0	74.4	86/07	86/09
MGNSIUM	MG,TOT	MG/L		3	22.20000	3.500000	24.7	18.2	86/07	86/09
BARIUM	BA,TOT	UG/L	K	3	200.0000	.0000000	200	200	86/07	86/09
CHROMIUM	CR,TOT	UG/L	K	3	30.00000	.0000000	30	30	86/07	86/09
COPPER	CU,TOT	UG/L		1	20.00000		20	20	86/07	86/07
			K	2	10.00000	.0000000	10	10	86/08	86/09
			T	3	13.33300	5.773500	20	10	86/07	86/09
IRON	FE,TOT	UG/L		3	266.6700	40.41600	290	220	86/07	86/09
LEAD	PB,TOT	UG/L	K	3	2.000000	.0000000	2	2	86/07	86/09
NICKEL	NI,TOTAL	UG/L		2	135.0000	134.3500	230	40	86/08	86/09
			K	1	40.00000		40	40	86/07	86/07
			T	3	103.3300	109.7000	230	40	86/07	86/09
ZINC	ZN,TOT	UG/L		1	15.00000		15	15	86/07	86/07
			K	2	10.00000	.0000000	10	10	86/08	86/09
			T	3	11.66700	2.886800	15	10	86/07	86/09
ALUMINUM	AL,TOT	UG/L	K	3	500.0000	.0000000	500	500	86/07	86/09
FEC COLI	MFM-FCBR	/100ML		1	280.0000		280	280	86/07	86/07
RESIDUE	DISS-180 C	MG/L		3	715.3300	111.2600	822	600	86/07	86/09
BOD 20C	5DAY CAR	MG/L		1	8.400000		8.4	8.4	86/07	86/07
BOD 20C	20DAYCAR	MG/L		1	26.00000		26.0	26.0	86/07	86/07

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Table C-4 (Continued).

STORET STATION NUMBER U05W10									
LATITUDE/LONGITUDE 41 19 42/82 59 15									
RACCOON CREEK NORTH OF CLYDE - TWP. RD. 223									
RIVER MILE 10.18									
PARAMETER			R	NO	MEAN	STAN DEV	MAXIMUM	MINIMUM	BEG END
WATER TEMP	CENT			3	20.86700	1.680500	22.7	19.4	86/07 86/09
CNDUCTVY AT 25C	MICROMHO			3	1123.300	202.0800	1340	940	86/07 86/09
DO PROBE	MG/L			3	3.066700	.4041500	3.5	2.7	86/07 86/09
BOD 5 DAY	MG/L			1	9.900000		9.9	9.9	86/07 86/07
BOD 20 DAY	MG/L			1	59.00000		59.0	59.0	86/07 86/07
COD LOWLEVEL	MG/L			3	65.66700	12.09700	75.0	52.0	86/07 86/09
PH	SU			3	7.250000	.5269400	7.80	6.75	86/07 86/09
RESIDUE TOT NFLT	MG/L			1	5.000000		5	5	86/07 86/07
			K	2	5.000000	.0000000	5	5	86/08 86/09
			T	3	5.000000	.0000000	5	5	86/07 86/09
OIL-GRSE FREON-GR	MG/L			1	1.490000		1.49	1.49	86/07 86/07
NH3+NH4- N TOTAL	MG/L			3	4.750000	1.100000	5.850	3.650	86/07 86/09
NO2-N TOTAL	MG/L			3	1.103300	.8578100	2.020	.320	86/07 86/09
TOT KJEL N	MG/L			3	7.166700	1.665400	8.500	5.300	86/07 86/09
NO2&NO3 N-TOTAL	MG/L			3	2.203300	1.840500	4.02	.34	86/07 86/09
PHOS-TOT	MG/L P			3	2.226700	1.106400	3.500	1.500	86/07 86/09
TOT HARD CACO3	MG/L			3	280.6700	35.53200	321	254	86/07 86/09
CALCIUM CA-TOT	MG/L			3	75.90000	15.65000	93.1	62.5	86/07 86/09
MGNSIUM MG,TOT	MG/L			3	22.16700	1.343000	23.7	21.2	86/07 86/09
BARIUM BA,TOT	UG/L		K	3	200.0000	.0000000	200	200	86/07 86/09
CHROMIUM CR,TOT	UG/L		K	3	30.00000	.0000000	30	30	86/07 86/09
COPPER CU,TOT	UG/L			1	10.00000		10	10	86/08 86/08
			K	2	10.00000	.0000000	10	10	86/07 86/09
			T	3	10.00000	.0000000	10	10	86/07 86/09
IRON FE,TOT	UG/L			3	246.6700	46.18900	300	220	86/07 86/09
LEAD PB,TOT	UG/L		K	3	2.000000	.0000000	2	2	86/07 86/09
NICKEL NI,TOTAL	UG/L			3	120.0000	130.0000	270	40	86/07 86/09
ZINC ZN,TOT	UG/L			1	20.00000		20	20	86/07 86/07
			K	2	10.00000	.0000000	10	10	86/08 86/09
			T	3	13.33300	5.773500	20	10	86/07 86/09
ALUMINUM AL,TOT	UG/L		K	3	500.0000	.0000000	500	500	86/07 86/09
FEC COLI MFM-FCBR	/100ML			1	480.0000		480	480	86/07 86/07
RESIDUE DISS-180 C	MG/L			3	738.6700	119.0400	856	618	86/07 86/09
BOD 20C 5DAY CAR	MG/L			1	9.300000		9.3	9.3	86/07 86/07
BOD 20C 20DAYCAR	MG/L			1	25.00000		25.0	25.0	86/07 86/07

Table C-4 (Continued).

STORET STATION NUMBER U05W07									
LATITUDE/LONGITUDE 41 19 02/82 59 09									
CLYDE WWTP 001 OUTFALL TO RACCOON CREEK									
RIVER MILE 11.00									
PARAMETER			R	NO	MEAN	STAN DEV	MAXIMUM	MINIMUM	BEG END
WATER TEMP	CENT			3	22.86700	1.582400	24.6	21.5	86/07 86/09
CNDUCTVY AT 25C	MICROMHO			4	913.0000	83.07000	989	823	86/07 86/09
DO PROBE	MG/L			3	6.766700	.4042400	7.2	6.4	86/07 86/09
BOD 5 DAY	MG/L			2	19.00000	4.242600	22.0	16.0	86/07 86/07
COO LOWLEVEL	MG/L			4	97.75000	18.19100	112.0	72.0	86/07 86/09
PH	SU			3	7.166700	.3788000	7.60	6.90	86/07 86/09
RESIDUE TOT NFLT	MG/L			3	10.00000	6.245000	17	5	86/07 86/09
			K	1	5.000000		5	5	86/08 86/08
			T	4	8.750000	5.678900	17	5	86/07 86/09
OIL-GRSE FREON-GR	MG/L			1	1.770000		1.77	1.77	86/07 86/07
NH3+NH4- N TOTAL	MG/L			4	8.537500	1.834200	9.950	5.850	86/07 86/09
NO2-N TOTAL	MG/L			4	.2250000	.0310910	.260	.190	86/07 86/09
TOT KJEL N	MG/L			4	15.25000	4.500000	19.000	9.000	86/07 86/09
NO2&NO3 N-TOTAL	MG/L			4	3.492500	.8296400	4.25	2.74	86/07 86/09
PHOS-TOT	MG/L P			4	5.565000	4.394500	12.150	3.090	86/07 86/09
TOT HARD CAC03	MG/L			4	229.5000	31.94300	260	199	86/07 86/09
CALCIUM CA-TOT	MG/L			4	64.52500	9.283600	73.6	54.7	86/07 86/09
MGNSIUM MG,TOT	MG/L			4	16.62500	2.260500	18.6	14.2	86/07 86/09
BARIUM BA,TOT	UG/L		K	4	200.0000	.0000000	200	200	86/07 86/09
CHROMIUM CR,TOT	UG/L		K	4	30.00000	.0000000	30	30	86/07 86/09
COPPER CU,TOT	UG/L			1	10.00000		10	10	86/07 86/07
			K	3	10.00000	.0000000	10	10	86/07 86/09
			T	4	10.00000	.0000000	10	10	86/07 86/09
IRON FE,TOT	UG/L			4	315.0000	95.39400	410	210	86/07 86/09
LEAD PB,TOT	UG/L			4	4.750000	1.707800	7	3	86/07 86/09
NICKEL NI,TOTAL	UG/L		K	4	40.00000	.0000000	40	40	86/07 86/09
ZINC ZN,TOT	UG/L			3	30.00000	8.660300	40	25	86/07 86/08
			K	1	10.00000		10	10	86/09 86/09
			T	4	25.00000	12.24800	40	10	86/07 86/09
ALUMINUM AL,TOT	UG/L		K	4	500.0000	.0000000	500	500	86/07 86/09
FEC COLI MFM-FCBR	/100ML			1	25.00000		25	25	86/07 86/07
RESIDUE DISS-180 C	MG/L			3	543.6700	52.59900	598	493	86/07 86/09
BOD 20C 5DAY CAR	MG/L			1	11.00000		11.0	11.0	86/07 86/07
BOD 20C 20DAYCAR	MG/L			1	47.00000		47.0	47.0	86/07 86/07

Table C-4 (Continued).

STORET STATION NUMBER U05W03									
LATITUDE/LONGITUDE 41 18 31/82 59 10									
WHIRLPOOL 001 OUTFALL TO RACCOON CREEK									
RIVER MILE 11.61									
PARAMETER			R	NO	MEAN	STAN DEV	MAXIMUM	MINIMUM	BEG END
WATER	TEMP	CENT		3	32.16700	.2904300	32.5	32.0	86/07 86/09
CNDUCTVY	AT 25C	MICROMHO		4	2355.000	579.4500	3000	1650	86/07 86/09
DO	PROBE	MG/L		3	5.600000	.5001000	6.1	5.1	86/07 86/09
BOD	5 DAY	MG/L		2	73.50000	27.57700	93.0	54.0	86/07 86/07
BOD	20 DAY	MG/L		1	220.0000		220.0	220.0	86/07 86/07
COD	LOWLEVEL	MG/L		4	261.7500	89.48900	380.0	165.0	86/07 86/09
PH		SU		3	9.300000	.1000500	9.40	9.20	86/07 86/09
RESIDUE	TOT NFLT	MG/L		4	9.250000	2.753800	12	6	86/07 86/09
OIL-GRSE	FREON-GR	MG/L		1	8.120000		8.12	8.12	86/07 86/07
NH3+NH4-	N TOTAL	MG/L		4	.9675000	.1668100	1.080	.720	86/07 86/09
NO2-N	TOTAL	MG/L		4	5.625000	1.767100	7.400	3.200	86/07 86/09
TOT KJEL	N	MG/L		4	10.45000	5.327600	18.000	5.600	86/07 86/09
NO2&NO3	N-TOTAL	MG/L		4	9.315000	3.672200	12.20	3.96	86/07 86/09
PHOS-TOT		MG/L P		4	1.275000	.1912300	1.500	1.050	86/07 86/09
TOT HARD	CAC03	MG/L		4	754.5000	364.5400	1130	336	86/07 86/09
CALCIUM	CA-TOT	MG/L		4	206.0800	114.4000	319.0	66.3	86/07 86/09
MGNSIUM	MG,TOT	MG/L		4	58.10000	19.89400	80.3	41.1	86/07 86/09
BARIUM	BA,TOT	UG/L		4	322.5000	45.00000	380	270	86/07 86/09
CHROMIUM	CR,TOT	UG/L	K	4	30.00000	.0000000	30	30	86/07 86/09
COPPER	CU,TOT	UG/L		4	51.25000	23.93600	85	30	86/07 86/09
IRON	FE,TOT	UG/L		4	617.5000	355.1900	1040	210	86/07 86/09
LEAD	PB,TOT	UG/L	K	2	2.000000	.0000000	2	2	86/08 86/09
NICKEL	NI,TOTAL	UG/L		4	317.5000	73.20100	380	240	86/07 86/09
ZINC	ZN,TOT	UG/L		3	51.66700	59.23100	120	15	86/07 86/08
			K	1	10.00000		10	10	86/09 86/09
			T	4	41.25000	52.65900	120	10	86/07 86/09
ALUMINUM	AL,TOT	UG/L		1	340.0000		340	340	86/08 86/08
			K	2	500.0000	.0000000	500	500	86/07 86/07
			T	3	446.6700	92.37700	500	340	86/07 86/08
FEC COLI	MFM-FCBR	/100ML	K	1	3.000000		3	3	86/07 86/07
RESIDUE	DISS-180 C	MG/L		3	1953.300	673.3800	2410	1180	86/07 86/09
BOD 20C	5DAY CAR	MG/L		1	75.00000		75.0	75.0	86/07 86/07
BOD 20C	20DAYCAR	MG/L		1	165.0000		165.0	165.0	86/07 86/07

Table C-4 (Continued).

STORET STATION NUMBER U05W02										
LATITUDE/LONGITUDE 41 18 26/82 59 09										
RACCOON CREEK AT CLYDE - END OF SPRING ST.										
RIVER MILE 11.70										
PARAMETER			R	NO	MEAN	STAN DEV	MAXIMUM	MINIMUM	BEG	END
WATER TEMP	CENT			3	19.60000	.7549500	20.3	18.8	86/07	86/09
STREAM FLOW	INST-CFS			3	.3000000	.3011700	.6	.04	86/07	86/09
CNDUCTVY AT 25C	MICROMHO			2	886.0000	97.58100	955	817	86/07	86/09
DO PROBE	MG/L			3	8.566700	2.173300	10.9	6.6	86/07	86/09
BOD 5 DAY	MG/L			1	1.100000		1.1	1.1	86/07	86/07
BOD 20 DAY	MG/L			1	2.500000		2.5	2.5	86/07	86/07
COD LOWLEVEL	MG/L			1	29.00000		29.0	29.0	86/09	86/09
			K	2	20.00000	.0000000	20.0	20.0	86/07	86/08
			T	3	23.00000	5.196200	29.0	20.0	86/07	86/09
PH	SU			3	7.816700	.2020900	8.00	7.60	86/07	86/09
RESIDUE TOT NFLT	MG/L			1	54.00000		54	54	86/08	86/08
			K	2	5.000000	.0000000	5	5	86/07	86/09
			T	3	21.33300	28.29000	54	5	86/07	86/09
OIL-GRSE FREON-GR	MG/L		K	1	1.000000		1.00	1.00	86/07	86/07
NH3+NH4- N TOTAL	MG/L			1	.0700000		.070	.070	86/09	86/09
			K	2	.0500000	.0000000	.050	.050	86/07	86/08
			T	3	.0566670	.0115470	.070	.050	86/07	86/09
NO2-N TOTAL	MG/L			3	.0500000	.0100000	.060	.040	86/07	86/09
TOT KJEL N	MG/L			3	.6333300	.1527600	.800	.500	86/07	86/09
NO2&NO3 N-TOTAL	MG/L			3	1.786700	1.235800	3.15	.74	86/07	86/09
PHOS-TOT	MG/L P			3	.1400000	.0264580	.160	.110	86/07	86/09
TOT HARD CAC03	MG/L			3	356.0000	33.15100	393	329	86/07	86/09
CALCIUM CA-TOT	MG/L			3	107.0000	9.539400	118.0	101.0	86/07	86/09
MGNSIUM MG,TOT	MG/L			3	21.53300	2.663300	23.8	18.6	86/07	86/09
BARIUM BA,TOT	UG/L		K	3	200.0000	.0000000	200	200	86/07	86/09
CHROMIUM CR,TOT	UG/L		K	3	30.00000	.0000000	30	30	86/07	86/09
COPPER CU,TOT	UG/L		K	3	10.00000	.0000000	10	10	86/07	86/09
IRON FE,TOT	UG/L			3	643.3300	597.6900	1330	240	86/07	86/09
LEAD PB,TOT	UG/L		K	3	2.000000	.0000000	2	2	86/07	86/09
NICKEL NI,TOTAL	UG/L		K	3	40.00000	.0000000	40	40	86/07	86/09
ZINC ZN,TOT	UG/L		K	3	10.00000	.0000000	10	10	86/07	86/09
ALUMINUM AL,TOT	UG/L			1	790.0000		790	790	86/08	86/08
			K	2	500.0000	.0000000	500	500	86/07	86/09
			T	3	596.6700	167.4300	790	500	86/07	86/09
FEC COLI MFM-FCBR	/100ML			1	2000.000		2000	2000	86/07	86/07
RESIDUE DISS-180 C	MG/L			3	601.3300	21.01200	622	580	86/07	86/09
BOD 20C 5DAY CAR	MG/L		K	1	1.000000		1.0	1.0	86/07	86/07
BOD 20C 20DAYCAR	MG/L			1	1.800000		1.8	1.8	86/07	86/07

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Table C-4 (Continued).

