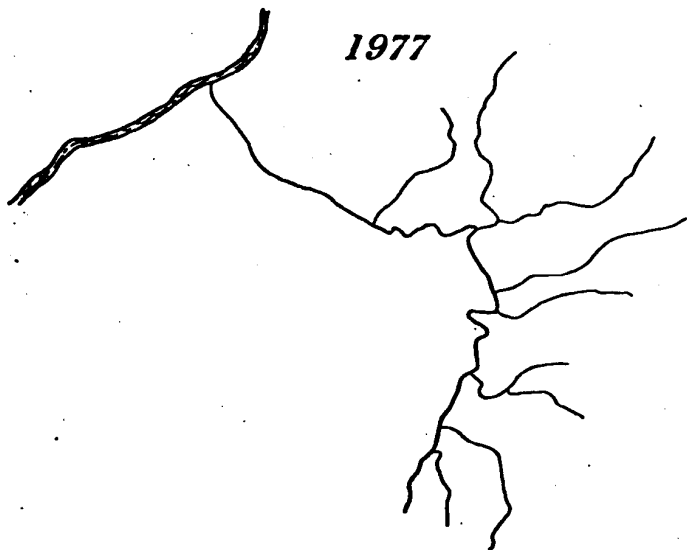


*BIOLOGICAL SURVEY
OF
PLASTER CREEK*



*State of Michigan
Department of Natural Resources
Water Quality Division
Biology Section
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INTRODUCTION AND BACKGROUND

A biological survey was conducted on 11 stations located on the lower nine miles of Plaster Creek in Grand Rapids, Michigan, from July 19 to September 8, 1977 (Figure 1). A combination of aquatic macroinvertebrate and fish communities, sediment chemistry composition and habitat observations were used to assess present water quality conditions.

Plaster Creek is protected for partial body contact and warm-water fish. It flows through a heavily industrialized section of Grand Rapids before its confluence with the Grand River. This creek receives substantial wastewater flows from industrial sources and storm water runoff. There are three combined storm-sanitary overflows which empty into Plaster Creek (Figure 1).

The three major storm drains discharging into Plaster Creek are the Silver Creek, Lee Street and Burton Street storm drains. Industries which have discharges to these drains include Reynolds Metal, GM Diesel, Kelvinator and Guardsman Chemical Coating Company. In May 1975, Guardsman Chemical Coating had large xylene leakage from a storage tank. No detectable impact on the creek was reported. Reynolds Metal Company had an oil loss in April, 1977, and Dexter Lock has had contaminated groundwater with hexavalent chromium. These are the only recent significant industrial losses reported for this area.

SUMMARY AND RECOMMENDATIONS

1. Sediments at the control station (PC-2) contained "heavily polluted" concentrations of lead, cyanide and phosphorus. Below the first combined sewer outfall (Buchanan Avenue, PC-4), phosphorus, copper, zinc, lead, cyanide and oils were found at "heavily polluted" levels. Further downstream, from the Kelvinator bridge to the mouth, in addition to the above parameters, cadmium and nickel were also elevated. Sediment values significantly exceeded Michigan background values (+ 2 std. dev.) for zinc, lead and arsenic at all stations.
2. The ditched portion of Cole Drain was found to contain extremely elevated levels of an assortment of unrelated toxicants, including heavy metals, PCB's and phthalates. This ditch has been dredged out and its contents were disposed of properly. No source(s) were determined for these contaminants.
3. Sediments in the Silver Creek storm drain outfall contained high levels of phosphorus, arsenic, copper, cadmium, chromium, zinc, lead, nickel, cyanide, phenols, oil and 1254 PCB's. Oils at 10,000 mg/kg were extremely elevated above background levels. The source(s) for these parameters should be further investigated.

4. Plaster Creek has good to excellent habitat in the river reach studied for the establishment of diverse benthic communities. However, the macroinvertebrate communities were limited. The upstream stations (Breton Avenue to Eastern Avenue) contained significant numbers of mayflies and caddisflies which indicated fair water quality.
5. Mayfly and caddisfly numbers were reduced from 76% to 6.7% of the total organisms between Eastern Avenue (Station PC-3) and Buchanan Avenue (Station PC-4), respectively. From Buchanan to Burton Street these groups continued to be depressed. This may be attributable to the large number of storm drains from the streets, homes and commercial businesses in the vicinity and a combined storm-sanitary drain.
6. Severely reduced benthic communities were found below Burton Street to the mouth with the elimination of mayflies and caddisflies. It appears that municipal storm drains and industrial discharges are degrading water quality to the extent that only very tolerant worms, snails, sowbugs and midges were found. Approximately 1.5 miles of the river are grossly degraded.
7. It is recommended that a survey be conducted on the headwaters of Plaster Creek to ascertain whether or not leachates from an old city landfill have been detrimental to Plaster Creek.

METHODS

SEDIMENTS

Concentrations of metals in sediments reflect either natural background levels or those resulting from man's activities. Wastewater discharges which contain metals cause the downstream river sediments to accumulate abnormally high heavy metal concentrations.

Once precipitated out of the water column, the majority of heavy metals remain in the sediments. However, some may return to the water by conversion to more biologically active forms and by the scouring action of water currents. These accumulations of metals are therefore potentially available for uptake and biomagnification, by organisms in the aquatic food chain. (Evans and Hesse, 1972).