STORET STATION NUMBER U05S01										
LATITUDE/LONGITUDE 41 17 17/82 58 57										
RACCOON CREEK UPST CLYDE - LIMERICK RD.										
RIVER MILE 13.60										
PARAMETER			R	NO	MEAN	STAN DEV	MAXIMUM	MINIMUM	BEG	END
WATER	TEMP	CENT		3	18.83300	1.893100	21.0	17.5	86/07	86/09
STREAM	FLOW,	INST-CFS		5	.1620000	.1825400	.5	0	86/07	86/09
CNDUCTVY	AT 25C	MICROMHO		3	891.0000	181.6800	1090	734	86/07	86/09
DO	PROBE	MG/L		3	4.266700	2.055100	6.4	2.3	86/07	86/09
PH		SU		3	7.366700	.7572700	7.90	6.50	86/07	86/09
NH3+NH4-	N TOTAL	MG/L		3	.4333300	.1418900	.560	.280	86/07	86/09
NO2-N	TOTAL	MG/L		3	.1200000	.0000000	.120	.120	86/07	86/09
TOT KJEL	N	MG/L		3	1.100000	.2645800	1.300	.800	86/07	86/09
NO2&NO3	N-TOTAL	MG/L		3	1.863300	1.566700	3.67	.88	86/07	86/09
PHOS-TOT		MG/L P		3	.2633300	.1171900	.350	.130	86/07	86/09
TOT HARD	CAC03	MG/L		3	363.3300	47.60700	418	331	86/07	86/09
CALCIUM	CA-TOT	MG/L		3	108.7700	14.45300	125.0	97.3	86/07	86/09
MGNSIUM	MG,TOT	MG/L		3	22.30000	3.122500	25.8	19.8	86/07	86/09
COPPER	CU,TOT	UG/L		1	130.0000		130	130	86/07	86/07
			K	2	10.00000	.0000000	10	10	86/08	86/09
			T	3	50.00000	69.28200	130	10	86/07	86/09
IRON	FE,TOT	UG/L		3	426.6700	124.2300	570	350	86/07	86/09
NICKEL	NI,TOTAL	UG/L	K	3	40.00000	.0000000	40	40	86/07	86/09
ZINC	ZN,TOT	UG/L		2	22.50000	3.535500	25	20	86/07	86/09
			K	1	10.00000		10	10	86/08	86/08
			T	3	18.33300	7.637700	25	10	86/07	86/09
ALUMINUM	AL,TOT	UG/L	K	3	500.0000	.0000000	500	500	86/07	86/09

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Table C-4 (Continued).

STORET STATION NUMBER U05W06									
LATITUDE/LONGITUDE 41 19 01/82 59 08									
RACCOON CREEK JUST UPST CLYDE WWTP OUTFALL									
RIVER MILE 11.01									
PARAMETER			R	NO	MEAN	STAN DEV	MAXIMUM	MINIMUM	BEG END
WATER TEMP	CENT			3	24.70000	1.374700	25.9	23.2	86/07 86/09
STREAM FLOW	INST-CFS			3	1.083300	.3178600	1	.8	86/07 86/09
CNDUCTVY AT 25C	MICROMHO			3	1303.300	209.8400	1540	1140	86/07 86/09
DO PROBE	MG/L			3	3.100000	1.646200	5.0	2.1	86/07 86/09
BOD 5 DAY	MG/L			1	30.00000		30.0	30.0	86/07 86/07
BOD 20 DAY	MG/L			1	65.00000		65.0	65.0	86/07 86/07
COD LOWLEVEL	MG/L			3	100.6700	43.40900	149.0	65.0	86/07 86/09
PH	SU			3	8.000000	.6084200	8.70	7.60	86/07 86/09
RESIDUE TOT NFLT	MG/L			2	7.500000	2.121300	9	6	86/07 86/09
			K	1	5.000000		5	5	86/08 86/08
			T	3	6.666700	2.081700	9	5	86/07 86/09
OIL-GRSE FREON-GR	MG/L			1	3.090000		3.09	3.09	86/07 86/07
NH3+NH4- N TOTAL	MG/L			3	1.806700	1.077100	2.920	.770	86/07 86/09
NO2-N TOTAL	MG/L			3	2.040000	1.040600	3.100	1.020	86/07 86/09
TOT KJEL N	MG/L			3	5.333300	1.242300	6.100	3.900	86/07 86/09
NO2&NO3 N-TOTAL	MG/L			2	3.805000	1.647600	4.97	2.64	86/07 86/08
PHOS-TOT	MG/L P			3	1.516700	1.533100	3.280	.500	86/07 86/09
TOT HARD CAC03	MG/L			3	373.6700	176.2100	566	220	86/07 86/09
CALCIUM CA-TOT	MG/L			3	100.1000	56.38300	163.0	54.1	86/07 86/09
MGNSIUM MG,TOT	MG/L			3	29.96700	8.979100	38.5	20.6	86/07 86/09
BARIUM BA,TOT	UG/L		K	3	200.0000	.0000000	200	200	86/07 86/09
CHROMIUM CR,TOT	UG/L		K	3	30.00000	.0000000	30	30	86/07 86/09
COPPER CU,TOT	UG/L			1	60.00000		60	60	86/07 86/07
			K	2	10.00000	.0000000	10	10	86/08 86/09
			T	3	26.66700	28.86800	60	10	86/07 86/09
IRON FE,TOT	UG/L			3	320.0000	235.1600	590	160	86/07 86/09
LEAD PB,TOT	UG/L		K	3	2.000000	.0000000	2	2	86/07 86/09
NICKEL NI,TOTAL	UG/L			2	135.0000	35.35500	160	110	86/07 86/08
			K	1	40.00000		40	40	86/09 86/09
			T	3	103.3300	60.27700	160	40	86/07 86/09
ZINC ZN,TOT	UG/L			1	90.00000		90	90	86/07 86/07
			K	2	10.00000	.0000000	10	10	86/08 86/09
			T	3	36.66700	46.18800	90	10	86/07 86/09
ALUMINUM AL,TOT	UG/L		K	3	500.0000	.0000000	500	500	86/07 86/09
FEC COLI MFM-FCBR	/100ML			1	9200.000		9200	9200	86/07 86/07
RESIDUE DISS-180 C	MG/L			3	894.6700	255.7700	1190	746	86/07 86/09
BOD 20C 5DAY CAR	MG/L			1	26.00000		26.0	26.0	86/07 86/07
BOD 20C 20DAYCAR	MG/L			1	49.00000		49.0	49.0	86/07 86/07

Table C-5. Concentrations of heavy metals in sediments of the Raccoon Creek study area, 1986. All parameter concentrations, excluding nickel, were ranked based on a stream sediment classification system described by Kelly and Hite (1984).

Stream Name River Mile	Sediment Concentration (mg/kg dry weight)					
	Cadmium	Chromium	Copper	Lead	Nickel	Zinc
Raccoon Creek						
13.2	0.10 ^a	5 ^a	7 ^a	7 ^a	9	33 ^a
10.2	0.51 ^b	13 ^a	30 ^a	290 ^c	41	373 ^e
3.1	0.43 ^a	8 ^a	8 ^a	17 ^a	19	48 ^a

- a Non-elevated.
- b Slightly elevated.
- c Elevated.
- d Highly elevated.
- e Extremely elevated.

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Table C-6. Diurnal D.O. (mg/l) concentrations measured on July 27, 1986, at 7 sites in Raccoon Creek.

Station	RM	Time	D.O.	°C	Time	D.O.	°C	Time	D.O.	°C
US 6	3.1	0700	4.5	21.5	1250	7.2	23.0	1705	9.4	25.5
SR 412	6.5	0711	3.4	20.2	1300	5.1	21.5	1715	5.5	23.0
TR 229	8.7	0722	3.2	22.2	1315	4.2	24.2	1725	4.2	25.1
TR 223	10.2	0730	1.2	22.2	1320	3.7	26.0	1735	3.7	25.8
UST WWTP	11.1	0740	1.4	24.6	1330	4.7	26.2	1743	2.6	25.8
Spring Street	11.7	0747	5.1	20.8	1340	8.0	23.2	1750	6.2	23.2
Limerick Road	13.2	0755	4.3	21.0	1350	6.7	23.6	1800	6.4	24.4

Table C-7. Fecal coliform counts (number/100 ml) from samples collected at 6 sites in Raccoon Creek on July 24, 1986.

Station	RM	Fecal Coliform/100 ml
Spring Street	11.7	2000
Whirlpool effluent	11.6	<3
Upstream Clyde WWTP	11.1	9200*
Clyde WWTP Effluent	11.0	25
T.R. 223	10.2	480
T.R. 229	8.7	280

* exceeds 2000/100 ml primary contact recreation WQS.

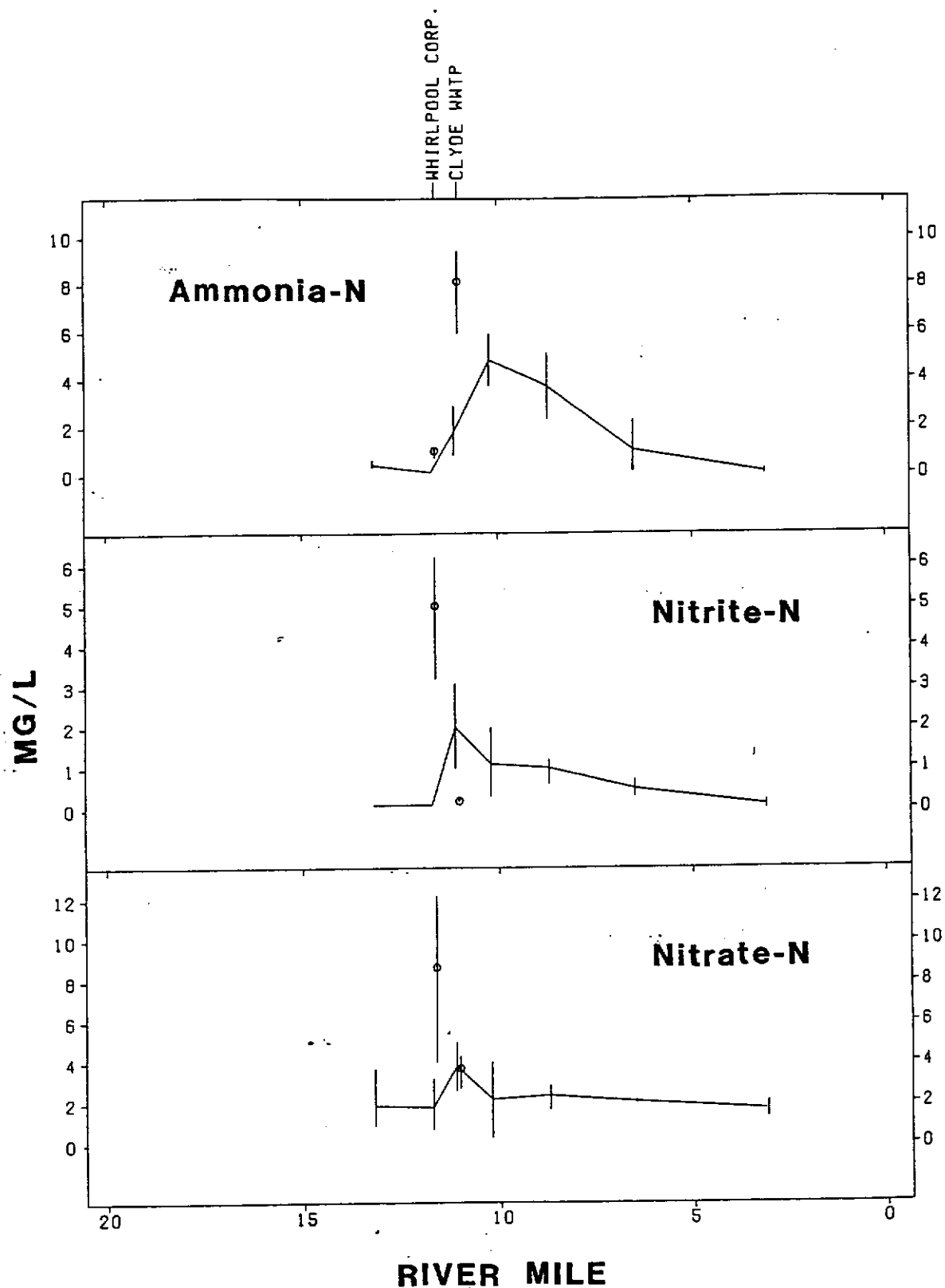


Figure C-1. Longitudinal trend of mean, maximum, and minimum ammonia-nitrogen, nitrate-nitrogen, and nitrite-nitrogen (mg/l) at 9 locations in the Raccoon Creek study area during the period July-September, 1986.

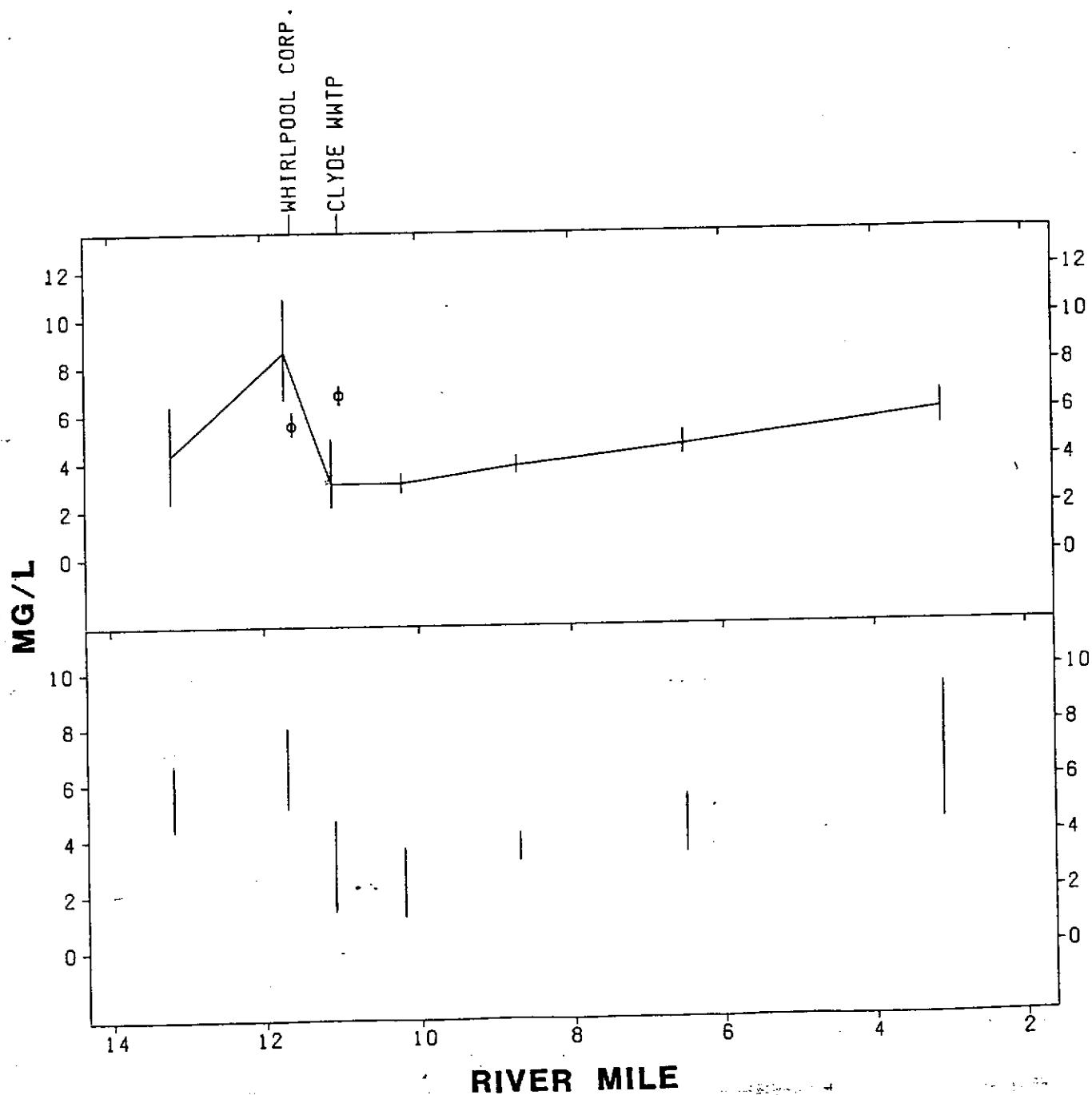


Figure C-2. Mean, maximum, and minimum dissolved oxygen concentrations measured at 7 stream and two effluent locations in Raccoon Creek, July-September, 1986 (top). Results of diurnal D.O. (maximum-minimum range) sampling at seven locations (bottom).

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SURVEY NAME: RACCOON CREEK

MACROINVERTEBRATE DATA

Macroinvertebrate Methods

The tabulated data presented are a result of macroinvertebrate sampling conducted at eight stations on Raccoon creek and Buck Run during the summer of 1986. Quantitative samples were collected at seven Raccoon Creek stations between July 28 and September 10, 1986. One qualitative sample was collected from Buck Run on September 9, 1986. The primary equipment used for the quantitative sampling was a modified Hester-Dendy multiple-plate artificial substrate sampler. Five samplers were colonized for six-week periods at the sites. Whenever possible, the samplers were located in run habitats rather than pool or riffle habitats, and an attempt was made to establish stations in ecologically similar situations. In addition to the quantitative sample, a qualitative sample from the natural substrate was collected at the time of retrieval of the multiple-plates using triangular ring frame dipnets and hand picking with forceps. At the station where only a qualitative sample was taken, the collection was made for a minimum of 30 minutes from all available habitats. The samples were processed, identified, and enumerated at the Ohio EPA Water Quality Laboratory and evaluating criteria were generated from the data. For more detailed descriptions of Ohio EPA macroinvertebrate field and laboratory methodologies, consult the Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices (Ohio EPA 1984b).

Table B-1. Summary of invertebrate data collected from artificial substrate samplers and from natural substrates in Raccoon Creek and Buck Run, July 28 to September 10, 1986.^a

Station River Mile	Evaluation	Invertebrate Community Index	No. Quant. Taxa	No. Qual. Taxa	Density (/ft. ²)
<u>Raccoon Creek</u>					
13.0	Fair (Good to Fair) ^a	10 (16)	20 (20)	40 (25)	111 (57)
11.7	Good (Good to Fair)	26 (18)	33 (28)	37 (21)	140 (274)
11.3	Poor (Poor)	0 (0)	9 (5)	11 (12)	1378 (85)
10.2	Poor (Poor)	0 (4)	15 (13)	18 (22)	1590 (945)
8.7	Fair to Poor (Fair)	16 (0)	23 (11)	37 (14)	661 (261)
6.5	Fair (Poor)	18 (2)	22 (21)	20 (17)	1256 (569)
3.1	Fair (Poor)	24 (6)	28 (19)	30 (14)	274 (196)

Station River Mile	Evaluation	No. Qual. Taxa	Relative Density	Predominant Organisms
<u>Buck Run</u>				
0.2	Fair to Poor (Poor)	23 (5)	Low (Low)	Damselflies, pond snails (None)

^a An Ohio EPA survey was also conducted at the same stations using the same methodology in 1983 (Ohio EPA 1984a). Results from that survey are included in parentheses for purposes of comparison.

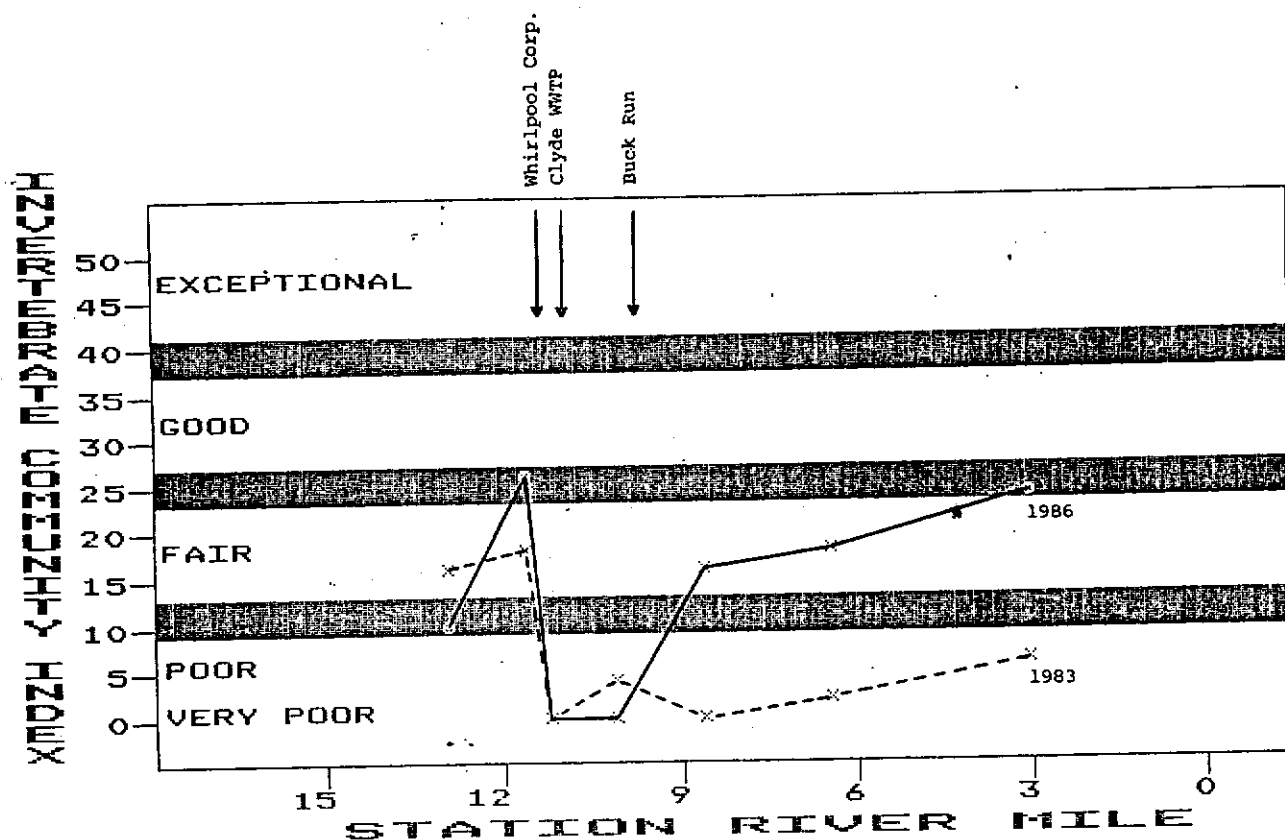


Figure B-1. Longitudinal trend of the Invertebrate Community Index (ICI) in the Raccoon Creek study area, 1986 (solid line) and 1983 (dashed line) based on quantitative results from the artificial substrate samplers.

Table B-2. Organisms collected from artificial substrate samplers from Raccoon Creek, July 28 to September 10, 1986.^a

Taxa	13.0	Station River Mile		
		11.7	11.3	10.2
Coelenterata:				
<u>Hydra</u> sp	7	32		
Platyhelminthes:				
Turbellaria	+	11+		
Bryozoa:				
<u>Plumatella</u> sp	+			
Annelida:				
Oligochaeta	33	67+	6677+	6496+
<u>Erpobdella punctata punctata</u>		+		2
<u>Helobdella stagnalis</u>		+		8
<u>Haemopsis marmorata</u>			+	
Crustacea:				
<u>Asellus</u> sp		2+		
<u>Lirceus</u> sp	+	+		
<u>Cambarus (Puncticambarus) robustus</u>	+			
<u>Orconectes rusticus</u>		+		
<u>Orconectes sanborni sanborni</u>	+			
Arachnoidea:				
Hydracarina	1			
Ephemeroptera:				
<u>Baetis</u> sp		1+		
<u>Callibaetis</u> sp	+			+
<u>Cloeon</u> sp	+	+		
<u>Heptagenia hebe</u>		+		
<u>Stenacron</u> sp	+	25+		
<u>Stenonema tripunctatum</u>	+	28+		
<u>Paraleptophlebia</u> sp		6		
<u>Caenis</u> sp	+			
Odonata:				
<u>Calopteryx</u> sp	+	+		
Coenagrionidae	+	+	+	32+
<u>Argia</u> sp		2+		+
<u>Aeshna</u> sp	+	+	+	
<u>Anax junius</u>			+	+
<u>Boyeria vinosa</u>	+			
<u>Plathemis lydia</u>			+	+
Hemiptera:				
<u>Belostoma</u> sp				+
<u>Nepa apiculata</u>	+			
<u>Sigara</u> sp	+			
<u>Trichocorixa</u> sp	+			
Megaloptera:				
<u>Sialis</u> sp	+			

Table B-2. (Continued)

Taxa	Station River Mile			
	13.0	11.7	11.3	10.2
Trichoptera:				
<u>Hydropsychidae</u>	2			
<u>Cheumatopsyche</u> sp	+	+		
<u>Hydropsyche</u> (<u>Hydropsyche</u>) <u>depravata</u> group		+		
<u>Hydroptila</u> sp		+		
<u>Oecetis</u> sp	+			
Coleoptera:				
<u>Haliphus</u> sp				+
<u>Peltodytes</u> sp				+
<u>Hydroporus</u> sp	+	+		
<u>Laccophilus</u> sp	+		+	+
<u>Helophorus</u> sp				+
<u>Tropisternus</u> sp				+
<u>Psephenus herriki</u>	+			
<u>Helodidae</u>	+			
<u>Stenelmis</u> sp	3+	+		
<u>Dubiraphia</u> sp	5	6	1	
<u>Dubiraphia vittata</u>	+	+		
Diptera:				
<u>Psychoda</u> sp			1	
<u>Telmatoscopus albipunctatus</u>			5+	
<u>Anopheles</u> sp		+		
<u>Culex</u> sp	+		+	
<u>Simulium</u> sp		+		
<u>Ablabesmyia mallochii</u>	+	48+		
<u>Conchaepelopia</u> sp	+	+		20+
<u>Helopelopia</u> sp	+			
<u>Labrundinia pilosella</u>	+	14		
<u>Natarsia</u> sp A				3
<u>Paramerina</u> sp		+		
<u>Procladius</u> sp	9+	5+	2	
<u>Psectrotanypus dyari</u>			4+	61+
<u>Tanypus carinatus</u>				35
<u>Tanypus neopunctipennis</u>			2	
<u>Telopelopia</u> sp				18
<u>Zavrelimyia</u> sp		5		
<u>Corynoneura taris</u>		10+		
<u>Cricotopus bicinctus</u>		+		71+
<u>Nanocladius crassicornus</u>		14		
<u>Nanocladius distinctus</u>		5		
<u>Paraphaenocladius</u> sp		+		
<u>Chironomus decorus</u> group	14	5		56
<u>Chironomus riparius</u> group	142		198+	386+
<u>Cladopelma</u> sp	4			
<u>Cryptochironomus fulvus</u> group		+		

Table B-2. (Continued)

Taxa	13.0	Station River Mile		
		11.7	11.3	10.2
<u>Dicrotendipes neomodestus</u>		33		
<u>Dicrotendipes nervosus</u> Type I	123	19		
<u>Dicrotendipes nervosus</u> Type II	32+	38		
<u>Glyptotendipes</u> sp	68+	5		
<u>Kiefferulus dux</u>	45			18
<u>Paratendipes</u> sp	18	38+		
<u>Phaenopsectra flavipes</u>	4	57		
<u>Polypedilum</u> (<u>Polypedilum</u>) <u>fallax</u> group	+	73		
<u>Polypedilum</u> (<u>Polypedilum</u>) <u>illinoense</u>	+	+		+
<u>Stictochironomus</u> sp	+	14+		
<u>Tribelos</u> sp	14			
<u>Paratanytarsus</u> sp	18	63		
<u>Rheotanytarsus exiguus</u> group		5		
<u>Tanytarsus</u> Type 3		14		
<u>Tanytarsus glabrescens</u> group		38		
Empididae		6		
Anthomyiidae			1	
Mollusca:				
<u>Ferrissia</u> sp	12+	1		
Lymnaeidae				8
<u>Physella</u> sp	1+	9+		736+
<u>Spaerium</u> sp	+	+		
Number of Quantitative Taxa	20	33	9	15
Number of Qualitative Taxa	40	37	11	18
Number of Organisms/Ft. ²	111	140	1378	1590
Invertebrate Community Index	10	26	0	0

^a Qualitative samples were collected from the natural substrates and their presence is indicated in the table by a +.

Table B-2. Organisms collected from artificial substrate samplers and from natural substrates from Raccoon Creek and Buck Run, July 28 to September 10, 1986.^a

Taxa	Station River Mile			Buck Run 0.2
	Raccoon Creek 8.7	6.5	3.1	
Coelenterata:				
<u>Hydra</u> sp			1	
Platyhelminthes:				
Turbellaria	44		+	
Nematomorpha:				
<u>Paragordius</u> sp				+
Annelida:				
Oligochaeta	369+	129+		
<u>Erpobdella punctata punctata</u>	+	+		+
<u>Helobdella stagnalis</u>	+	+		+
<u>Haemopsis marmorata</u>	+	+		+
Crustacea:				
<u>Asellus</u> sp	+	1328+	16+	
<u>Hyalella azteca</u>		+	+	
<u>Orconectes</u> sp			+	
<u>Orconectes immunis</u>	+	+		
Ephemeroptera:				
<u>Baetis</u> sp				+
<u>Callibaetis</u> sp	1+	+	+	+
<u>Stenacron</u> sp	2+		+	
<u>Stenonema tripunctatum</u>	2			
<u>Paraleptophlebia</u> sp		1		
Odonata:				
<u>Calopteryx</u> sp	+	4+	13+	+
Coenagrionidae	12+	5+	+	+
<u>Argia</u> sp	+	+		+
<u>Aeshna</u> sp	+	+		
<u>Boyeria vinosa</u>		1	+	
<u>Somatochlora</u> sp	1			
<u>Plathemis lydia</u>	+			
Hemiptera:				
<u>Sigara</u> sp	+		+	
<u>Trichocorixa</u> sp	+		+	
Megaloptera:				
<u>Sialis</u> sp	+		+	
Trichoptera:				
<u>Cheumatopsyche</u> sp		13	18+	+
<u>Hydropsyche</u> (<u>Hydropsyche</u>) <u>depravata</u> group			+	
Lepidoptera:				
<u>Crambus</u> sp				+

Table B-2. (Continued)

Taxa	Station River Mile			Buck Run 0.2
	Raccoon Creek 8.7	6.5	3.1	

Coleoptera:				
<u>Haliphus</u> sp	+		+	+
<u>Peltodytes</u> sp	+	+	+	
<u>Copelatus</u> sp	+			
<u>Hydroporus</u> sp	+			
<u>Laccophilus</u> sp	+			+
<u>Enochrus</u> sp			+	
<u>Tropisternus</u> sp	+			
<u>Stenelmis</u> sp				+
<u>Dubiraphia quadrinotata</u>			+	
Diptera:				
<u>Anopheles</u> sp				+
<u>Simulium</u> sp	12+	1008+	+	
<u>Ceratopogonidae</u>			4	
<u>Ablabesmyia mallochii</u>	48		70	+
<u>Alotanypus</u> sp	+			
<u>Conchapelopia</u> sp	96+	695+	70+	+
<u>Helopelopia</u> sp		+		
<u>Labrundinia pilosella</u>	48			
<u>Natarsia</u> sp A	+		14	
<u>Nilotanypus</u> sp			14	
<u>Procladius</u> sp	24+		42	
<u>Psectrotanypus dyari</u>	+			
<u>Tanypus neopunctipennis</u>			14	
<u>Thienemannimyia</u> sp	48+	39	14+	
<u>Corynoneura taris</u>	24	77	28	
<u>Cricotopus bicinctus</u>	+		56+	+
<u>Nanocladius crassicornus</u>			14	
<u>Nanocladius rectinervis</u>	48	116		
<u>Rheocricotopus robacki</u>		270	42+	
<u>Thienemanniella</u> prob. xena		270	14	
<u>Chironomus decorus</u> group	24+		28+	
<u>Cryptochironomus fulvus</u> group	+		14+	
<u>Dicrotendipes neomodestus</u>			14	
<u>Dicrotendipes nervosus</u> Type II	311		14	
<u>Phaenopsectra flavipes</u>		39		
<u>Polypedilum</u> (<u>Polypedilum</u>) <u>convictum</u>			+	
<u>Polypedilum</u> (<u>Polypedilum</u>) <u>fallax</u> group	167+	116+	223	
<u>Polypedilum</u> (<u>Polypedilum</u>) <u>illinoense</u>	1268+	270	14+	
<u>Polypedilum</u> (<u>Tripodura</u>) <u>scalaenum</u> group	96			
<u>Stictochironomus</u> sp		+	+	
<u>Paratanytarsus</u> sp	239+	1506+	433	+
<u>Tanytarsus</u> sp			28	
<u>Tanytarsus glabrescens</u> group			154	
<u>Tanytarsus guerlus</u> group		154		
<u>Empididae</u>		90		+

Table B-2. (Continued)

Taxa	Station River Mile			Buck Run 0.2
	Raccoon Creek 8.7	6.5	3.1	
Mollusca:				
<u>Ferrissia</u> sp		2	3+	
<u>Fossaria</u> sp				+
<u>Gyraulus</u> (<u>Torquis</u>) <u>parvus</u>	10+			+
<u>Physella</u> sp	411+	148+	1+	+
Number of Quantitative Taxa	23	22	28	
Number of Qualitative Taxa	37	20	30	23
Number of Organisms/Ft. ²	661	1256	274	
Invertebrate Community Index	16	18	24	

^a Qualitative samples were collected from the natural substrates and their presence is indicated in the table by a +.

Table B-3. (Continued)

Station RM 10.2

General Location: At TR 223
County: Sandusky
Sampling Method: Artificial substrate, dipnet/handpick
Substrate Characterization: Primarily coarse gravel with some boulder, rubble,
fine gravel, sand, clay, detritus, and filamentous algae
Substrate Compaction: Firm
Width (Range): 10-20 feet
Depth (Range): 2-24 inches
Depth at Sampler Site: 24 inches
Habitat at Sampler Site: Slow run
Canopy: Open
Riparian Vegetation: Shrubs
Land Use: Agricultural/rural

Station RM 8.7

General Location: Upst. TR 229
County: Sandusky
Sampling Method: Artificial substrate, dipnet/handpick
Substrate Characterization: Primarily clay with some fine gravel, sand, and
silt
Substrate Compaction: Medium
Width (Range): 10-20 feet
Depth (Range): 1-36 inches
Depth at Sampler Site: 30 inches
Habitat at Sampler Site: Slow run
Canopy: Closed
Riparian Vegetation: Large trees
Land Use: Agricultural/rural

Station RM 6.5

General Location: Upst. SR 412
County: Sandusky
Sampling Method: Artificial substrate, dipnet/handpick
Substrate Characterization: Primarily sand with some rubble, coarse gravel,
fine gravel, silt, clay and detritus
Substrate Compaction: Medium
Width (Range): 8-15 feet
Depth (Range): 2-36 inches
Depth at Sampler Site: 24 inches
Habitat at Sampler Site: Slow run
Canopy: Closed
Riparian Vegetation: Large trees
Land Use: Agricultural/rural

Table B-3. Macroinvertebrate sampling station characteristics for Raccoon Creek and Buck Run, July 28 to September 10, 1986.

Raccoon Creek

Station RM 13.0

General Location: Dst. Limerick Road

County: Sandusky

Sampling Method: Artificial substrate, dipnet/handpick

Substrate Characterization: Primarily rubble with some boulder, coarse gravel, fine gravel, and silt

Substrate Compaction: Firm

Width (Range): 0-10 feet

Depth (Range): 0-18 inches

Depth at Sampler Site: 18 inches

Habitat at Sampler Site: Pool

Canopy: Closed

Riparian Vegetation: Large trees

Land Use: Agricultural/rural

Station RM 11.7

General Location: Dst. Spring Street

County: Sandusky

Sampling Method: Artificial substrate, dipnet/handpick

Substrate Characterization: Primarily rubble with some boulder, coarse gravel, fine gravel, silt, and detritus

Substrate Compaction: Firm

Width (Range): 6-15 feet

Depth (Range): 2-24 inches

Depth at Sampler Site: 24 inches

Habitat at Sampler Site: Pool

Canopy: 25% Open

Riparian Vegetation: Large trees

Land Use: Municipal/industrial

Station RM 11.3

General Location: At US 20

County: Sandusky

Sampling Method: Artificial substrate, dipnet/handpick

Substrate Characterization: Primarily rubble with some boulder, coarse gravel, fine gravel, and sewage solids

Substrate Compaction: Firm

Width (Range): 10-15 feet

Depth (Range): 1-5 inches

Depth at Sampler Site: 15 inches

Habitat at Sampler Site: Slow run

Canopy: Closed

Riparian Vegetation: Small trees

Land Use: Municipal/industrial

Table B-3. (Continued)

Station RM 3.1

General Location: At US 6

County: Sandusky

Sampling Method: Artificial substrate, dipnet/handpick

Substrate Characterization: Primarily silt and muck with some rubble, coarse
gravel, sand and detritus

Substrate Compaction: Soft

Width (Range): 8-16 feet

Depth (Range): 3-18 inches

Depth at Sampler Site: 18 inches

Habitat at Sampler Site: Slow run

Canopy: 50% Open

Riparian Vegetation: Grass

Land Use: Agricultural/rural

Buck Run

Station RM 0.2

General Location: At TR 223

County: Sandusky

Sampling Method: Dipnet/handpick

Substrate Characterization: Primarily coarse gravel and fine gravel with some
rubble, sand, silt, clay, and filamentous algae

Substrate Compaction: Firm

Width (Range): 4-6 feet

Depth (Range): 1-15 inches

Habitat: Pool/riffle/run

Canopy: 50% Open

Riparian Vegetation: Small trees

Land Use: Agricultural/rural

SURVEY NAME: RACCOON CREEK

FISH DATA

Table F-1. Characteristics of electrofishing sampling methods most frequently used by the Ohio EPA to sample fish communities^a.