Concentrations of chlorinated hydrocarbons and phthalates in sediments are strictly a function of man's activities. These activities include the use of hydrocarbons as pesticides and phthalates as plasticizers. Polychlorinated biphenyls are frequently used as fire resistant heat transfer and hydraulic fluids. These substances can move from the sediments and can be converted to more biologically active forms, which are potentially available for uptake by aquatic organisms. These substances are also bio-accumulating.

FIGURE 2

SEDIMENT

SAMPLING STATION LOCATIONS ON PLASTER CREEK, GRAND RAPIDS,
KENT COUNTY, MICHIGAN. JULY TO SEPTEMBER 1977

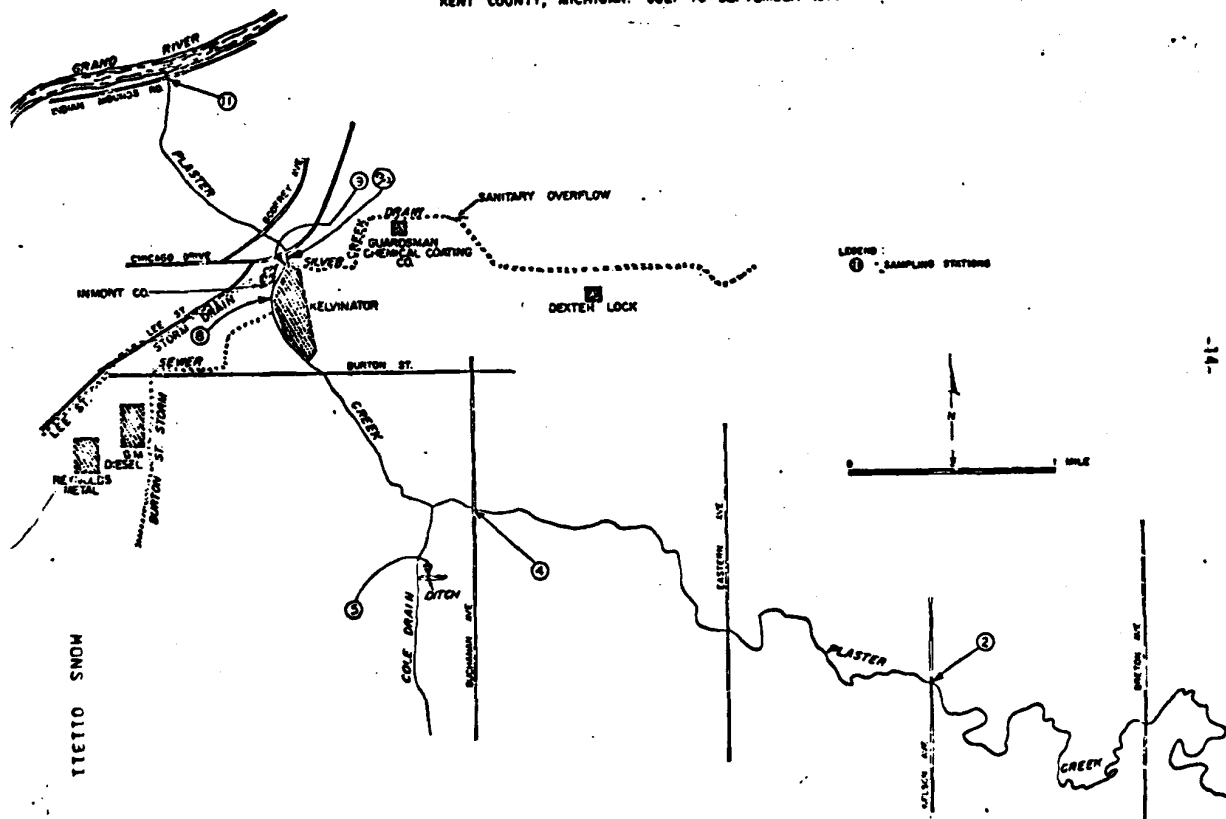


Table 2

Heavy metals, nutrients, chemicals and hydrocarbons found in Plaster Creek sediments in September, 1977, Grand Rapids, Michigan.

Station location: Station Number	Reichen Avenue (Pond-Bike Park) PC-2	Euclid Road PC-4	Cole Drain US 131 & 24th Avenue PC-5	Kalvinator Bridge PC-8
<u>Parameters (mg/g)</u>				
Kjeldahl Nitrogen	1,600	2,300 *	2,200 *	6,000 *
Total Phosphorus	710 *	820 *	720 *	1,400 *
COD	90,000 *	140,000 *	530,000 *	140,000 *
Arsenic	5.6	7.2	74	4.0
Copper	31	58 *	190 *	190 *
Mercury	0.08	0.17	0.18	0.14
Cadmium	3.5	4.9	8.3 *	7.2 *
Total Chromium	28	28	33	54
Iron			66,000 *	
Zinc	200	310 *	500 *	230 *
Nickel	40	41	56 *	52 *
Lead	240 *	660 *	1,000 *	360 *
Cyanide	0.5 *	0.9 *	0.1	1.9 *
Phenols	0.2	0.3	1.6	0.5

Hydrocarbons

12-12 PCB ug/kg	< 500	< 500	170,000	< 500
12-14 PCB ug/kg	< 500	700	38,000	500
12-16 PCB ug/kg	< 500	< 500	< 10,000	< 500
DEPH ug/kg	< 1,000	< 1,000	200,000	< 1,000
Oil ug/kg	1,600	2,800 *	2,000	5,300 *

- * indicating those values exceeding EPA 1975 proposed sediment classification levels of heavily polluted.
 + collected in the ditched portion at the end of Darling Freight Lines property.