	<u>Sampling Method</u>		
	A	D or E	F
Gear Used:	12', 14', or 16' boat	D: Sportyak (7.5' boat) E: Longline (100m extension cord)	Backpack
Power Source:	Smith Root Type VIA electrofishing unit or Smith Root 3.5 GPP generator/pulsator unit	Model 1736 VDC T&J generator/pulsator unit	Michigan DNR battery pack unit
Current Type:	Pulsed DC	Pulsed DC	Pulsed DC
Wattage: (AC Power Source)	3500	1750	-
Volts:	50-1000	100-300	100 or 200
Amperage:	4-11	2-7	1.5-2
Anode Location:	Front of boom	Net hoop	Net hoop
Distance Sampled (km):	0.5	0.2	0.15-0.20
Sampling Direction:	Downstream	Upstream	Upstream
Relative Number:	Based on 1.0 km	Based on 0.3 km	Based on 0.3km
Stream Size:	Moderate to large streams	Small wadeable streams to headwater tributaries	headwater tributaries

^a More detailed descriptions of sampling methods are given in the Ohio EPA Manual of Surveillance Methods and Quality Assurance Practices (Ohio EPA 1984b).

Table F-2. Fish sampling methods^a used in the Raccoon Creek study area by the Ohio EPA during June-September, 1986.

Stream Name	River Mile	Sampler Type	Number of Samples	Distance Sampled
Raccoon Creek	13.2	D-Sportyak	3	0.153 km
	11.7	D-Sportyak F-Longline	3	0.20 km
	11.2	D-Sportyak F-Longline	3	0.20 km
	10.3	D-Sportyak	3	0.20 km
	8.6	D-Sportyak	3	0.20 km
	6.5	D-Sportyak	3	0.20 km
	3.7	D-Sportyak	2	0.20 km

^a Methods used in this survey follow guidelines established in the Ohio EPA Manual of Surveillance Methods and Quality Assurance Practices (Ohio EPA 1984b), unless otherwise indicated.

Table F-3. Relative numbers (number/0.3 km) of fish collected at seven locations in Raccoon Creek, July - September, 1986.

SPECIES	RM 3.7	RM 6.5	RM 8.6	RM 10.2	RM 11.2
GIZZARD SHAD	51.8	2.0	-	-	-
CENTRAL MUDMINNOW	-	-	-	0.5	-
WHITE SUCKER	12.0	60.0	23.0	15.0	-
COMMON CARP	0.8	0.5	-	-	0.5
GOLDFISH	6.8	0.5	-	2.5	-
BLACKNOSE DACE	3.8	3.0	10.0	13.0	1.0
CREEK CHUB	15.8	41.5	31.5	30.5	0.5
STRIPED SHINER	-	-	-	0.5	-
COMMON SHINER	10.5	11.0	1.5	-	-
SPOTFIN SHINER	8.3	0.5	-	-	-
SAND SHINER	1.5	-	-	-	-
FATHEAD MINNOW	59.3	15.0	18.0	7.5	3.5
BLUNTNOSE MINNOW	0.8	-	1.5	0.5	3.5
CENTRAL STONEROLLER	1.5	6.0	16.0	3.5	1.0
BLACK BULLHEAD	-	-	-	-	-
LARGEMOUTH BASS	-	-	-	-	-
GREEN SUNFISH	47.3	13.0	14.5	26.0	10.5
BLUEGILL SUNFISH	-	-	1.0	-	-
GREEN SF X HYBRID	0.8	0.5	-	-	-
HYBRID X SUNFISH	0.8	-	-	-	-
LOGPERCH	0.8	-	-	-	-
JOHNNY DARTER	1.5	-	-	-	-
TOTAL RELATIVE NUMBER	223.5	153.5	117.0	99.5	20.5
TOTAL NUMBER SPECIES	15.0	11.0	9.0	10.0	7.0
TOTAL NUMBER HYBRIDS	2.0	1.0	0.0	0.0	0.0

* REPRESENTS SPECIES VALUES LESS THAN 0.1

Table F-3. continued.

SPECIES	RM 11.6	RM 13.2
GIZZARD SHAD	-	-
CENTRAL MUDMINNOW	0.5	4.3
WHITE SUCKER	75.0	51.5
COMMON CARP	-	-
GOLDFISH	-	-
BLACKNOSE DACE	27.0	93.3
CREEK CHUB	71.0	153.7
STRIPED SHINER	21.0	-
COMMON SHINER	47.0	163.0
SPOTFIN SHINER	-	-
SAND SHINER	-	-
FATHEAD MINNOW	52.5	46.2
BLUNTNOSE MINNOW	3.0	64.5
CENTRAL STONEROLLER	383.0	100.5
BLACK BULLHEAD	0.5	1.3
LARGEMOUTH BASS	-	0.7
GREEN SUNFISH	32.0	33.0
BLUEGILL SUNFISH	-	0.5
GREEN SF X HYBRID	-	-
HYBRID X SUNFISH	-	-
LOGPERCH	-	-
JOHNNY DARTER	0.5	3.0
TOTAL RELATIVE NUMBER	713.0	715.5
TOTAL NUMBER SPECIES	12.0	13.0
TOTAL NUMBER HYBRIDS	0.0	0.0

* REPRESENTS SPECIES VALUES LESS THAN 0.1

Table F-4. Relative numbers (number/0.3 km) of fish collected at nine locations in Raccoon Creek, July - September, 1983.

SPECIES	RM 3.1	RM 6.5	RM 8.5	RM 10.1	RM 10.2
GIZZARD SHAD	298.9	-	-	-	-
CENTRAL MUDMINNOW	-	0.5	0.7	-	-
WHITE SUCKER	13.9	18.0	0.7	-	-
COMMON CARP	47.8	4.5	4.1	-	1.3
GOLDFISH	13.9	3.5	2.7	-	-
BLACKNOSE DACE	0.6	31.0	75.0	78.6	47.5
CREEK CHUB	7.8	183.0	167.8	263.9	92.5
EMERALD SHINER	37.2	-	-	-	-
REDFIN SHINER	0.6	-	-	-	-
STRIPED SHINER	5.6	6.5	2.7	1.8	-
COMMON SHINER	-	0.5	-	-	-
SPOTFIN SHINER	62.8	6.5	-	-	-
MIMIC SHINER	1.1	-	-	-	-
FATHEAD MINNOW	70.6	66.5	73.0	63.6	7.5
BLUNTNOSE MINNOW	20.0	7.5	4.1	-	-
CENTRAL STONEROLLER	-	6.0	4.1	7.1	1.3
BROWN BULLHEAD	2.2	0.5	-	-	-
BLACK BULLHEAD	1.1	-	-	-	-
BL'KSTRIPE TOPMINNOW	0.6	-	-	-	-
WHITE CRAPPIE	1.1	-	-	-	-
GREEN SUNFISH	258.9	23.0	63.4	15.9	8.8
BLUEGILL SUNFISH	3.3	-	-	-	-
PUMPKINSEED SUNFISH	5.6	-	-	-	-
LOGPERCH	0.6	-	-	-	-
JOHNNY DARTER	-	-	-	-	-
FRESHWATER DRUM	0.6	-	-	-	-
TOTAL RELATIVE NUMBER	854.4	357.5	398.3	430.7	158.8
TOTAL NUMBER SPECIES	22.0	14.0	11.0	6.0	6.0

* REPRESENTS SPECIES VALUES LESS THAN 0.1

Table F-4. continued.

SPECIES	RM 11.1	RM 11.3	RM 11.6	RM 13.2
GIZZARD SHAD	-	-	-	-
CENTRAL MUDMINNOW	-	-	1.4	2.7
WHITE SUCKER	-	3.6	233.2	164.4
COMMON CARP	-	3.6	54.5	2.7
GOLDFISH	2.1	-	1.4	-
BLACKNOSE DACE	2.1	3.6	25.9	2.1
CREEK CHUB	4.2	10.7	514.0	258.5
EMERALD SHINER	-	-	-	-
REDFIN SHINER	-	-	-	-
STRIPED SHINER	-	-	184.1	82.5
COMMON SHINER	-	-	-	-
SPOTFIN SHINER	-	-	-	-
MIMIC SHINER	-	-	-	-
FATHEAD MINNOW	6.3	10.7	466.3	295.3
BLUNTNOSE MINNOW	-	-	248.2	366.2
CENTRAL STONEROLLER	6.3	42.9	422.7	108.4
BROWN BULLHEAD	-	-	9.6	2.7
BLACK BULLHEAD	-	-	-	4.1
BL'K STRIPE TOPMINNOW	-	-	-	-
WHITE CRAPPIE	-	-	-	-
GREEN SUNFISH	152.1	407.2	353.2	561.3
BLUEGILL SUNFISH	-	-	1.4	-
PUMPKINSEED SUNFISH	-	-	-	-
LOGPERCH	-	-	-	-
JOHNNY DARTER	-	-	-	1.4
FRESHWATER DRUM	-	-	-	-
TOTAL RELATIVE NUMBER	173.0	482.2	2515.7	1852.3
TOTAL NUMBER SPECIES	6.0	7.0	13.0	13.0

* REPRESENTS SPECIES VALUES LESS THAN 0.1

Table F-5. Mean fish community indices (\pm standard error in parentheses) based on electrofishing samples at seven locations sampled by Ohio EPA in the Raccoon Creek study area during July-September, 1986 and at nine locations during July-September, 1983.

<u>Stream</u> River Mile	Mean No. of Species	Cumulative Species	Mean Relative Number	Mean Relative Weight	Composite Index	Modified Composite Index	Index of Biotic Integrity	Narrative Evaluation
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Raccoon Creek - 1986

13.2	10.7	13	716	5.3	7.5	6.5	42	Fair
11.6	8.7	12	713	7.5	7.0	6.6	36	Fair
11.2	3.0	7	21	0.2	2.2	1.2	14	Very poor
10.2	6.3	10	100	0.8	4.3	2.6	22	Very poor
8.6	7.3	9	117	0.7	5.1	3.8	28	Very poor
6.5	8.0	11	154	4.8	5.8	3.7	22	Very poor
3.7	12.0	15	224	2.4	6.8	5.8	24	Poor

Raccoon Creek - 1983

13.2	10.5	13	1852	17.7	8.5	6.1		Fair
11.6	11.0	13	2516	57.6	9.3	6.9		Fair
11.3	4.0	7	482	1.9	3.3	1.3		Very poor
11.1	3.5	6	173	1.9	3.8	2.0		Very poor
10.2	5.0	6	159	0.5	4.0	1.8		Very poor
10.1	5.5	6	431	1.6	5.4	3.2		Very poor
8.5	9.0	11	398	3.0	6.2	3.5		Very poor
6.5	12.5	14	358	5.9	6.4	4.0		Poor
3.1	18.5	22	854	27.2	7.9	6.4		Fair

RACCOON CREEK-1986 IWB VS RIVER MILE

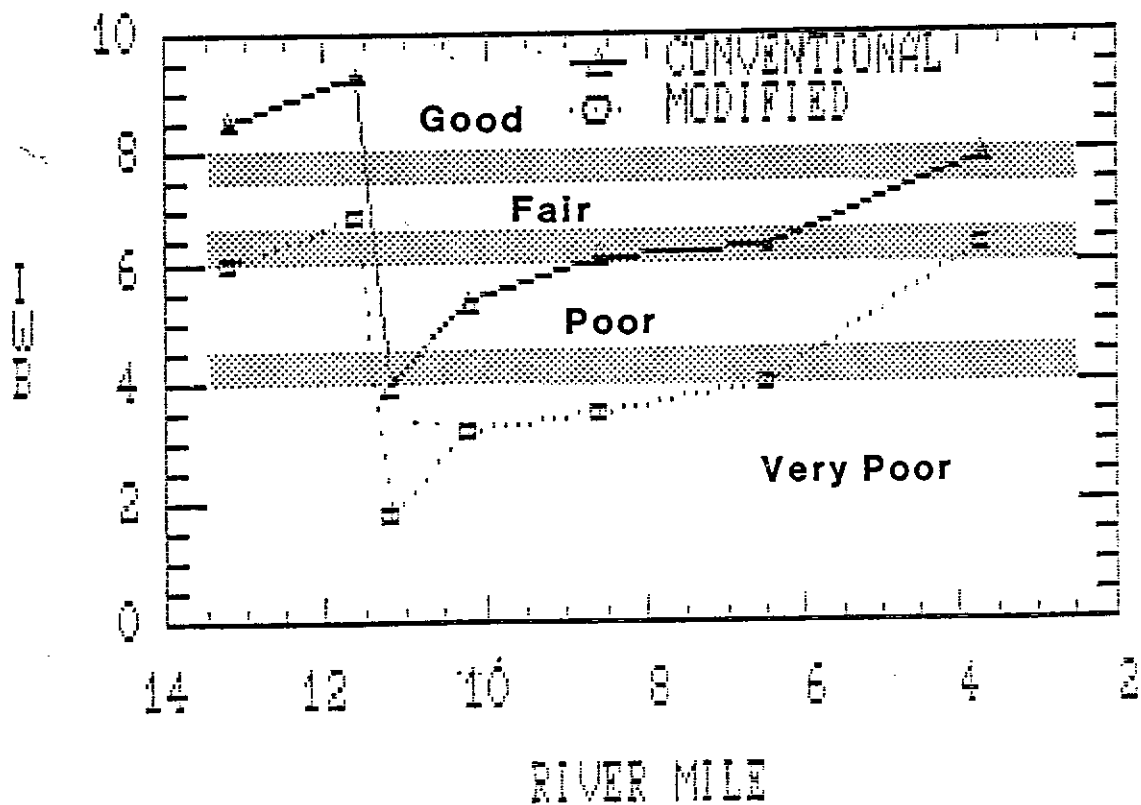
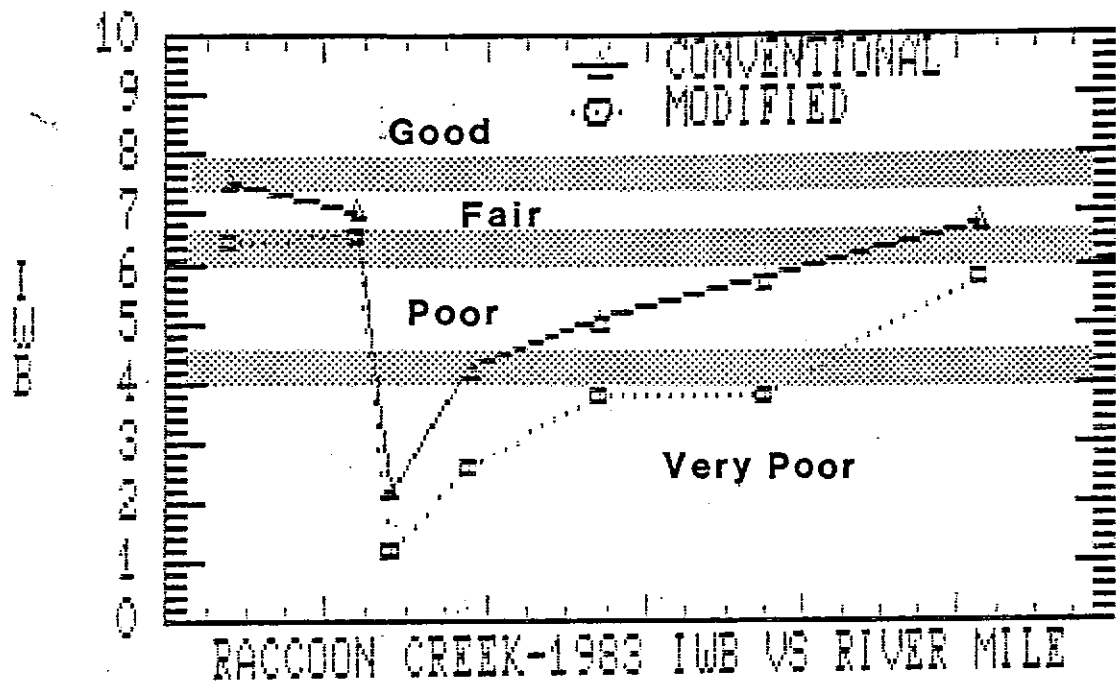


Figure F-1. Longitudinal trend of the conventional composite index and modified composite index at electrofishing locations in the Raccoon Creek study area based on electrofishing collections during July-October, 1983 and 1986.

Table F-6. Evaluation of the fish community in the Raccoon Creek study area during July-September, 1986 using the Index of Biological Integrity modified for application to Ohio waters. Scores of 5, 3, or 1 are assigned to each metric according to whether it: approximates (5), partially deviates from (3), or strongly deviates from (1) an ecological grouping expected in a relatively undisturbed stream. Numbers in parentheses are numbers of species, individuals, or proportion of individuals, as indicated.

	Sampling Station (River Mile)						
	13.2	11.6	11.2	10.2	8.6	6.5	3.7
IBI Metrics							
<u>NUMBERS OF</u>							
Total Species	5 (13)	5 (12)	3 (7)	3 (10)	3 (9)	3 (11)	3 (15)
Total Individuals	3 (716)	3 (713)	1 (21)	1 (100)	1 (117)	1 (154)	1 (224)
Darter Species	3 (1)	1 (1)	1 (0)	1 (0)	1 (0)	1 (0)	3 (2)
Sunfish Species	5 (2)	1 (1)	1 (1)	1 (1)	3 (2)	3 (2)	3 (2)
Sucker Species	3 (1)	3 (1)	1 (0)	1 (1)	1 (1)	1 (1)	1 (1)
Intolerant Species	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)	1 (0)
<u>PROPORTION OF INDIVIDUALS</u>							
Omnivores	3 (23)	5 (18)	* (37)	3 (26)	3 (26)	1 (51)	1 (59)
Insect. Cyprinids	3 (13.04)	1 (3.79)	* (4.88)	3 (13.07)	1 (8.55)	1 (4.95)	1 (2.35)
Green Sunfish	5 (4.6)	5 (4.5)	* (51)	1 (26)	3 (12)	3 (8)	1 (21)
Top Carnivores	1 (0.09)	1 (0)	* (0)	1 (0)	1 (0)	1 (0)	1 (0)
Hybrids	5 (0)	5 (0)	* (0)	5 (0)	5 (0)	3 (0.33)	3 (0.67)
Anomalies	5 (0.07)	5 (0.07)	* (0)	1 (9.55)	5 (0.43)	3 (0.68)	5 (0.34)
Index Value	42	36	14	22	28	22	24

* when relative numbers are less than 75 proportional metrics score 1 each.

Table F-7. External anomalies observed on fish collected at seven locations in Raccoon Creek, July - September, 1986 and at nine locations, July - September, 1983.

PERCENTAGE OF FISH WITH EXTERNAL ANOMALIES AT SAMPLING LOCATIONS IN RACCOON CREEK, JULY-SEPT. 1986.

MILE	DATE	BL	BH	AL	AH	D	E	L	T	P	C	Z
3.7	1986	29.9	0.0	0.0	0.0	0.0	0.0	0.3	0.0	2.7	0.0	0.0
6.5	1986	24.4	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0
8.6	1986	27.4	0.0	0.0	0.0	0.0	0.0	0.4	0.0	4.3	0.0	0.0
10.2	1986	29.6	0.0	0.0	0.0	0.0	0.0	9.5	0.0	13.6	0.0	0.0
11.2	1986	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.6	1986	20.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
13.2	1986	27.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0

PERCENTAGE OF FISH WITH EXTERNAL ANOMALIES AT SAMPLING LOCATIONS IN RACCOON CREEK, JULY-SEPT. 1983.

MILE	DATE	BL	BH	AL	AH	D	E	L	T	P	C	Z
3.1	1983	4.4	0.0	0.7	0.0	0.4	1.4	0.2	0.0	0.1	0.0	0.0
6.5	1983	19.2	0.0	0.1	0.0	0.6	0.9	2.3	0.0	1.2	0.0	0.0
8.5	1983	21.9	0.0	3.4	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0
10.1	1983	13.1	0.0	0.0	0.0	1.5	1.7	0.0	0.0	0.0	0.0	0.0
10.2	1983	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.1	1983	8.4	0.0	1.2	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0
11.3	1983	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11.6	1983	48.6	0.0	2.1	0.0	1.0	1.0	0.9	0.0	0.4	0.0	0.0
13.2	1983	37.8	0.0	0.0	0.0	0.0	0.7	0.8	0.0	0.0	0.0	0.0

BL - Light blackspot; BH - Heavy blackspot; AL - Light anchor worm; AH - Heavy anchor worm; D - Deformities; E - Eroded fins; L - Lesions; T - External tumors; P - External parasites; C - Leeches; Z - Other.

Table F-9. Ohio EPA biological criteria (fish) for determining water quality use designations and attainment of Clean Water Act (CWA) goals (November 1980; revised January 1987).

C a t e g o r y	--- MEETS CWA GOALS ---		----- DOES NOT MEET CWA GOALS -----		
	"Exceptional" Class I (EWH)	"Good" Class II (WWH)	"Fair" Class III	"Poor" Class IV	"Very Poor" Class V
1. ^a	Exceptional, or unusual assemblage of species	Usual association of expected species	Some expected species absent, or in low abundance	Many expected species absent, or in low abundance	Most expected species absent
2.	Sensitive species abundant	Sensitive species present	Sensitive species absent, or in very low abundance	Sensitive species absent,	Only most tolerant species remain
3.	Exceptionally high species richness	High species richness	Declining species richness	Low species richness	Very low species richness
4. ^b	Composite index Greater than 9.0 - 9.5	Composite index Greater than 7.5 - 8.0, Less than 9.0 - 9.5	Composite index Greater than 6.0 - 6.5, Less than 7.5 - 8.0	Composite index Greater than 4.0 - 4.5, Less than 6.0 - 6.5	Composite index Less than 4.0 - 4.5
5.	Outstanding recreational fishery		Tolerant species increasing, beginning to predominate	Tolerant species predominate	Community organization lacking
6.	Species with an endangered, threatened, or special concern status are present				

^a Conditions: Categories 1, 2, 3 and 4 (if data is available) must be met and 5 or 6 must also be met in order to be designated in that particular class.

^b Based primarily on electrofishing samples, ranges may vary for other sampling methods; does not apply to the Coldwater Habitat (CWH) use designation.

ADDITIONAL COMMENTS/POLLUTION IMPACTS: may be agricultural drainage vs

	GEAR	DISTANCE	WATER CLARITY	WATER STAGE	SUBJECTIVE RATING [1-10]
FIRST PASS	<u>5.4</u>	<u>0.153</u>	<u>clear to slight turbidity</u>	<u>slight to none</u>	
SECOND PASS	<u> </u>	<u> </u>	<u> </u>	<u> </u>	
THIRD PASS	<u> </u>	<u> </u>	<u> </u>	<u> </u>	

CANOPY (% OPEN) 20 GRADIENT: ☐ HIGH ☒ MODERATE ☐ LOW PHOTOS:

STREAM MEASUREMENTS

TOT. LENGTH

AVE. DEPTH

MAX. DEPTH

% POOL: 30 % RIFFLE: 30 % RUN: 30











dry
CROSS-SECTIONS OF STREAM:

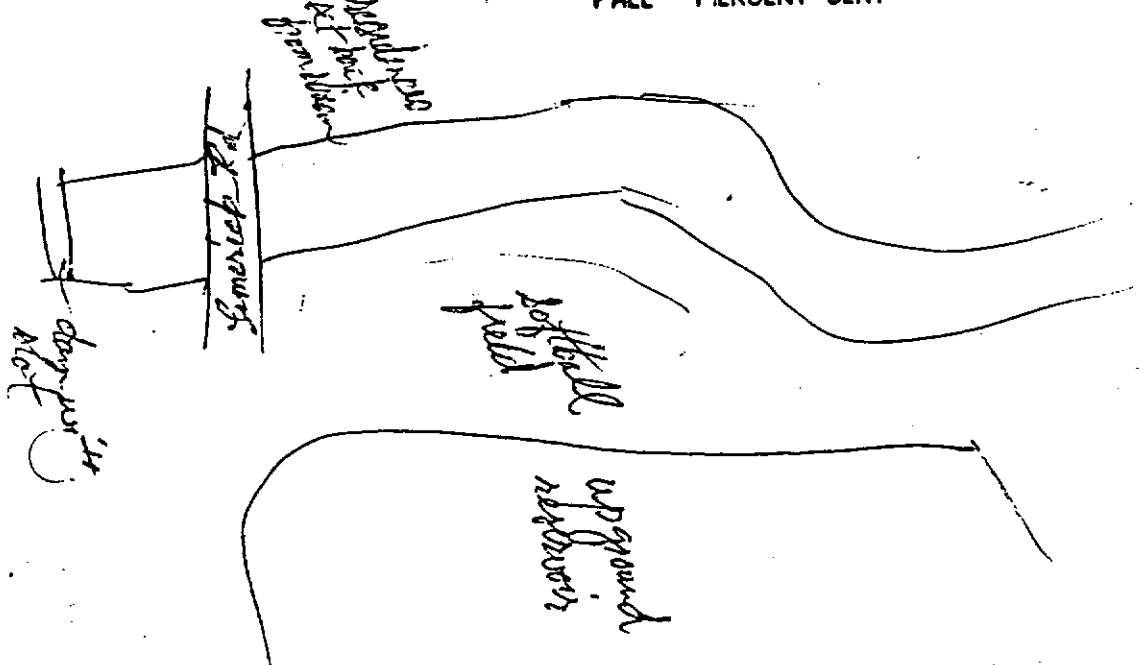
A

B

C

DRAWING OF STREAM:

- | | | | | | | | | | |
|---|---|---|---|---|---|--|---|---|---|
|  |  |  |  |  |  |  |  |  |  |
| BOULD. | DEEPEST | LOG | OUT-FALL | SUB-MERGENT | EMERGENT | FOREST | SHRUB | ROW-CROP | RIFFLE |



ADDITIONAL COMMENTS/POLLUTION IMPACTS: CSO'S USED within zone: residential

	GEAR	DISTANCE	WATER CLARITY	WATER STAGE	SUBJECTIVE RATING [1-10]
FIRST PASS	<u>LL</u>	<u>0.20km</u>	<u>turbid</u>	<u>highly high</u>	
SECOND PASS					
THIRD PASS					

CANOPY (% OPEN) 90 GRADIENT: ☐ HIGH ☒ MODERATE ☐ LOW PHOTOS: _____

STREAM MEASUREMENTS

TOT. LENGTH

AVE. DEPTH

MAX. DEPTH

% POOL: 40 % RIFFLE: 30 % RUN: 30

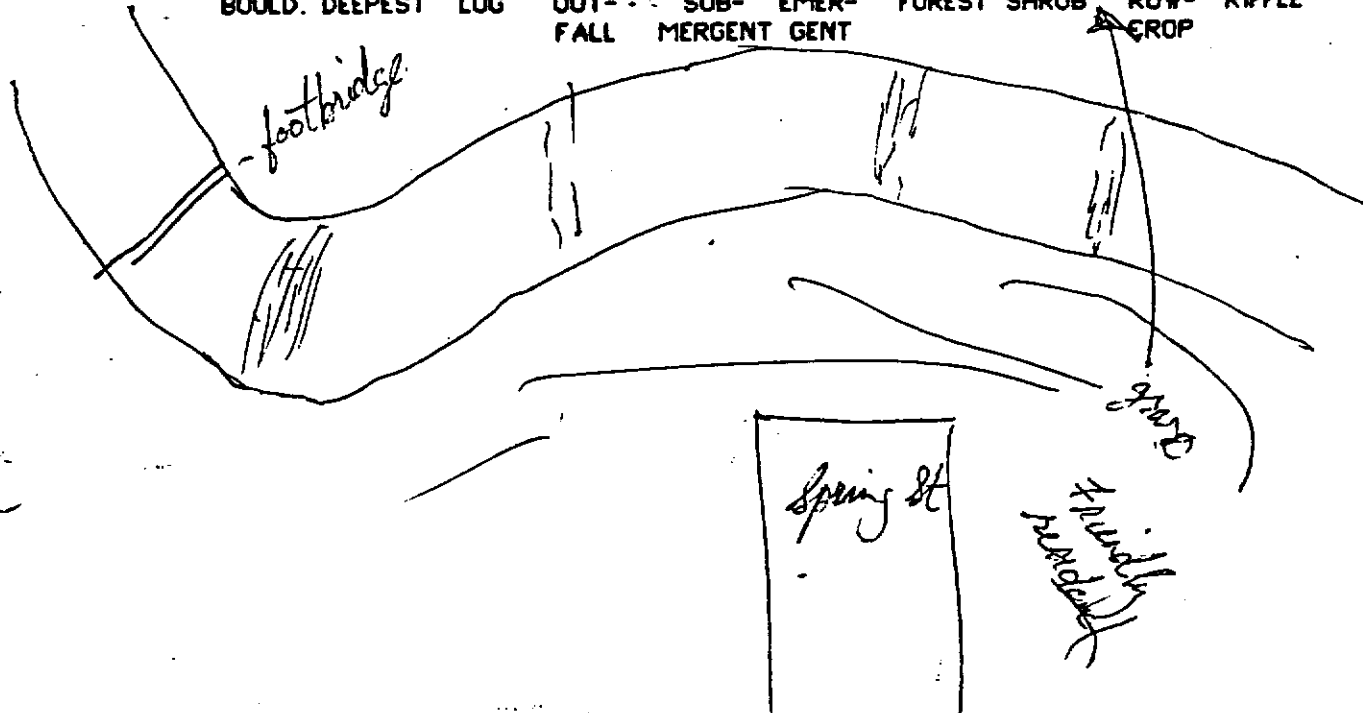
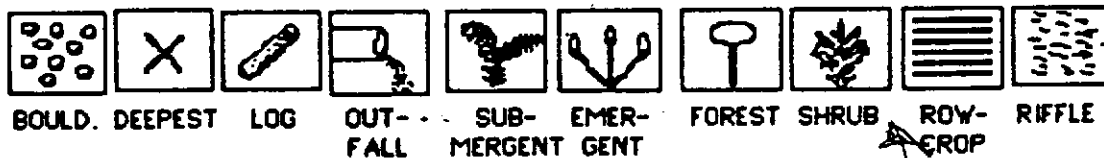
CROSS-SECTIONS OF STREAM:

A

B

C

DRAWING OF STREAM:



ADDITIONAL COMMENTS/POLLUTION IMPACTS:

CSO's, PST industrial & municipal
~~discharge from water body & one small over/low pipe from WWT~~
~~discharge of effluent from WWT on road & a pipe small in area indicate~~
~~discharge in past 10 years~~

5 at most

GEAR 1st DISTANCE 0.1 km WATER CLARITY turbid WATER STAGE _____
 FIRST PASS _____ SUBJECTIVE RATING [1-10]
 SECOND PASS _____
 THIRD PASS _____

CANOPY (% OPEN) varied from 10-90% GRADIENT ☐ HIGH ☒ MODERATE ☐ LOW PHOTOS _____

STREAM MEASUREMENTS

TOT. LENGTH _____

AVE. DEPTH _____

MAX. DEPTH _____

% POOL: 20 % RIFFLE: 20 % RUN: 60

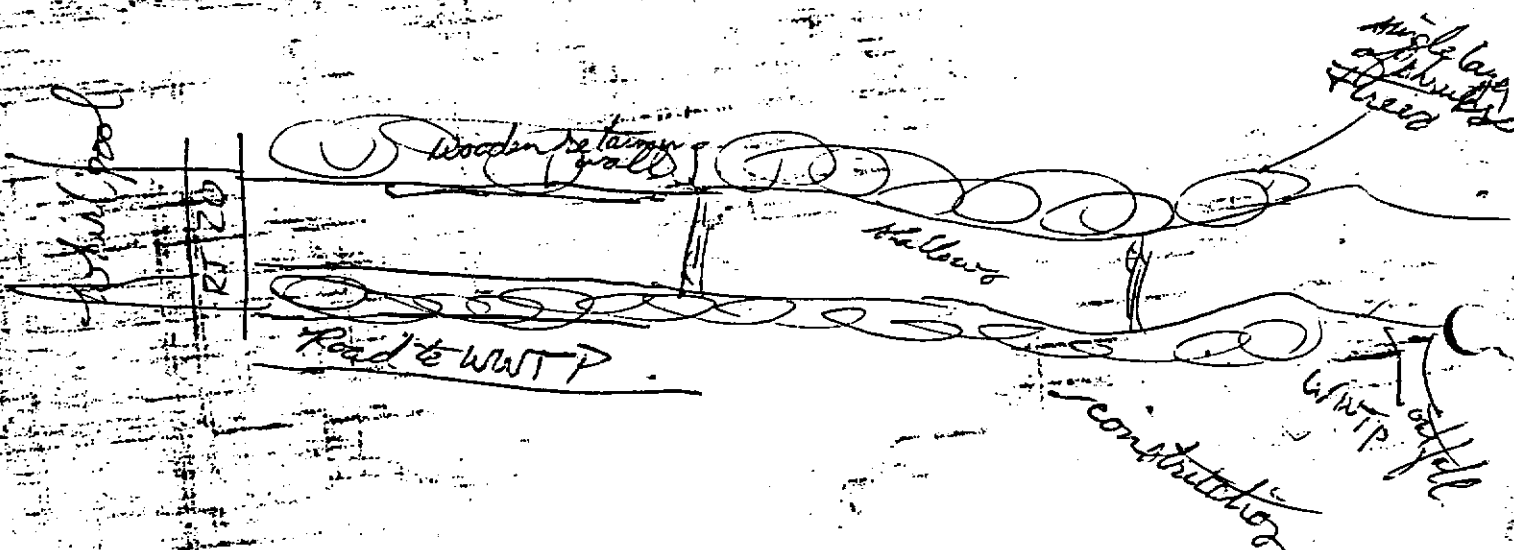
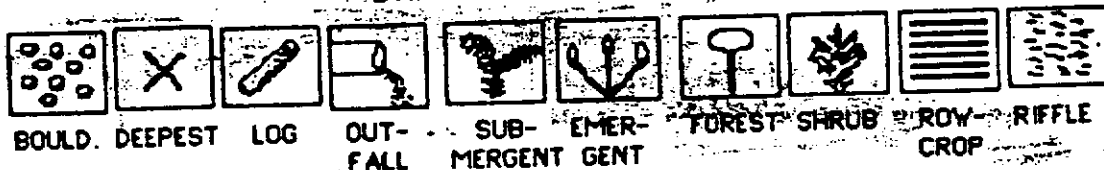
CROSS-SECTIONS OF STREAM:

A

B

C

DRAWING OF STREAM:



ADDITIONAL COMMENTS/POLLUTION IMPACTS: Clude WWTP 7.8 Mi upstream
slight chlorine & sulfur smell in H₂O occasional field used along stream

7

SUBJECTIVE
RATING
[1-10]

CANOPY (% OPEN) 240-50% GRADIENT: ☐-HIGH ☒-MODERATE ☐-LOW PHOTOS: _____

STREAM MEASUREMENTS

TOT. LENGTH

AYE. DEPTH

MAX. DEPTH

8 POOL: 45 8 RIFFLE: 20 8 RUN: 55

CROSS-SECTIONS OF STREAM:

A

C

DRAWING OF STREAM:



BOULD. DEEPEST

LOG

OUT-

SUB-

EMER-

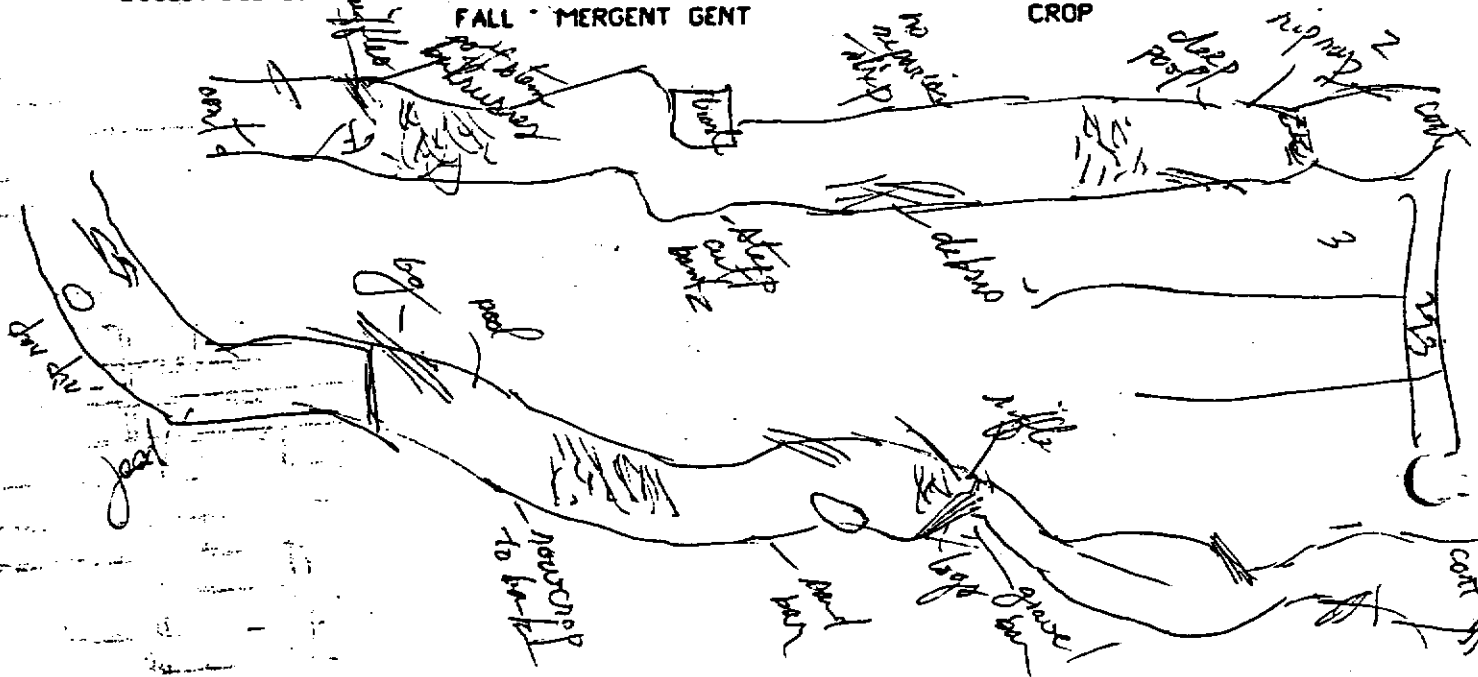
FOREST

SHRUE

RDY-

RIFLE

BOULD.	DEEPEST LOG	OUT-FALL	SUB-MERGENT	EMER-GENT	FOREST	SHRUB	ROW-CROP	RIFFLE
	1					3		



ADDITIONAL COMMENTS/POLLUTION IMPACTS: Check WWTP, Whistler
household runoff - mud field detritus. DST from bridge

4

	GEAR	DISTANCE	WATER CLARITY	WATER STAGE
FIRST PASS	<u>D-54</u>	<u>0.20m</u>	<u>clear</u>	<u>Righting high</u>
SECOND PASS				
THIRD PASS				

SUBJECTIVE
RATING
[1-10]

CANOPY (% OPEN) 30 GRADIENT: ☐ HIGH ☒ MODERATE ☐ LOW PHOTOS: _____

STREAM MEASUREMENTS

TOT. LENGTH

AVE. DEPTH

MAX. DEPTH

% POOL: 35 % RIFFLE: 5 % RUN: 60











CROSS-SECTIONS OF STREAM:

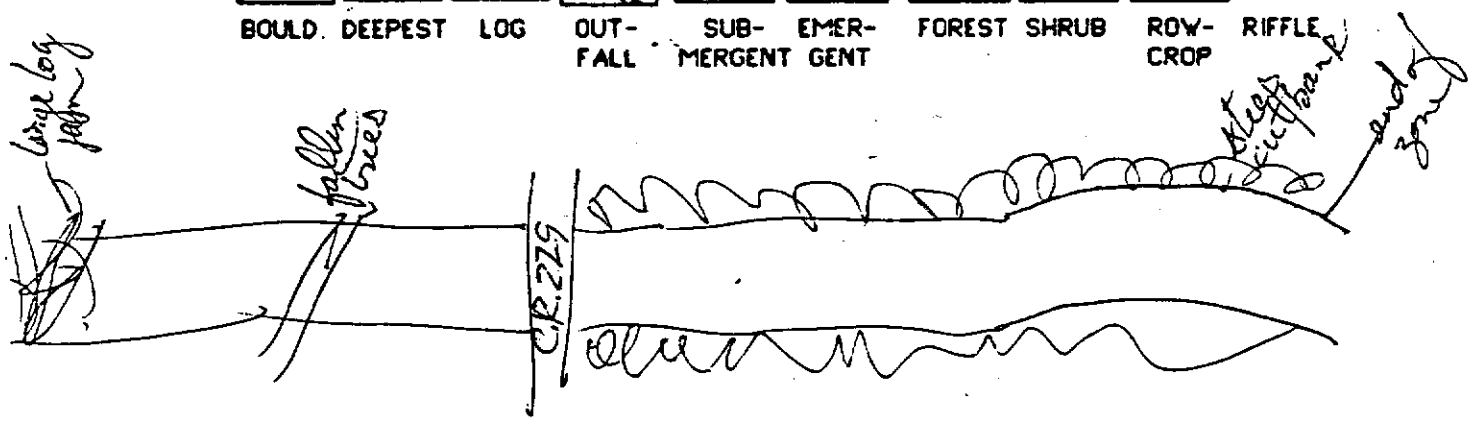
A

B

C

DRAWING OF STREAM:

									
BOULD.	DEEPEST	LOG	OUT-FALL	SUB-MERGENT	EMERGENT	FOREST	SHRUB	ROW-CROP	RIFFLE



ADDITIONAL COMMENTS/POLLUTION IMPACTS: agr. runoff continuing to zone

7

	GEAR	DISTANCE	WATER CLARITY, L	WATER STAGE
FIRST PASS	<u>D-5Y</u>	<u>0-10</u>	<u>clear but stained</u>	<u>high 1/2 high</u>
SECOND PASS				
THIRD PASS				

SUBJECTIVE RATING (1-10)

CANOPY (% OPEN) 35 GRADIENT: ☐ HIGH ☒ MODERATE ☐ LOW PHOTOS: _____

STREAM MEASUREMENTS

TOT. LENGTH

AVE. DEPTH

MAX. DEPTH

% POOL: 20 % RIFFLE: 20 % RUN: 60

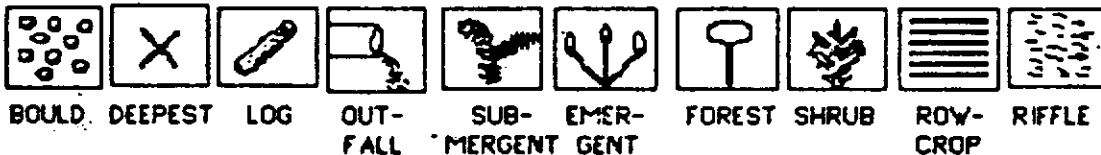
CROSS-SECTIONS OF STREAM:

A

B

C

DRAWING OF STREAM:



ADDITIONAL COMMENTS/POLLUTION IMPACTS: Clyde WTP Whirlpool Corp of non-point agric. runoff

6

	GEAR	DISTANCE	WATER CLARITY	WATER STAGE
FIRST PASS	<u>D-3T</u>	<u>0.195</u>	<u>Clear could see bottom</u>	<u>Normal</u>
SECOND PASS				
THIRD PASS				

SUBJECTIVE
RATING
[1-10]

CANOPY (% OPEN) 20 GRADIENT: ☐-HIGH ☒-MODERATE ☐-LOW PHOTOS:

STREAM MEASUREMENTS

	POOL	RIFLE	RUN
TOT. LENGTH			
AVE. DEPTH			
MAX. DEPTH			

% POOL: 30 % RIFLE: 30 % RUN: 40

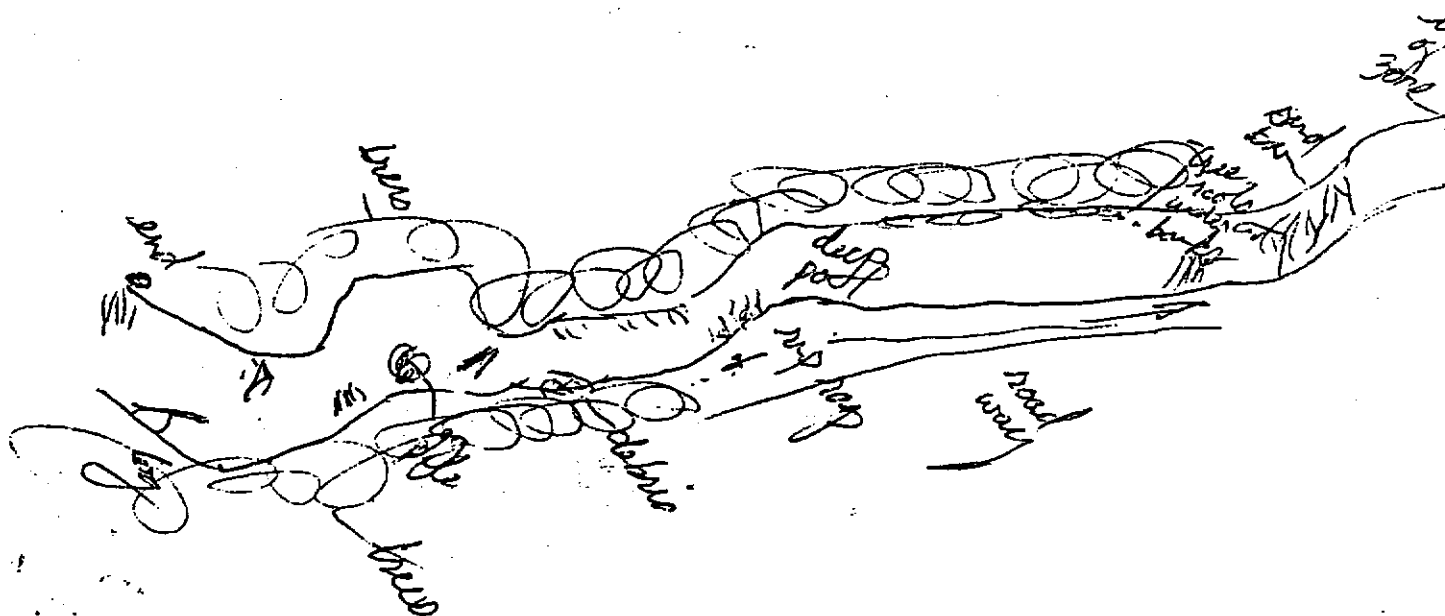
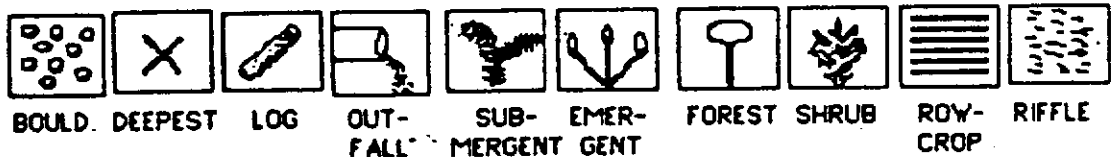
CROSS-SECTIONS OF STREAM:

A

B

C

DRAWING OF STREAM:



Ohio EPA Site Description Sheet - Fish

Stream Raccoon Creek RM 3.7 Date 8/13/86 County SANDUCKY
 Location US 20 Rd USGS Quad VICKERY
 Township RILEY Section Latit./Longit. 41°23'59" / 83°54'01"

57.5

TOTAL
QHEI

1) SUBSTRATE

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	QUALITY
<input type="checkbox"/> BOULDER [7]			<input type="checkbox"/> GRAVEL [5]	10		<input checked="" type="checkbox"/> EMBEDDED [-2]
<input type="checkbox"/> COBBLE [6]			<input type="checkbox"/> SAND [4]	50		<input type="checkbox"/> SILT COVERED [-1]
<input type="checkbox"/> HARDPAN [3]			<input type="checkbox"/> BEDROCK [3]			<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> SILT [3]			<input type="checkbox"/> DETRITUS [2]			<input type="checkbox"/> BOULDERS AS SLABS [1]
<input type="checkbox"/> MUCK [2]			<input type="checkbox"/> SLUDGE [1]			

COMMENTS: considerable erosion of sandy soil has covered bottom

2) INSTREAM COVER

TYPE	AMOUNT
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> DEEP POOLS [1]
<input type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> OXBOWS [1]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]
<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]
	<input type="checkbox"/> EXTENSIVE [7]
	<input type="checkbox"/> MODERATE [5]
	<input checked="" type="checkbox"/> SPARSE [3]
	<input type="checkbox"/> NEARLY ABSENT [1]

COMMENTS: Most of cover is fine roots undercut by erosion, deep pools

3) CHANNEL MORPHOLOGY:

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [4]	<input type="checkbox"/> NONE [4]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> IMPOUND.
<input checked="" type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [3]	<input type="checkbox"/> RECOVERED [3]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> ISLANDS
<input checked="" type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [2]	<input checked="" type="checkbox"/> RECOVERING [2]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> LEVEED
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		

COMMENTS: lower portions of zone straightened & riprapped

4) RIPARIAN ZONE AND BANK EROSION

L R	WIDTH	QUALITY	BANK EROSION
<input type="checkbox"/> EXTENSIVE >100m [5]	<input checked="" type="checkbox"/> FOREST, SWAMP [5]	<input type="checkbox"/> URBAN [1]	<input type="checkbox"/> NONE [5]
<input type="checkbox"/> WIDE 50-100m [4]	<input type="checkbox"/> OPEN PASTURE [1]	<input checked="" type="checkbox"/> ROWCROP [1]	<input type="checkbox"/> LITTLE [4]
<input checked="" type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> OLD FIELD [3]	<input type="checkbox"/> SHRUB [4]	<input type="checkbox"/> MODER. [3]
<input checked="" type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK [2]		<input checked="" type="checkbox"/> HEAVY [2]
<input type="checkbox"/> VERY NARROW 1-5m [1]	<input type="checkbox"/> CONSERV. TILLAGE [2]		<input checked="" type="checkbox"/> SEVERE [1]
<input type="checkbox"/> NONE [0]	<input type="checkbox"/> FENCED PASTURE [2]		

COMMENTS: very large trees lining bank but only three deep - banks heavily eroded exposing tree roots

[5] POOL AND RIFFLE QUALITY

A) POOL	MAX. DEPTH	COVER	CURRENT	MORPHOLOGY
<input checked="" type="checkbox"/> >1m [3]	<input type="checkbox"/> EXTENSIVE [3]	<input type="checkbox"/> TORRENTIAL [-1]	<input type="checkbox"/> WIDE [2]	
<input type="checkbox"/> 0.7-1m [2]	<input type="checkbox"/> MODERATE [2]	<input checked="" type="checkbox"/> FAST [1]	<input checked="" type="checkbox"/> EQUAL [1]	
<input type="checkbox"/> 0.4-0.7m [1]	<input checked="" type="checkbox"/> SPARSE [1]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> NARROW [0]	
<input type="checkbox"/> <0.4m [0]	<input type="checkbox"/> NEARLY ABSENT [0]	<input type="checkbox"/> SLOW [1]		
		<input type="checkbox"/> INTERSTITIAL [-1]		
		<input type="checkbox"/> INTERMITTENT [-2]		
		<input type="checkbox"/> EDDIES [1]		

COMMENTS: fair deep for width of stream

B) RIFFLE	DEPTH	SUBSTRATE	SUBSTRATE QUALITY
<input type="checkbox"/> GENERALLY <10 cm [1]	<input type="checkbox"/> STABLE (Cobble, Boulder) [1]	<input checked="" type="checkbox"/> EMBEDDED [0]	
<input checked="" type="checkbox"/> GENERALLY >10 cm, MAX <50 [2]	<input checked="" type="checkbox"/> UNSTABLE (Gravel, Sand) [0]	<input type="checkbox"/> NOT EMBED. [1]	
<input type="checkbox"/> GENERALLY >10 cm, MAX >50 [3]		<input type="checkbox"/> NO RIFFLE [0]	

COMMENTS: fine gravel sand riffle[6] MAP GRADIENT 7.14 SCORE 8 [7] DRAINAGE AREA 25.75 SCORE 9

GRADIENT

DRAINAGE
AREA

rio EPA Site Description Sheet - Fish

Stream Barroon Creek RM 6.5 Date 7/7/86 County SANDUSKY
 Location UST S.R. 414 USGS Quad 11N 01E 01
 Township R11E Section 1 Latit./Longit. 41° 52' N 82° 52' W

39

TOTAL
QHEI

1) SUBSTRATE

TYPE	POOL	RIFFLE	POOL	RIFFLE	QUALITY
<input type="checkbox"/> BOULDER [7]			<input type="checkbox"/> GRAVEL [5]	<u>50</u>	<input type="checkbox"/> EMBEDDED [-2]
<input type="checkbox"/> COBBLE [6]			<input type="checkbox"/> SAND [4]	<u>40</u>	<input type="checkbox"/> SILT COVERED [-1]
<input type="checkbox"/> HARDPAN [3]	<u>20</u>		<input type="checkbox"/> BEDROCK [3]		<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> SILT [3]	<u>40</u>	<u>10</u>	<input type="checkbox"/> DETRITUS [2]		<input type="checkbox"/> BOULDERS AS SLABS [1]
<input type="checkbox"/> MUCK [2]			<input type="checkbox"/> SLUDGE [1]		

8

SUBSTRATE

COMMENTS: considerably greater percentage of material in pools not coarse clean
this site play covered by deposits

2) INSTREAM COVER

TYPE	AMOUNT
<input type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> EXTENSIVE [7]
<input type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> MODERATE [5]
<input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> SPARSE [3]
<input type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> NEARLY ABSENT [1]
<input type="checkbox"/> AQUATIC MACROPHYTES [1]	

0

COVER

COMMENTS: fish seemed comfortable gravel substrate is around
fallen trees at sand pit present in stream

3) CHANNEL MORPHOLOGY:

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [4]	<input type="checkbox"/> NONE [4]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> IMPOUND.
<input checked="" type="checkbox"/> MODERATE [3]	<input checked="" type="checkbox"/> GOOD [3]	<input type="checkbox"/> RECOVERED [3]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> ISLANDS
<input checked="" type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [2]	<input checked="" type="checkbox"/> RECOVERING [2]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> LEVEED
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		

3

CHANNEL

COMMENTS: has been channelized in past but has fairly good riffle pool
run through UST fence large area for 10-20 ft old

4) RIPARIAN ZONE AND BANK EROSION

L R	WIDTH	QUALITY	BANK EROSION
<input type="checkbox"/> EXTENSIVE >100m [5]	<input type="checkbox"/> FOREST, SWAMP [5]	<input type="checkbox"/> URBAN [1]	<input type="checkbox"/> NONE [5]
<input type="checkbox"/> WIDE 50-100m [4]	<input type="checkbox"/> OPEN PASTURE [1]	<input type="checkbox"/> ROWCROP [1]	<input checked="" type="checkbox"/> LITTLE [4]
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> OLD FIELD [3]	<input type="checkbox"/> SHRUB [4]	<input type="checkbox"/> MODER. [3]
<input checked="" type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK [2]		<input type="checkbox"/> HEAVY [2]
<input type="checkbox"/> VERY NARROW 1-5m [1]	<input type="checkbox"/> CONSERV. TILLAGE [2]		<input type="checkbox"/> SEVERE [1]
<input type="checkbox"/> NONE [0]	<input type="checkbox"/> FENCED PASTURE [2]		

7

RIPARIAN

COMMENTS: typical riparian just along stream banks no extra
backed by row crop

[5] POOL AND RIFFLE QUALITY

A) POOL	MAX. DEPTH	COVER	CURRENT	MORPHOLOGY
<input checked="" type="checkbox"/> >1m [3]	<input type="checkbox"/> EXTENSIVE [3]	<input type="checkbox"/> TORRENTIAL [-1]	<input type="checkbox"/> WIDE [2]	
<input type="checkbox"/> 0.7-1m [2]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> FAST [1]	<input checked="" type="checkbox"/> EQUAL [1]	
<input type="checkbox"/> 0.4-0.7m [1]	<input type="checkbox"/> SPARSE [1]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> NARROW [0]	
<input type="checkbox"/> <0.4m [0]	<input type="checkbox"/> NEARLY ABSENT [0]	<input type="checkbox"/> SLOW [1]		
		<input type="checkbox"/> INTERSTITIAL [-1]		
		<input type="checkbox"/> INTERMITTENT [-2]		
		<input type="checkbox"/> EDDIES [1]		

8

POOL/
RIFFLE

COMMENTS: uncompacted silt & sand
reduce av. hab.

B) RIFFLE	DEPTH	SUBSTRATE	SUBSTRATE QUALITY
<input checked="" type="checkbox"/> GENERALLY <10 cm [1]	<input type="checkbox"/> STABLE (Cobble, Boulder) [1]	<input checked="" type="checkbox"/> EMBEDDED [0]	
<input type="checkbox"/> GENERALLY >10 cm, MAX <50 [2]	<input type="checkbox"/> UNSTABLE (Gravel, Sand) [0]	<input type="checkbox"/> NOT EMBED. [1]	
<input type="checkbox"/> GENERALLY >10 cm, MAX >50 [3]		<input type="checkbox"/> NO RIFFLE [0]	

COMMENTS: no darters found

[6] MAP GRADIENT 8.3 SCORE 8

[7] DRAINAGE AREA 17.25 SCORE 9

8

GRADIENT

9

DRAINAGE
AREA

Ohio EPA Site Description Sheet - Fish

Stream 3rd Run Creek RM 8.6 Date 7/17/84 County SANDUSKY
 Location DST C.R. 229 USGS Quad COEMON - EAST
 Township GREEN CREEK Section Latit./Longit. 42° 33' N 83° 00' W

1 SUBSTRATE

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	QUALITY
<input type="checkbox"/> BOULDER [7]	—	—	<input type="checkbox"/> GRAVEL [5]	—	—	<input checked="" type="checkbox"/> EMBEDDED [-2]
<input type="checkbox"/> COBBLE [6]	—	—	<input type="checkbox"/> SAND [4]	—	—	<input type="checkbox"/> SILT COVERED [-1]
<input checked="" type="checkbox"/> HARDPAN [3]	20	—	<input type="checkbox"/> BEDROCK [3]	—	—	<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> SILT [3]	25	—	<input type="checkbox"/> DETRITUS [2]	—	—	<input type="checkbox"/> BOULDERS AS SLABS [1]
<input type="checkbox"/> MUCK [2]	—	—	<input type="checkbox"/> SLUDGE [1]	—	—	

COMMENTS: mostly pool & run w/ clay bottom. riffles small

2) INSTREAM COVER

TYPE	AMOUNT
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> DEEP POOLS [1]
<input type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> OXBOWS [1]
<input type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> BOULDERS [1]
<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]

COMMENTS: clay pan bottom eliminates most habitat

3) CHANNEL MORPHOLOGY:

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [4]	<input type="checkbox"/> NONE [4]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> IMPOUND.
<input type="checkbox"/> MODERATE [3]	<input type="checkbox"/> GOOD [3]	<input type="checkbox"/> RECOVERED [3]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> ISLANDS
<input checked="" type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [2]	<input checked="" type="checkbox"/> RECOVERING [2]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> LEVEED
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		

COMMENTS: fairly straight channel a little meandering upstream or middle

4) RIPARIAN ZONE AND BANK EROSION

L R	WIDTH	QUALITY	BANK EROSION
<input type="checkbox"/> EXTENSIVE >100m [5]	<input checked="" type="checkbox"/> FOREST, SWAMP [5]	<input type="checkbox"/> URBAN [1]	<input type="checkbox"/> NONE [5]
<input type="checkbox"/> WIDE 50-100m [4]	<input type="checkbox"/> OPEN PASTURE [1]	<input type="checkbox"/> ROWCROP [1]	<input type="checkbox"/> LITTLE [4]
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> OLD FIELD [3]	<input type="checkbox"/> SHRUB [4]	<input type="checkbox"/> MODER. [3]
<input checked="" type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK [2]		<input checked="" type="checkbox"/> HEAVY [2]
<input type="checkbox"/> VERY NARROW 1-5m [1]	<input type="checkbox"/> CONSERV. TILLAGE [2]		<input type="checkbox"/> SEVERE [1]
<input type="checkbox"/> NONE [0]	<input type="checkbox"/> FENCED PASTURE [2]		

COMMENTS: a few trees just along both banks backed all down

[5] POOL AND RIFFLE QUALITY

A) POOL	MAX. DEPTH	COVER	CURRENT	MORPHOLOGY
<input checked="" type="checkbox"/> >1m [3]	<input type="checkbox"/> EXTENSIVE [3]	<input type="checkbox"/> TORRENTIAL [-1]	<input type="checkbox"/> WIDE [2]	
<input type="checkbox"/> 0.7-1m [2]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> FAST [1]	<input checked="" type="checkbox"/> EQUAL [1]	
<input type="checkbox"/> 0.4-0.7m [1]	<input checked="" type="checkbox"/> SPARSE [1]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> NARROW [0]	
<input type="checkbox"/> <0.4m [0]	<input type="checkbox"/> NEARLY ABSENT [0]	<input type="checkbox"/> SLOW [1]		
		<input type="checkbox"/> INTERSTITIAL [-1]		
		<input type="checkbox"/> INTERMITTENT [-2]		
		<input type="checkbox"/> EDDIES [1]		

COMMENTS: NO POOL [0]

B) RIFFLE

DEPTH	SUBSTRATE	SUBSTRATE QUALITY
<input checked="" type="checkbox"/> GENERALLY <10 cm [1]	<input type="checkbox"/> STABLE (Cobble, Boulder) [1]	<input checked="" type="checkbox"/> EMBEDDED [0]
<input type="checkbox"/> GENERALLY >10 cm, MAX <50 [2]	<input type="checkbox"/> UNSTABLE (Gravel, Sand) [0]	<input type="checkbox"/> NOT EMBED. [1]
<input type="checkbox"/> GENERALLY >10 cm, MAX >50 [3]		<input type="checkbox"/> NO RIFFLE [0]

COMMENTS: fairly small not much habitat

[6] MAP GRADIENT

9.1 SCORE 8

[7] DRAINAGE AREA

4.50 SCORE 8

GRADIENT

DRAINAGE AREA

1.5

TOTAL QHEI

4

SUBSTRATE

6

COVER

3.5

CHANNEL

12

RIPARIAN

7

POOL / RIFFLE

5

6

Ohio EPA Site Description Sheet - Fish

Stream Raccoon Creek RM 102 Date 7/19/86 County SANDUSKY
 Location 1ST RT 223th. DST Ohio WNP USGS Quad CLYDE
 Township GREEN CREEK Section 1 Latit./Longit. 41 19 39 82 59 14

68

TOTAL
QHEI

7

SUBSTRATE

13

COVER

12.5

CHANNEL

6

RIPARIAN

12.5

POOL/
RIFFLE

9

GRADIENT

8

DRAINAGE
AREA

SUBSTRATE

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	QUALITY
<input type="checkbox"/> BOULDER [7]	—	—	<input type="checkbox"/> GRAVEL [5]	—	30	<input type="checkbox"/> EMBEDDED [-2]
<input type="checkbox"/> COBBLE [6]	—	30	<input type="checkbox"/> SAND [4]	—	30	<input type="checkbox"/> SILT COVERED [-1]
<input checked="" type="checkbox"/> HARDPAN [3]	—	—	<input type="checkbox"/> BEDROCK [3]	—	—	<input checked="" type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> SILT [3]	—	—	<input type="checkbox"/> DETRITUS [2]	—	—	<input type="checkbox"/> BOULDERS AS SLABS [1]
<input type="checkbox"/> MUCK [2]	—	—	<input type="checkbox"/> SLUDGE [1]	—	—	

COMMENTS: Majority bottom clay, hard pan but frequent accumulations of gravel & cobbles esp. in runs & riffles

INSTREAM COVER

TYPE	AMOUNT
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> DEEP POOLS [1]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> OXBOWS [1]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> BOULDERS [1] <u>algae</u>
<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input checked="" type="checkbox"/> AQUATIC MACROPHYTES [1]
	<input type="checkbox"/> EXTENSIVE [7]
	<input type="checkbox"/> MODERATE [5]
	<input type="checkbox"/> SPARSE [3]
	<input type="checkbox"/> NEARLY ABSENT [1]

COMMENTS: good variety

CHANNEL MORPHOLOGY:

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
<input checked="" type="checkbox"/> HIGH [4]	<input checked="" type="checkbox"/> EXCELLENT [4]	<input checked="" type="checkbox"/> NONE [4]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> IMPOUND.
<input checked="" type="checkbox"/> MODERATE [3]	<input checked="" type="checkbox"/> GOOD [3]	<input checked="" type="checkbox"/> RECOVERED [3]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> ISLANDS
<input type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [2]	<input type="checkbox"/> RECOVERING [2]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> LEVEED
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		

COMMENTS: good rubble pool/run development, appears some bank stabilization in form of concrete rubble on outside bank

RIPARIAN ZONE AND BANK EROSION

L	R	WIDTH	QUALITY	BANK EROSION
<input type="checkbox"/>	<input type="checkbox"/>	EXTENSIVE >100m [5]	<input type="checkbox"/> FOREST, SWAMP [5]	<input type="checkbox"/> URBAN [1]
<input type="checkbox"/>	<input type="checkbox"/>	WIDE 50-100m [4]	<input type="checkbox"/> OPEN PASTURE [1]	<input checked="" type="checkbox"/> ROWCROP [1]
<input type="checkbox"/>	<input type="checkbox"/>	MODERATE 10-50m [3]	<input type="checkbox"/> OLD FIELD [3]	<input type="checkbox"/> SHRUB [4]
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK [2]	<input checked="" type="checkbox"/> MODER. [3]
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	VERY NARROW 1-5m [1]	<input type="checkbox"/> CONSERV. TILLAGE [2]	<input type="checkbox"/> HEAVY [2]
<input type="checkbox"/>	<input type="checkbox"/>	NONE [0]	<input type="checkbox"/> FENCED PASTURE [2]	<input type="checkbox"/> SEVERE [1]

COMMENTS: outlets banks have little riparian veg. just weeds & grass. banks small trees & large shrubs row crop again broken up by stream

POOL AND RIFFLE QUALITY

A) POOL	MAX. DEPTH	COVER	CURRENT	MORPHOLOGY
<input type="checkbox"/>	>1m [3]	<input checked="" type="checkbox"/> EXTENSIVE [3]	<input type="checkbox"/> TORRENTIAL [-1]	<input checked="" type="checkbox"/> WIDE [2]
<input type="checkbox"/>	0.7-1m [2]	<input checked="" type="checkbox"/> MODERATE [2]	<input checked="" type="checkbox"/> FAST [1]	<input type="checkbox"/> EQUAL [1]
<input type="checkbox"/>	0.4-0.7m [1]	<input type="checkbox"/> SPARSE [1]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> NARROW [0]
<input type="checkbox"/>	<0.4m [0]	<input type="checkbox"/> NEARLY ABSENT [0]	<input type="checkbox"/> SLOW [1]	

COMMENTS: several good pools

B) RIFFLE

DEPTH	SUBSTRATE	SUBSTRATE QUALITY
<input type="checkbox"/> GENERALLY <10 cm [1]	<input checked="" type="checkbox"/> STABLE (Cobble, Boulder) [1]	<input type="checkbox"/> EMBEDDED [0]
<input checked="" type="checkbox"/> GENERALLY >10 cm, MAX <50 [2]	<input type="checkbox"/> UNSTABLE (Gravel, Sand) [0]	<input checked="" type="checkbox"/> NOT EMBED. [1]
<input type="checkbox"/> GENERALLY >10 cm, MAX >50 [3]		<input type="checkbox"/> NO RIFFLE [0]

COMMENTS:

[6] MAP GRADIENT 22.2 SCORE[7] DRAINAGE AREA 10.75 SCORE

Ohio EPA Site Description Sheet - Fish

Stream Raccoon Creek RM 11.2 Date 7/10/86 County SANDUSKY
 Location DET RT 20 TURNOFF of VST NWTP USGS Quad CLYDE
 Township GREEN CREEK Section Letit./Longt 41 18 50 82 59 09

65.5

TOTAL
QHEI

1) SUBSTRATE

TYPE	POOL	RIFFLE		POOL	RIFFLE	QUALITY
<input type="checkbox"/> <input checked="" type="checkbox"/> BOULDER [7]	<u>40</u>	<u>40</u>	<input type="checkbox"/> <input type="checkbox"/> GRAVEL [5]	<u>45</u>	<u>15</u>	<input type="checkbox"/> EMBEDDED [-2]
<input type="checkbox"/> <input checked="" type="checkbox"/> COBBLE [6]	<u>40</u>	<u>40</u>	<input type="checkbox"/> <input type="checkbox"/> SAND [4]	<u>45</u>	<u>15</u>	<input checked="" type="checkbox"/> SILT COVERED [-1]
<input type="checkbox"/> <input type="checkbox"/> HARDPAN [3]			<input type="checkbox"/> <input type="checkbox"/> BEDROCK [3]			<input type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> <input type="checkbox"/> SILT [3]			<input type="checkbox"/> <input type="checkbox"/> DETRITUS [2]			<input type="checkbox"/> BOULDERS AS SLABS [1]
<input type="checkbox"/> <input type="checkbox"/> MUCK [2]			<input type="checkbox"/> <input type="checkbox"/> SLUDGE [1]	<u>5</u>	<u>5</u>	

COMMENTS: again mostly anthropogenic, i.e. concrete rubble

SUBSTRATE

2) INSTREAM COVER

TYPE	AMOUNT
<input checked="" type="checkbox"/> UNDERCUT BANKS [1]	<input type="checkbox"/> EXTENSIVE [7]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> MODERATE [5]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> SPARSE [3]
<input type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> NEARLY ABSENT [1]
<input checked="" type="checkbox"/> DEEP POOLS [1]	
<input type="checkbox"/> OXBOWS [1]	
<input checked="" type="checkbox"/> BOULDERS [1]	
<input type="checkbox"/> AQUATIC MACROPHYTES [1]	

COMMENTS: most obscuring habitat even looking at site, a little bit
broader of more variable in width & depth

COVER

3) CHANNEL MORPHOLOGY:

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [4]	<input type="checkbox"/> NONE [4]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> IMPOUND.
<input type="checkbox"/> MODERATE [3]	<input checked="" type="checkbox"/> GOOD [3]	<input checked="" type="checkbox"/> RECOVERED [3]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> ISLANDS
<input checked="" type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [2]	<input checked="" type="checkbox"/> RECOVERING [2]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> LEVEED
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO		

COMMENTS: has been dredged but erosion at the bank & meandering
has to allow recovery

CHANNEL

4) RIPARIAN ZONE AND BANK EROSION

L R	WIDTH	QUALITY	BANK EROSION
<input type="checkbox"/> <input type="checkbox"/> EXTENSIVE >100m [5]	<input type="checkbox"/> <input type="checkbox"/> FOREST, SWAMP [5]	<input type="checkbox"/> <input type="checkbox"/> URBAN [1]	<input type="checkbox"/> <input type="checkbox"/> NONE [5]
<input type="checkbox"/> <input type="checkbox"/> WIDE 50-100m [4]	<input type="checkbox"/> <input type="checkbox"/> OPEN PASTURE [1]	<input type="checkbox"/> <input type="checkbox"/> ROWCROP [1]	<input type="checkbox"/> <input type="checkbox"/> LITTLE [4]
<input type="checkbox"/> <input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> <input type="checkbox"/> OLD FIELD [3]	<input type="checkbox"/> <input type="checkbox"/> SHRUB [4]	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> MODER. [3]
<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> <input type="checkbox"/> RESIDENTIAL, PARK [2]	<input type="checkbox"/> <input type="checkbox"/> CONSERV. TILLAGE [2]	<input type="checkbox"/> <input type="checkbox"/> HEAVY [2]
<input type="checkbox"/> <input type="checkbox"/> VERY NARROW 1-5m [1]	<input type="checkbox"/> <input type="checkbox"/> FENCED PASTURE [2]		<input type="checkbox"/> <input type="checkbox"/> SEVERE [1]
<input type="checkbox"/> <input type="checkbox"/> NONE [0]			

COMMENTS: small trees & large shrub or mixed with some herbaceous
weeds

RIPARIAN

[5] POOL AND RIFFLE QUALITY

A) POOL	MAX. DEPTH	COVER	CURRENT	MORPHOLOGY
<input type="checkbox"/> >1m [3]	<input type="checkbox"/> EXTENSIVE [3]	<input type="checkbox"/> TORRENTIAL [-1]	<input checked="" type="checkbox"/> WIDE [2]	
<input checked="" type="checkbox"/> 0.7-1m [2]	<input type="checkbox"/> MODERATE [2]	<input type="checkbox"/> FAST [1]	<input type="checkbox"/> EQUAL [1]	
<input type="checkbox"/> 0.4-0.7m [1]	<input checked="" type="checkbox"/> SPARSE [1]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> NARROW [0]	
<input type="checkbox"/> <0.4m [0]	<input type="checkbox"/> NEARLY ABSENT [0]	<input checked="" type="checkbox"/> SLOW [1]		
		<input checked="" type="checkbox"/> INTERSTITIAL [-1]		
		<input type="checkbox"/> INTERMITTENT [-2]		
		<input type="checkbox"/> EDDIES [1]		

COMMENTS: a few good pools

B) RIFFLE	DEPTH	SUBSTRATE	SUBSTRATE QUALITY
<input checked="" type="checkbox"/> GENERALLY <10 cm [1]	<input checked="" type="checkbox"/> STABLE (Cobble, Boulder) [1]	<input checked="" type="checkbox"/> EMBEDDED [0]	
<input type="checkbox"/> GENERALLY >10 cm, MAX <50 [2]	<input type="checkbox"/> UNSTABLE (Gravel, Sand) [0]	<input type="checkbox"/> NOT EMBED. [1]	
<input type="checkbox"/> GENERALLY >10 cm, MAX >50 [3]		<input type="checkbox"/> NO RIFFLE [0]	

COMMENTS: habitat capable of supporting
darters

POOL/
RIFFLE[6] MAP GRADIENT 125 SCORE[7] DRAINAGE AREA 8.75 SCORE 7

GRADIENT

DRAINAGE
AREA

19

7

Ohio EPA Site Description Sheet - Fish

Stream Raccoon Creek RM 11.2 Date 7/10/80 County SANDUSKY
 Location USFWS Lead Endos Aprone #1 USGS Quad CLIDE
 Township GREEN CREEK Section 1 Latit./Longit. 41 18 27 82 58 10

655

TOTAL
QHEI

14

SUBSTRATE

9

COVER

9.5

CHANNEL

8

RIPARIAN

12

POOL/
RIFFLE

7

DRAINAGE
AREA

SUBSTRATE

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	QUALITY
<input checked="" type="checkbox"/> BOULDER [7]	<u>40</u>	<u>50</u>	<input type="checkbox"/> GRAVEL [5]			<input type="checkbox"/> EMBEDDED [-2]
<input checked="" type="checkbox"/> COBBLE [6]	<u>40</u>	<u>40</u>	<input type="checkbox"/> SAND [4]		<u>20</u>	<input type="checkbox"/> SILT COVERED [-1]
<input type="checkbox"/> HARDPAN [3]			<input type="checkbox"/> BEDROCK [3]			<input checked="" type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> SILT [3]	<u>10</u>		<input type="checkbox"/> DETRITUS [2]			<input type="checkbox"/> BOULDERS AS SLABS [1]
<input type="checkbox"/> MUCK [2]	<u>10</u>		<input type="checkbox"/> SLUDGE [1]			

COMMENTS: Stream bottom appears to be composed of concrete cobble & boulders.
 2) INSTREAM COVER predominate cover good none the less expect higher & species

TYPE	AMOUNT
<input type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> DEEP POOLS [1]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input type="checkbox"/> OXBOWS [1]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input checked="" type="checkbox"/> BOULDERS [1]
<input type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> AQUATIC MACROPHYTES [1]
	<input type="checkbox"/> EXTENSIVE [7]
	<input checked="" type="checkbox"/> MODERATE [5]
	<input type="checkbox"/> SPARSE [3]
	<input type="checkbox"/> NEARLY ABSENT [1]

COMMENTS: not as great a diversity as substrate, mostly large particle substrate.

3) CHANNEL MORPHOLOGY:

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
<input type="checkbox"/> HIGH [4]	<input type="checkbox"/> EXCELLENT [4]	<input type="checkbox"/> NONE [4]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> IMPOUND.
<input checked="" type="checkbox"/> MODERATE [3]	<input checked="" type="checkbox"/> GOOD [3]	<input type="checkbox"/> RECOVERED [3]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> ISLANDS
<input type="checkbox"/> LOW [2]	<input checked="" type="checkbox"/> FAIR [2]	<input checked="" type="checkbox"/> RECOVERING [2]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> LEVEED
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		

COMMENTS: looks like it was dredged and then filled & lined with concrete
cobble & boulders to maintain the channel.

4) RIPARIAN ZONE AND BANK EROSION

L R	WIDTH	QUALITY	BANK EROSION
<input type="checkbox"/> EXTENSIVE >100m [5]	<input type="checkbox"/> FOREST, SWAMP [5]	<input type="checkbox"/> URBAN [1]	L R
<input type="checkbox"/> WIDE 50-100m [4]	<input type="checkbox"/> OPEN PASTURE [1]	<input type="checkbox"/> ROWCROP [1]	<input type="checkbox"/> NONE [5]
<input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> OLD FIELD [3]	<input type="checkbox"/> SHRUB [4]	<input checked="" type="checkbox"/> LITTLE [4]
<input checked="" type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> RESIDENTIAL, PARK [2]		<input type="checkbox"/> MODER. [3]
<input type="checkbox"/> VERY NARROW 1-5m [1]	<input type="checkbox"/> CONSERV. TILLAGE [2]		<input type="checkbox"/> HEAVY [2]
<input type="checkbox"/> NONE [0]	<input type="checkbox"/> FENCED PASTURE [2]		<input type="checkbox"/> SEVERE [1]

COMMENTS: grazed areas along bottom of both banks narrow strip
to top of bank some fox grapes brush & some weeds

[5] POOL AND RIFFLE QUALITY

A) POOL	MAX. DEPTH	COVER	CURRENT	MORPHOLOGY
<input type="checkbox"/> >1m [3]	<input type="checkbox"/> EXTENSIVE [3]	<input type="checkbox"/> TORRENTIAL [-1]	<input checked="" type="checkbox"/> WIDE [2]	
<input checked="" type="checkbox"/> 0.7-1m [2]	<input checked="" type="checkbox"/> MODERATE [2]	<input checked="" type="checkbox"/> FAST [1]	<input type="checkbox"/> EQUAL [1]	
<input type="checkbox"/> 0.4-0.7m [1]	<input type="checkbox"/> SPARSE [1]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> NARROW [0]	
<input type="checkbox"/> <0.4m [0]	<input type="checkbox"/> NEARLY ABSENT [0]	<input type="checkbox"/> SLOW [1]		
		<input type="checkbox"/> INTERSTITIAL [-1]		
		<input type="checkbox"/> INTERMITTENT [-2]		
		<input type="checkbox"/> EDDIES [1]		

COMMENTS: 1 pool & a couple lesser ones

B) RIFFLE	DEPTH	SUBSTRATE	SUBSTRATE QUALITY
<input type="checkbox"/> GENERALLY <10 cm [1]	<input checked="" type="checkbox"/> STABLE (Cobble, Boulder) [1]	<input type="checkbox"/> EMBEDDED [0]	
<input checked="" type="checkbox"/> GENERALLY >10 cm, MAX <50 [2]	<input type="checkbox"/> UNSTABLE (Gravel, Sand) [0]	<input checked="" type="checkbox"/> NOT EMBED. [1]	
<input type="checkbox"/> GENERALLY >10 cm, MAX >50 [3]		<input type="checkbox"/> NO RIFFLE [0]	

COMMENTS: good riffles but no darters

[6] MAP GRADIENT 5 SCORE 6[7] DRAINAGE AREA 7.5 SCORE 7

GRADIENT

DRAINAGE
AREA

Ohio EPA Site Description Sheet - Fish

Stream Raccoon Creek (Lake Erie) RM 132 Date 7/10/85 County SANDUSKY
 Location DST Limerick Rd. Bridge USGS Quad CLYDE
 Township GREEN CREEK Section 1 Latit./Longit. 41°17'21" 82°58'54"



TOTAL QHEI

1) SUBSTRATE

TYPE	POOL	RIFFLE	TYPE	POOL	RIFFLE	QUALITY
<input type="checkbox"/> <input type="checkbox"/> BOULDER [7]	—	<u>50</u>	<input checked="" type="checkbox"/> <input type="checkbox"/> GRAVEL [5]	—	<u>30</u>	<input type="checkbox"/> EMBEDDED [-2]
<input type="checkbox"/> <input type="checkbox"/> COBBLE [6]	—	<u>40</u>	<input type="checkbox"/> <input type="checkbox"/> SAND [4]	—	<u>30</u>	<input type="checkbox"/> SILT COVERED [-1]
<input type="checkbox"/> <input type="checkbox"/> HARDPAN [3]	—	—	<input type="checkbox"/> <input type="checkbox"/> BEDROCK [3]	—	—	<input checked="" type="checkbox"/> SILT FREE [1]
<input type="checkbox"/> <input type="checkbox"/> SILT [3]	—	—	<input type="checkbox"/> <input type="checkbox"/> DETRITUS [2]	—	—	<input type="checkbox"/> BOULDERS AS SLABS [1]
<input type="checkbox"/> <input type="checkbox"/> MUCK [2]	—	—	<input type="checkbox"/> <input type="checkbox"/> SLUDGE [1]	—	—	

COMMENTS: fairly good w/ all substrate

SUBSTRATE

2) INSTREAM COVER

TYPE	AMOUNT
<input type="checkbox"/> UNDERCUT BANKS [1]	<input checked="" type="checkbox"/> EXTENSIVE [7]
<input checked="" type="checkbox"/> OVERHANGING VEGETATION [1]	<input checked="" type="checkbox"/> MODERATE [5]
<input checked="" type="checkbox"/> SHALLOWS (IN SLOW WATER) [1]	<input type="checkbox"/> SPARSE [3]
<input checked="" type="checkbox"/> LOGS OR WOODY DEBRIS [1]	<input type="checkbox"/> NEARLY ABSENT [1]
<input type="checkbox"/> DEEP POOLS [1]	
<input type="checkbox"/> OXBOWS [1]	
<input type="checkbox"/> BOULDERS [1]	
<input type="checkbox"/> AQUATIC MACROPHYTES [1]	

COMMENTS: good instream cover extensive in water near instream vegetation
good instream cover under cut banks & riffled etc.



COVER

3) CHANNEL MORPHOLOGY:

SINUOSITY	DEVELOPMENT	CHANNELIZATION	STABILITY	OTHER
<input type="checkbox"/> HIGH [4]	<input checked="" type="checkbox"/> EXCELLENT [4]	<input type="checkbox"/> NONE [4]	<input type="checkbox"/> HIGH [3]	<input type="checkbox"/> IMPOUND.
<input checked="" type="checkbox"/> MODERATE [3]	<input checked="" type="checkbox"/> GOOD [3]	<input checked="" type="checkbox"/> RECOVERED [3]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> ISLANDS
<input type="checkbox"/> LOW [2]	<input type="checkbox"/> FAIR [2]	<input type="checkbox"/> RECOVERING [2]	<input type="checkbox"/> LOW [1]	<input type="checkbox"/> LEVEED
<input type="checkbox"/> NONE [1]	<input type="checkbox"/> POOR [1]	<input type="checkbox"/> RECENT OR NO RECOVERY [1]		

COMMENTS: looks like was channelized i.e. dredged a long time ago but
good meanders & riffles



CHANNEL

4) RIPARIAN ZONE AND BANK EROSION

L	R	WIDTH	QUALITY	BANK EROSION
<input type="checkbox"/> <input type="checkbox"/> EXTENSIVE >100m [5]	<input type="checkbox"/> <input type="checkbox"/> FOREST, SWAMP [5]	<input type="checkbox"/> <input type="checkbox"/> URBAN [1]	<input type="checkbox"/> <input type="checkbox"/> NONE [5]	
<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> WIDE 50-100m [4]	<input type="checkbox"/> <input type="checkbox"/> OPEN PASTURE [1]	<input type="checkbox"/> <input type="checkbox"/> ROWCROP [1]	<input checked="" type="checkbox"/> <input type="checkbox"/> LITTLE [4]	
<input type="checkbox"/> <input type="checkbox"/> MODERATE 10-50m [3]	<input type="checkbox"/> <input type="checkbox"/> OLD FIELD [3]	<input type="checkbox"/> <input type="checkbox"/> SHRUB [4]	<input type="checkbox"/> <input type="checkbox"/> MODER. [3]	
<input type="checkbox"/> <input type="checkbox"/> NARROW 5-10m [2]	<input type="checkbox"/> <input type="checkbox"/> RESIDENTIAL, PARK [2]		<input type="checkbox"/> <input type="checkbox"/> HEAVY [2]	
<input type="checkbox"/> <input type="checkbox"/> VERY NARROW 1-5m [1]	<input type="checkbox"/> <input type="checkbox"/> CONSERV. TILLAGE [2]		<input type="checkbox"/> <input type="checkbox"/> SEVERE [1]	
<input type="checkbox"/> <input type="checkbox"/> NONE [0]	<input type="checkbox"/> <input type="checkbox"/> FENCED PASTURE [2]			

COMMENTS: good riparian strip appears little erosion to
erod. upon areas adj. to riparian



RIPARIAN

[5] POOL AND RIFFLE QUALITY

A) POOL	MAX. DEPTH	COVER	CURRENT	MORPHOLOGY
<input checked="" type="checkbox"/> >1m [3]	<input checked="" type="checkbox"/> EXTENSIVE [3]	<input type="checkbox"/> TORRENTIAL [-1]	<input type="checkbox"/> WIDE [2]	
<input type="checkbox"/> 0.7-1m [2]	<input checked="" type="checkbox"/> MODERATE [2]	<input type="checkbox"/> FAST [1]	<input checked="" type="checkbox"/> EQUAL [1]	
<input type="checkbox"/> 0.4-0.7m [1]	<input type="checkbox"/> SPARSE [1]	<input checked="" type="checkbox"/> MODERATE [1]	<input type="checkbox"/> NARROW [0]	
<input type="checkbox"/> <0.4m [0]	<input type="checkbox"/> NEARLY ABSENT [0]	<input type="checkbox"/> SLOW [1]		
		<input checked="" type="checkbox"/> INTERSTITIAL [-1]		
		<input type="checkbox"/> INTERMITTENT [-2]		
		<input type="checkbox"/> EDDIES [1]		

COMMENTS: good pools at bends & undercut
tree



POOL/ RIFFLE

B) RIFFLE	DEPTH	SUBSTRATE	SUBSTRATE QUALITY
<input type="checkbox"/> GENERALLY <10 cm [1]	<input checked="" type="checkbox"/> STABLE (Cobble, Boulder) [1]	<input type="checkbox"/> EMBEDDED [0]	
<input checked="" type="checkbox"/> GENERALLY >10 cm, MAX <50 [2]	<input type="checkbox"/> UNSTABLE (Gravel, Sand) [0]	<input checked="" type="checkbox"/> NOT EMBED. [1]	
<input type="checkbox"/> GENERALLY >10 cm, MAX >50 [3]		<input type="checkbox"/> NO RIFFLE [0]	

COMMENTS: large cobble boulder substrate



GRADIENT



DRAINAGE AREA

[6] MAP GRADIENT 16.7 SCORE[7] DRAINAGE AREA 4.25 SCORE